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The cost of thromboembolic events in hospitalized patients with breast or prostate cancer in France

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ABSTRACT

Background: Cancer is associated with a high risk of venous thromboembolism. We aimed to determine the number of stays and the cost of hospital management of thromboembolic events (VTEs) occurring in patients with breast cancer (BC) or prostate cancer (PC).

Methods: The French national hospital database (PMSI) was analysed in order to identify patients whose BC or PC was diagnosed in 2010 and who were hospitalized for a VTE at least once during the following two years. The numbers of stays induced by a VTE, and the corresponding number of patients hospitalized, were determined using the disease-specific ICD-10 codes. Associated hospital costs were estimated from the perspective of the third-party payer, using the French official tariffs.

Results: We identified 62,365 patients with BC and 45,551 patients with PC; in each group, 1,271 (2.0%) and 997 (2.2%), respectively, were hospitalized for a VTE or had a VTE during their hospital stay. During the 2 years of follow-up of these 2,268 patients, 346 (15.3%) were hospitalized for a VTE recurrence. In total, 1,604 stays for BC patients and 1,210 stays for PC patients were analyzed. In BC patients, the mean cost per stay amounted to € 3,302 and € 2,916 for first event and recurrence, respectively, and in PC patients, € 3,611 and € 3,363 for first event and recurrence, respectively. In patients who had at least one recurrence, mean hospitalization cost per patient was € 5,545 and € 5,692 in BC and PC, respectively. Over a 2-year period, the total cost of hospital stays induced by VTEs reached € 1.98 million and € 1.43 million for BC and PC, respectively.

Conclusion: The burden of VTE in cancer patients is high; costs would be reduced by decreasing the occurrence of thromboembolic complications in this at-risk population. Better prevention and follow-up measures may reduce recurrence and VTE costs.

INTRODUCTION

- In France, cancer-related costs represent a growing part, namely 10% of third-party payer expenses in 2012 (€14.5 billion) with an increase of 2.8% compared to 2011. All available options to reduce or at least stabilize the costs without decreasing the quality of patient care must be considered¹.
- Patients with cancer are known to have a four-to-six fold increased risk of venous thromboembolism (VTE), including deep venous thrombosis and pulmonary embolism^{2,3}. These venous thromboembolic events lead to hospitalizations that dramatically increase the burden of the patients' management.
- Several international studies tried to estimate the VTE burden in cancer patients: in the USA, an observational study of patients treated with chemotherapy showed an VTE overall incidence of 13.5% at 12 months⁴. In addition, the risk of recurrence in cancer patients has been estimated at 20.6% compared to 6.8% in patients without cancer⁵. A study in ambulatory US patients with various types of cancer revealed that patients with VTE had a total healthcare cost increased by 79.9% compared to those without VTE over the 12-month post VTE follow-up period⁶.
- These studies demonstrated that VTEs had significant costs, mainly due to hospitalizations, but also because of recurrences.

AIMS OF THE STUDY

- To evaluate the epidemiological and economical burden of cancer-related VTE in France :
 - To estimate the number of hospital admissions related to VTE in newly diagnosed breast or prostate cancers patients over two years;
 - To determine VTE-recurrence importance;
 - To calculate the associated hospital costs.

METHODS

- **Data source:** French Medical Information System (Programme de Médicalisation des Systèmes d'Information: PMSI), which covers all French public and private hospitals with a completeness close to 98% since 2007. For each patient, PMSI contains: diagnosis that led to hospitalization, associated diagnoses related to co-morbidities and/or complications during admission and examinations performed during the admission.

- **Data collection of VTE-related admissions:** cases were extracted from the PMSI database using the International Classification of Diseases, 10th revision (ICD-10 codes). We kept patients with breast cancer (code C50) or prostate cancer (code C61) and selected newly diagnosed patients in 2010 (incident cancer cases). Among these new BC or PC patients, we searched for those hospitalized with DVT (code I80) or PE (code I26) as primary diagnosis (PD), related diagnosis (RD) or significant associated diagnosis (SAD). Incident patients with DVT or PE were followed for 2 years (2011 and 2012) using PMSI database, in order to identify the number of thromboembolic recurrences that requires hospitalization.
- **Number of stays and patients hospitalized for TVE:** the number of hospital stays when a VTE occurred during the 2-year follow-up period was estimated, as well as the corresponding number of patients hospitalized at least once.
- **Economic Evaluation:** hospital costs were estimated from a healthcare payer's perspective. Costs of chemotherapy, ambulatory and indirect costs related to productivity loss were not considered in the analysis. Costs were calculated using the official 2010, 2011 and 2012 public and private hospitals Diagnosis Related Groups (DRG) tariffs.

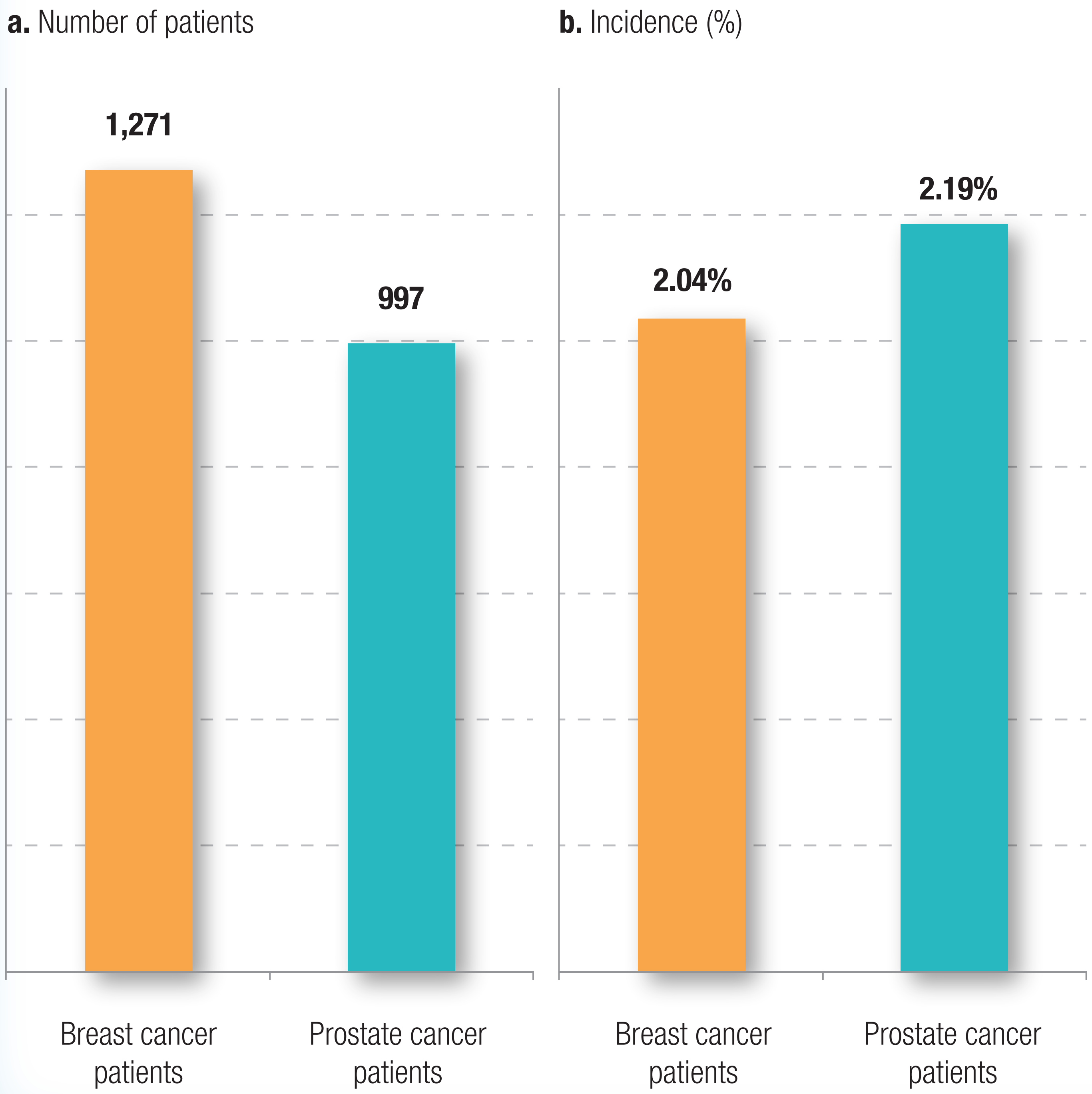
RESULTS

1 Incidence of VTE-related hospitalization

Among all breast and prostate cancer patients hospitalized in 2010, we excluded patients who had been hospitalized for those cancers from 2006 to 2010. Newly diagnosed cases in 2010 were then 62,365 for breast cancer patients and 45,551 for prostate cancer patients, representing a population of 107 916 new patients.

During a 2-year follow-up period, 2,268 patients (**Fig. 1a**) were hospitalized for a VTE (or presented a VTE during an hospitalization): 1,271 breast cancer patients (2.04%) and 997 prostate cancer patients (2.19%, **Fig. 1b**), these results being consistent with literature^{7,8}.

Figure 1. Patients hospitalized once for VTE (a) and incidence of VTE-related hospitalizations (b).



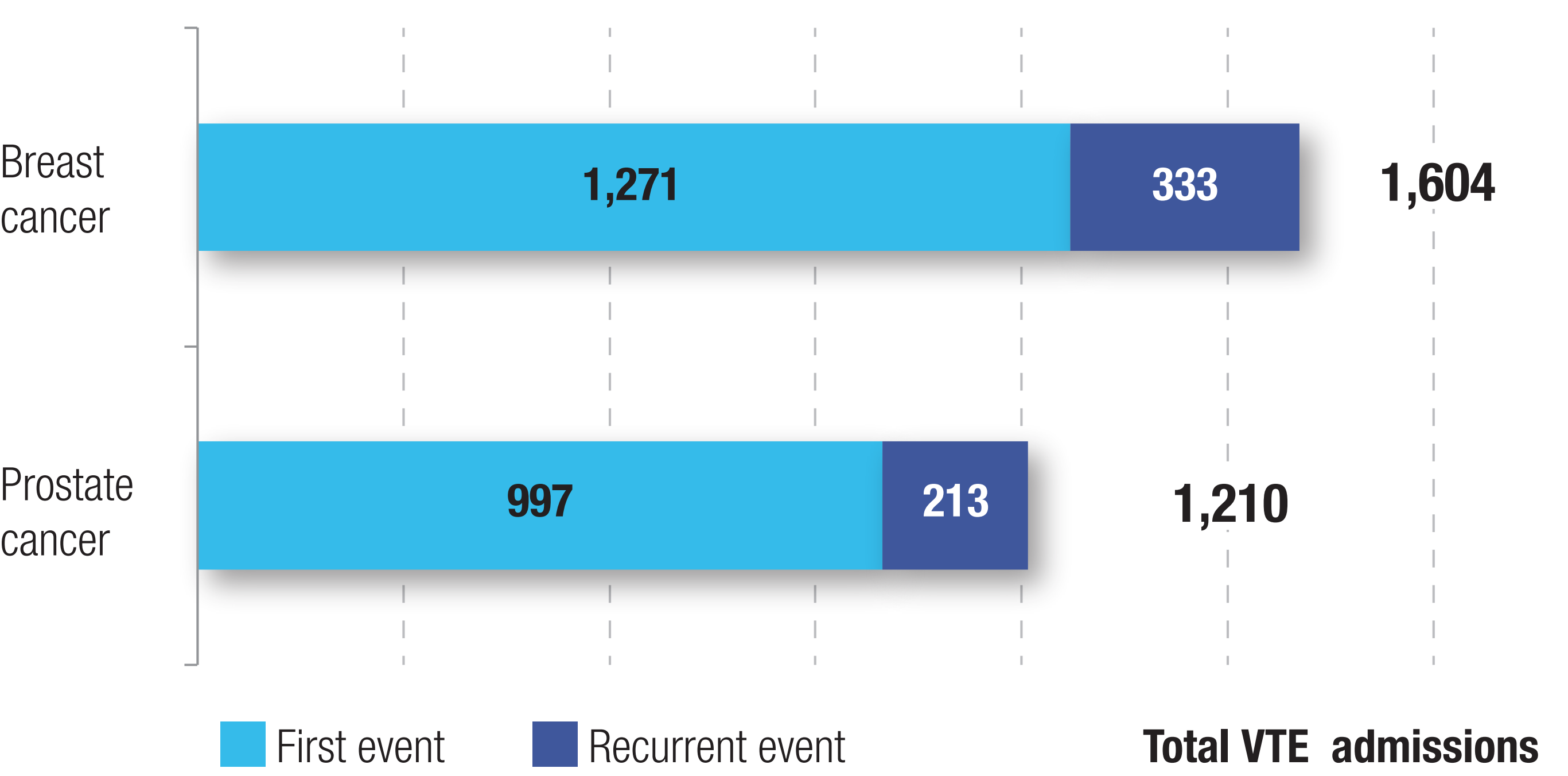
2 Recurrence and severity

202 (15.9%) breast cancer patients and 144 (14.4%) prostate cancer patients experienced recurrent VTE-related hospitalization during the 2-year follow-up (**Table 1**). Among all stays, recurrence represented 20.8% of admissions in BC patients and 17.6% in PC patients (**Fig. 2**).

Table 1. Patients with recurrent VTE

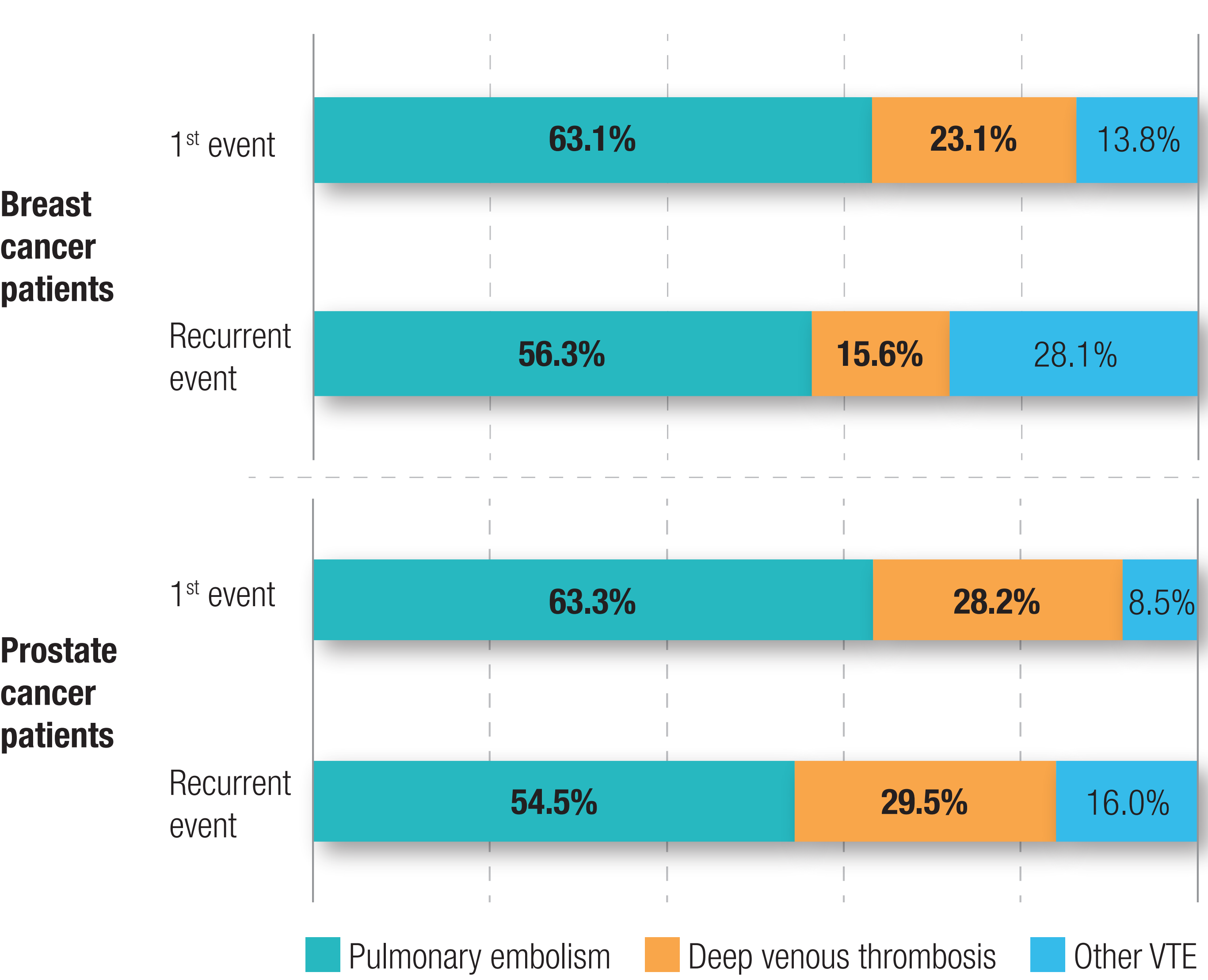
	Number of recurrent VTE patients (All VTE patients)	Percentage of recurrent VTE patients, among all VTE patients
Breast cancer	202 (1,271)	15.9%
Prostate cancer	144 (997)	14.4%

Figure 2. Stays for first and recurrent VTE



VTE was classified as primary or related diagnosis (PD/RD) in 606 (38%) admissions of breast cancer patients and 398 (33%) admissions of prostate cancer patients. Pulmonary embolism and deep venous thrombosis were the most frequent causes of hospitalization (**Fig. 3**).

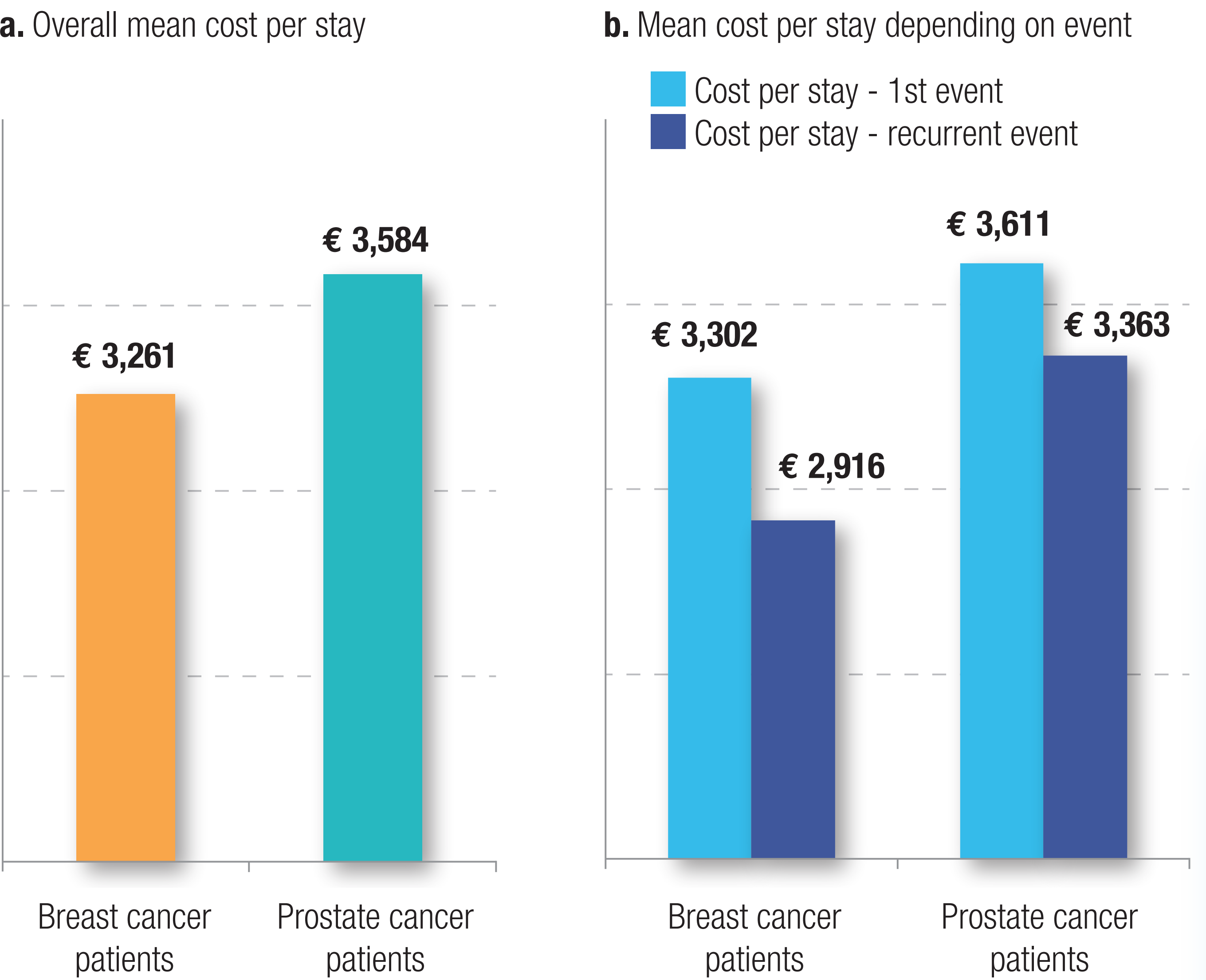
Figure 3. Distribution of VTE leading to hospital admission, by category (among admissions for VTE as PD/RD)



3 Costs evaluation

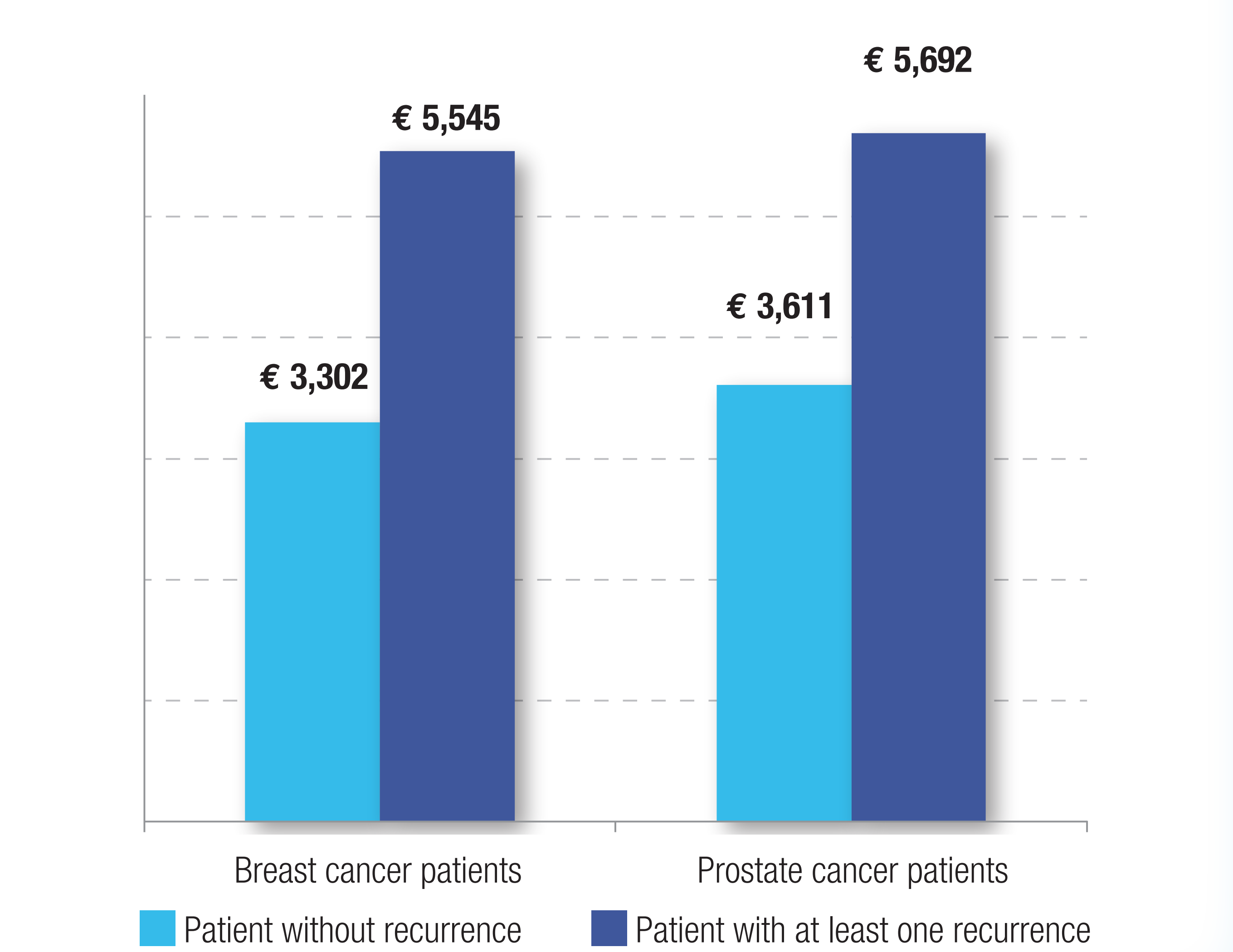
The overall mean cost per stay was € 3,261 for breast cancer patients and € 3,584 for prostate cancer patients (**Fig. 4a**). It ranged from € 2,916 to € 3,611 depending on the event (first or recurrent) and the type of cancer (**Fig. 4b**). The cost per stay was lower for a recurrent event compared to the cost for a first event.

Figure 4. Cost per hospital stay for a VTE as PD/RD: overall mean cost (a), mean cost for first event or recurrent event (b)



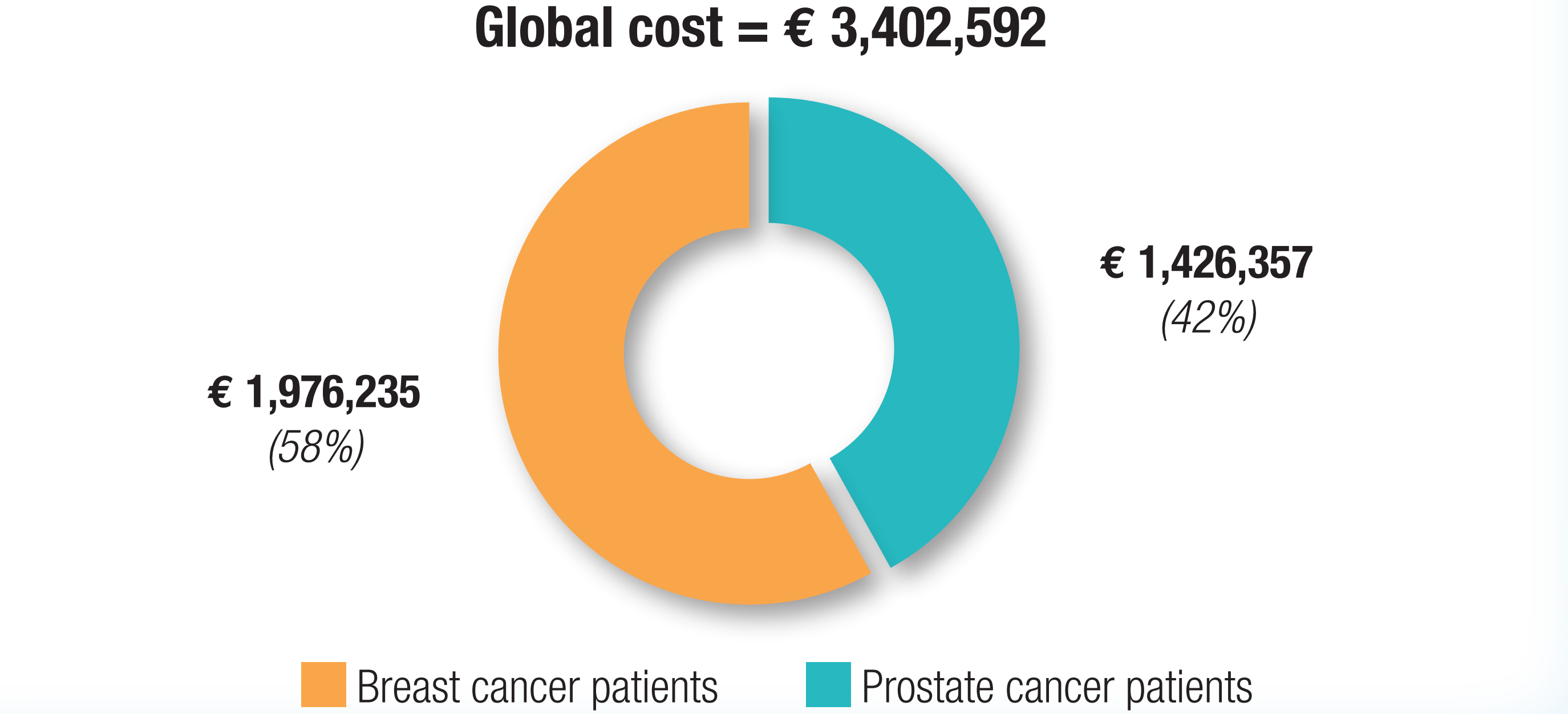
The amount per patient ranged from € 3,302 to € 5,692, depending on the type of cancer and VTE recurrence. The cost per patient was dramatically increased for patients with recurrent VTE, in both types of cancer: the cost raised by 68% in breast cancer patient with recurrent event (up to € 5,545), and 58% in prostate cancer patients (up to € 5,692), compared to patients without recurrence (**Fig. 5**).

Figure 5. Mean cost per patient hospitalized at least once for VTE as PD/RD



The global cost of VTE-related hospitalizations neared € 3.4 millions over a 2-year period, for admissions with VTE as primary or related diagnosis (**Fig. 6**). Among this, recurrent VTE-related hospitalizations represented a cost of € 186,620 for breast cancer patients and € 147,959 for prostate cancer patients.

Figure 6. Global cost of VTE-related hospitalization over a 2-year period (VTE as PD/RD only).



DISCUSSION / CONCLUSION

- Among a population of 107,916 new patients with breast or prostate cancer, 2,268 patients experienced a thrombosis event leading to hospitalization. The cost of those hospitalizations in France appeared to be elevated: € 3.4 millions dedicated to the management of a single complication. Moreover, this amount may be underestimated as we did not consider admissions with VTE as a significant associated diagnosis, neither ambulatory costs nor indirect costs.
- The mean cost of VTE hospital management ranged from € 3,302 to € 5,692 per patient experiencing a VTE. This cost is substantial considering that the global yearly expenditure for a cancer patient is estimated € 10,000 per year (all types of cancer included). These costs are however lower than those calculated by US studies, were the lowest estimation for hospitalization was \$ 7,700 for a DVT (approximately € 5,600)⁹, which can be probably explained by major differences in healthcare management systems and costs between France and the US. Furthermore, in our study, we found that recurrence increased the cost of VTE management (24% of VTE-related admissions and a cost nearing € 5,700 per patient).
- Yet, thrombosis incidence could be reduced and recurrence could be avoided by recommended VTE prophylaxis and management. Indeed, although the guidelines are consistent and easy to implement, they're poorly followed:
 - the ENDORSE study showed that only 55% of French cancer patients with thrombosis risks were administered prophylaxis (2011)¹⁰;
 - the CARMEN study showed that 58% of French cancer patients with VTE were treated in accordance with recommendations (2010)¹¹.
- Thus, a good adherence of recommendations, adequate and prolonged curative treatment as well as ambulatory management could reduce VTE-related costs in cancer patients.

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