Current incidence of venous thromboembolism and comparison with 1998: a community-based study in Western France

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Summary

In 1998 we estimated the incidence of venous thromboembolism (VTE) to be 1.8/1,000 per year. The aim of this study was to compare current VTE incidence to that observed in 1998. We prospectively recorded all cases of symptomatic pulmonary embolism (PE) and deep vein thrombosis (DVT) of the lower limbs diagnosed between March 1, 2013 and February 28, 2014 in hospitals and in the community, using the same method and geographic area than in 1998. The 2013 incidence rates of VTE were computed and compared with those of 1998 using age- and sex-specific standardised incidence ratios (SIRs). In 2013, we recorded 576 VTE cases (279 isolated DVT and 297 PE ± DVT). Among 367,911 inhabitants, the overall incidence of VTE was 1.57/1,000 (95 % CI 1.44–1.69). The overall VTE incidence was significantly lower in 2013 as compared with 1998: SIR 0.72 (95 % CI 0.67–0.79) as well as the incidence of isolated DVT: SIR 0.53 (95 % CI 0.47–0.60); conversely, the overall incidence of PE was unchanged: SIR 1.10 (95 % CI, 0.98–1.23) despite an increase in the incidence of isolated PE: SIR 1.29 (95 % CI, 1.10–1.52). In 1998, 4.4 % of PE cases were diagnosed using CTPA as compared with 73.7 % in 2013 ($p < 0.001$). In conclusion, between 1998 and 2013, the incidence of symptomatic DVT decreased. Conversely, we found no similar reduction in the incidence of symptomatic PE; whether this is due to changes in diagnostic tests and algorithms in the management of suspected PE requires further investigations.

Keywords

Venous thromboembolism, epidemiology

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Introduction

Venous thromboembolism (VTE), defined as pulmonary embolism (PE) and deep-vein thrombosis (DVT) of the lower limbs, is the third most common cardiovascular illness after acute coronary syndrome and stroke (1). It leads to an increased morbidity, functional disability and mortality. Based on administrative or selected data, estimates suggest that 15 % of people with VTE will die within three months of diagnosis (2, 3), that up to half of patients with DVT will develop post-thrombotic syndrome (4), and that 0.1 to 9.1 % of PE patients will present with chronic thromboembolic pulmonary hypertension (5). The US Agency for Healthcare Research and Quality (AHRQ) identified in 2001 prevention of VTE through appropriate thromboprophylaxis as the number-one safety practice for hospitals (6). Because VTE is a major public health issue, it is important to have a precise estimate of its current incidence and to identify patients with a higher risk in order to implement active targeted prevention campaigns.

In 1998, we estimated the incidence of VTE within a well-defined geographic area in Western France (7). The overall incidence of VTE was found to be 1.83 per thousand (95 % confidence interval [CI] 1.69 to 1.98), rising markedly with increasing age. These data have been used to evaluate the burden of VTE: it was included in an epidemiological model built to estimate the number of VTE events in Europe, as well as VTE-related deaths and rates of post-thrombotic syndrome and chronic thromboembolic pulmonary hypertension (8).

Over the last 15 years, the prevention, diagnosis, and treatment of VTE have dramatically changed. D-dimer testing is now widely used and reduces the number of patients requiring imaging when VTE is suspected. Computed tomography pulmonary angiography (CTPA) scan has become an easy and readily available

test to diagnose PE. More importantly, the reduction of length of stay in hospital, the increase in the proportion of outpatient care, the implementation of VTE prophylaxis policies, as well as population aging, could have modified the epidemiology of VTE. Given the impact of VTE on public health, a comprehensive estimate of the variations in the incidence of VTE appears to be of major interest.

Thus, we aimed to estimate the 2013 incidence of VTE in Brest district and to compare this incidence to what was observed in 1998 using the same methods in the same geographical area.

Material and methods

Data sources

All physicians involved in the diagnosis of VTE in the Brest District area, France, agreed to join the EPI-GETBO study group (Groupe d'Etude de la Thrombose de Bretagne Occidentale). This group consisted of all radiologists, nuclear medicine physicians, vascular medicine physicians, and epidemiologists involved in the diagnosis and management of VTE in the Brest District area. Thrombosis assessment in the Brest District is provided in four hospitals (University Hospital, Brest, Clermont-Tonnerre Military Hospital, Brest, Clinique Keraudren, Brest, and Ferdinand Grall Hospital, Landerneau). In addition, six vascular medicine physicians and 33 radiologists provide out of hospital assessment of VTE. Every report of an exam showing evidence of VTE was mailed to our research centre. Reminders were sent to diagnosis providers every month to ensure collection of VTE cases. A study coordinator visited each study site every month to verify completeness of data reporting.

The protocol was approved by the Brest University Hospital Ethics Committee. No individual written consent was required.

Inclusion criteria

Based on the same inclusion criteria as in 1998 (7), all patients living in the Brest District between March 1, 2013 and February 28, 2014 with a documented symptomatic DVT of the lower limbs and/or symptomatic PE were included in the analysis. Patients with asymptomatic VTE, upper extremity venous thrombosis, isolated superficial or muscular vein thrombosis, were not included in the analysis.

Definition of VTE

Diagnosis of DVT was established by the absence of full compressibility of a proximal (i.e. thrombosis located in the popliteal vein or above) or distal vein of the deep lower limb on compression ultrasonography (CUS). Diagnosis of PE was established by 1) a segmental or larger artery filling defect on chest CTPA; 2) the combination of high pre-test clinical probability of PE with a high probability ventilation-perfusion (V/Q) lung scan according to the PIOPED criteria (9) or a positive V/Q single photon emission computed tomography (SPECT) according to the European Association of Nuclear Medicine criteria (10); 3) a proximal DVT on CUS in a patient with suspected PE (11).

Data collection and validation

All results of imaging tests showing evidence of venous thrombosis were prospectively sent to the Brest University Hospital Clinical Research Center. The database was regularly checked out in order to exclude double entries, to review, validate, and adjudicate diagnosis of VTE (AD, KL, DM).

A standardised case report form was filled for every patient with a proven acute DVT of the lower limbs and/or PE. All patients or their families were interviewed directly or by phone in order to collect clinical data, and the charts of admitted patients were reviewed. Patients' general demographic characteristics, risk factors for VTE, clinical signs and symptoms, date and location of VTE and place of diagnosis of VTE were recorded.

Statistical methods

Annual incidence rates per thousand inhabitants were calculated as the number of VTE cases occurring during the study period from March 1, 2013 to February 28, 2014, divided by the population of Brest District. We used data from the census performed in 2013 by the National Institute for Statistics and Economics Studies (INSEE). It was determined that the population of Brest District was 367,911 (12).

We performed an indirect standardisation to compare the 2013 incidence of VTE to that of 1998 since population characteristics of district inhabitants were likely to have changed over that period. We determined the expected number of VTE events in 2013 by applying the age and sex specific VTE incidence rate obtained in the 1998 study (Suppl. Table 1, available online at www.thrombosis-online.com) to the 2013 population. Then standardised incidence ratios (SIR) were calculated as the ratio of observed to expected numbers of VTE, along with exact 95% confidence intervals.

P-values of less than 0.05, calculated on the basis of the chi-square test and the Student's t-test, were considered to indicate statistical significance.

Role of the funding source

The funders of this study (Brest University) had no role in the design of the study, data collection, data analysis, data interpretation, writing of the report, or decision to approve and submit the paper for publication. AD and DM had full access to all the data in the study and all authors had final responsibility for the decision to submit for publication.

Results

Between March 1, 2013 and February 28, 2014, a total of 1221 patients were screened for inclusion in the study. Of these patients,

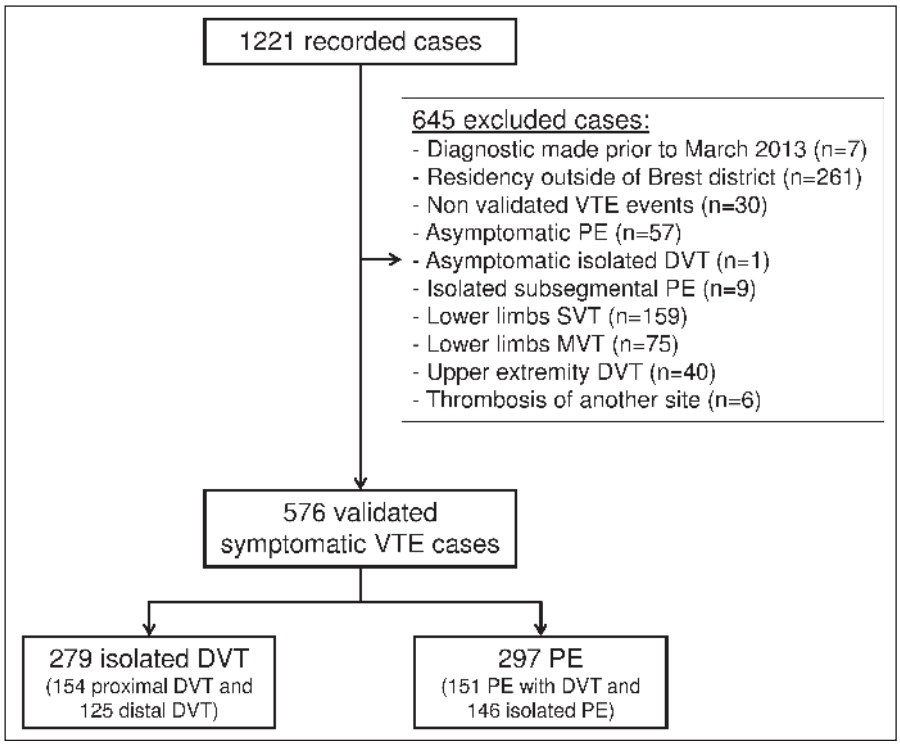

Figure 1: Study flow-chart. VTE: venous thromboembolism; PE: pulmonary embolism; DVT: deep-vein thrombosis; SVT: superficial vein thrombosis; MVT: muscular vein thrombosis.

645 were excluded for various reasons (►Figure 1). In total, 576 inhabitants of the Brest District were diagnosed with a symptomatic VTE event at a mean age of 68 ± 17.8 years. There were 254 (44.1%) men, and 147 patients (25.5%) had a past history of VTE. Inpatients (i.e. patients in whom VTE occurred and was diagnosed while admitted to hospital for another condition) accounted for 15.1% (n=87) of all cases. Of the 576 patients, 279 (48.4%) had an isolated DVT of the lower limbs, of whom 154 (55.2%) were proximal and 125 (44.8%) were distal. The remaining 297 patients (51.6%) had a PE, either isolated (n=146) or associated (n=151) with a DVT of the lower limbs. Of the 279 cases of isolated DVT of the lower limbs, 187 (67.0%) were treated on an outpatient basis (34.8%). Conversely, 13 of the 297 PE±DVT cases (4.4%) were not admitted to hospital for VTE treatment.

Incidence of VTE in 2013

Among 367,911 inhabitants, the overall annual incidence rate of symptomatic VTE was 1.57 per 1000 (95% CI: 1.44 to 1.69); the incidence of isolated symptomatic DVT was 0.76 per 1000 (95% CI, 0.67–0.85), that of symptomatic PE with or without DVT was 0.81 per 1000 (95% CI, 0.72–0.90), and that of symptomatic PE without DVT was 0.40 per 1000 (95% CI, 0.33 to 0.46) (►Table 1). The incidence of VTE increased with increasing age (Suppl. Table 2, available online at www.thrombosis-online.com). The annual incidence was 0.39 per 1000 in residents aged 20–39 years and reached 7.68 per 1000 in residents aged 75 and older (Suppl. Table 2, available online at www.thrombosis-online.com). DVT and PE incidences were both associated with increasing age (►Figure 2).

Comparison of the incidence of VTE between 1998 and 2013

The total number of residents of the district rose from 342,017 in 1998 to 367,911 in 2013 (+8%). Noticeably, there was a 46% increase in the number of residents of 75 and older (►Table 2).

In 1998, there were 627 VTE events as compared with 576 in 2013. Several clinical characteristics of the patients were different (►Table 3). Inpatient cases of VTE were less frequent in 2013 as compared with 1998 (15.1% vs 25.8%, p<0.001). Conversely, the mean age of patients (68 ± 17.8 vs 68 ± 17, p=1), sex distribution

Table 1: Incidence of VTE in 2013 in the Brest district (population 367,911).

	Number of events	Incidence rate per 1000 (95% CI)
Overall venous thromboembolism	576	1.57 (1.44–1.69)
Deep-vein thrombosis	279	0.76 (0.67–0.85)
Proximal	154	0.42 (0.35–0.48)
Distal	125	0.34 (0.28–0.40)
Pulmonary embolism	297	0.81 (0.72 –0.90)
Pulmonary embolism with deep-vein thrombosis	151	0.41 (0.34–0.48)
Isolated pulmonary embolism	146	0.40 (0.33–0.46)

CI: confidence interval.

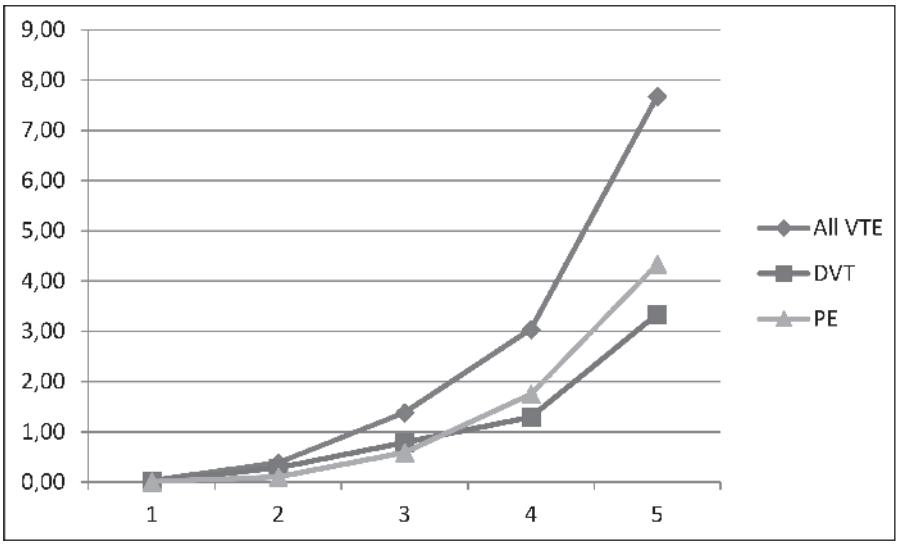

Figure 2: Overall incidence of VTE, DVT, and PE among Brest district residents (per 1000). VTE: venous thromboembolism; DVT: deep-vein thrombosis; PE: pulmonary embolism.

(44.1% vs 40.3%, p=0.19) and proportions of patients with a past history of VTE (25.5% vs 26.0%, p=0.90) were not different between 2013 and 1998.

Standardisation showed a significant 28% reduction in the incidence of overall VTE between 1998 and 2013: SIR 0.72 (95% CI 0.67–0.79). The incidence of isolated DVT also significantly decreased by 47%: SIR 0.53 (95% CI 0.47–0.60) (►Table 4). Conversely, between 1998 and 2013, the overall incidence of PE was unchanged: SIR 1.10 (95% CI, 0.98–1.23), although the incidence of isolated PE increased by 29%: SIR 1.29 (95% CI, 1.10–1.52).

Table 2: Distribution and change in the number of residents of the Brest district between 1998 and 2013 according to age and sex.

Age group	1998	2013	% variation
Overall residents			
All	342017	367911	+8%
0–19	96342	92511	-4%
20–39	106384	94840	-11%
40–59	75526	97599	+29%
60–74	41855	50926	+22%
≥75	21910	32035	+46%
Male residents			
All	166550	179717	+8%
0–19	49354	47464	-4%
20–39	54723	49189	-10%
40–59	37328	48967	+31%
60–74	18022	23417	+30%
≥75	7123	10680	+50%
Female residents			
All	175467	188194	+7%
0–19	46988	45047	-4%
20–39	51661	45651	-12%
40–59	38198	48632	+27%
60–74	23833	27509	+15%
≥75	14787	21355	+44%

In comparison with 1998, the observed incidence rates of overall VTE in 2013 remained stable in younger residents and decreased by approximately 35% in residents 60 years and older (►Table 4). The decrease in the incidence of isolated DVT was seen across all age categories with maximal reduction among residents of more than 60 years. The incidence of PE with or without DVT was stable regardless of residents' age. The increase in the incidence of isolated PE was observed in all residents.

Diagnostic assessment for PE significantly changed between 1998 and 2013 (►Table 3). CT scan was used in 4.4% of PE patients in 1998 versus 73.7% in 2013, whereas V/Q scan was used in 62.7% of PE patients in 1998 versus 5.4% in 2013. SPECT was not available in 1998 and was used in 9.5% of PE diagnoses in 2013. In 1998 and 2013, all DVTs were diagnosed by ultrasonography.

Discussion

Within a well-defined geographic area in Western Europe, current incidence of VTE is 1.57 per 1000 (95% CI: 1.44 to 1.69). The standardised overall annual incidence of VTE was significantly reduced by 28% between 1998 and 2013. Within the same period of time, the standardised incidence of isolated DVT of the lower limbs significantly decreased by 47% whereas the standardised overall incidence of PE remained unchanged. Conversely, the standardised annual incidence of isolated PE significantly rose by 29% between 1998 and 2013.

How might the decrease in VTE incidence be explained? A wider implementation of thromboprophylaxis in hospitalised patients might partially explain this result. Indeed, since our first survey in 1998, results of major trials showing the efficacy of low-molecular-weight heparin and fondaparinux for the preven-

Table 3: Comparison of patients' characteristics between 1998 and 2013 (1998 data extracted from [7]).

	1998	2013	P-value
Number of VTE cases	627	576	
Age	68 ± 17	68 ± 17.8	1
Age categories			<0.01
0–19	2 (0.3 %)	3 (0.5 %)	
20–39	52 (8.5 %)	37 (6.4 %)	
40–59	97 (15.9 %)	135 (23.4 %)	
60–74	204 (33.4 %)	155 (26.9 %)	
≥75	255 (41.8 %)	246 (42.7 %)	
Male	253 (40.3 %)	254 (44.1 %)	0.19
Past history of VTE	163 (26.0 %)	146 (26.2 %)	0.90
Deep-vein thrombosis	423	279	<0.001
Distal deep-vein thrombosis	199	125	
Proximal deep-vein thrombosis	224	154	
Pulmonary embolism	204	297	<0.001
Isolated pulmonary embolism	86	146	
Pulmonary embolism with deep-vein thrombosis	118	151	
Inpatients cases	162 (25.8 %)	87 (15.1 %)	<0.001
Medical ward	104 (64.2 %)	46 (52.9 %)	
Surgical ward	58 (35.8 %)	24 (27.6 %)	
Rehabilitation centre	-	8 (9.2 %)	
Psychiatric ward	-	5 (5.7 %)	
Risk factors for VTE			
Past history of VTE	163 (26.0 %)	148 (26.0 %)	0.90
Cancer	-	108 (18.9 %)	
Recent surgery (<3 months)	-	64 (11.2 %)	
Lower limb immobilisation/trauma	-	40 (7.0 %)	
Pregancy/post-partum	-	6 (1.9 %)	
Oral contraceptives	-	28 (8.8 %)	
Hormonal replacement therapy	-	8 (2.5 %)	
Long distance travel	-	48 (8.4 %)	
Diagnosis method for pulmonary embolism			
Ultrasonography of the legs	65 (31.9 %)	34 (11.5 %)	<0.01
High probability lung scan	128 (62.7 %)	16 (5.4 %)	<0.001
Positive SPECT	0	28 (9.5 %)	<0.001
CTPA	9 (4.4 %)	218 (73.7 %)	<0.001
Pulmonary angiography	2 (1.0 %)	0	0.50

VTE: venous thromboembolism; SPECT: single photon emission computed tomography; CTPA: computed tomography pulmonary angiography.

Table 4: Standardized incidence ratio (SIR) for VTE, DVT, and PE.

Age groups	Observed cases 1998	Observed cases 2013	Expected cases 2013	Ratio
All VTE				
0–19	2	3	1.9	1.56
20–39	52	37	46.3	0.80
40–59	97	135	125.7	1.07
60–74	204	155	249.4	0.62
≥75	255	246	372.5	0.66
Total	**610**	**576**	**795.8**	**SIR 0.72 (95 % CI 0.67–0.79)**
DVT				
0–19	2	2	1.9	1.04
20–39	40	27	35.6	0.76
40–59	68	77	88.1	0.87
60–74	146	66	178.7	0.37
≥75	151	107	220.7	0.48
Total	**407**	**279**	**525.0**	**SIR 0.53 (95 % CI 0.47–0.60)**
All PE				
0–19	0	1	0.0	-
20–39	12	10	10.7	0.93
40–59	29	58	37.6	1.54
60–74	58	89	70.7	1.26
≥75	104	139	151.8	0.92
Total	**203**	**297**	**270.9**	**SIR 1.10 (95 % CI 0.98–1.23)**
Isolated PE				
0–19	0	0	0.0	
20–39	6	5	5.3	0.94
40–59	15	27	19.4	1.39
60–74	24	38	28.6	1.33
≥75	41	76	59.9	1.27
Total	**86**	**146**	**113.2**	**SIR 1.29 (95 % CI 1.10–1.52)**

VTE: venous thromboembolism; DVT: deep-vein thrombosis; PE: pulmonary embolism; SIR: standardised incidence ratio (ratio of observed to expected number of events); CI: confidence interval.

tion of VTE in acutely ill medical patients have been published (e.g. the MEDENOX study was published in 1999) and largely endorsed through practice guidelines (13–15). It is likely that pharmacological thromboprophylaxis was more often used in 2013 than in 1998. Importantly, the reduction in VTE incidence was observed in patients older than 60, this age category being at a higher risk of hospital-acquired VTE, and more exposed and sensitive to VTE prevention (16). Besides pharmacological thromboprophyla-

xis, early mobilisation and reduction in the length of stay of medically ill hospitalised patients might also have participated to the reduction in the incidence of overall VTE (17, 18).

How might the absence of modification in the incidence of PE be explained? While our study found a significant 47% reduction in the incidence of isolated DVT, no change in the overall incidence of PE was observed. We even observed an increase in the incidence of isolated PE. Between 1998 and 2013, diagnostic methods and diagnosis criteria for DVT remained unchanged: the diagnostic of symptomatic DVT was based on the absence of full compressibility of a venous segment using ultrasonography. There has been no major improvement in the accuracy of ultrasonography for DVT evaluation over that period. Conversely, since 1998, new imaging technologies of pulmonary arteries have been developed and the accuracy of diagnostic algorithms of symptomatic PE have been improved, leading to potential changes in the observed incidence of symptomatic PE. Over that period, strategies using V/Q lung scan have been replaced by strategies using single-detector then multi-detector CT scan, which led to an increase in detected PE (19). In a randomised controlled trial that compared CT scan with V/Q scan for the management of patients with suspected PE, CT scan strategy resulted in a significant 30% increased in the number of VTE diagnoses as compared with V/Q scanning (20). Given that similar rates of VTE were observed during follow-up in patients whom PE was ruled out initially in the two groups, this 30% increased number of PE questions the clinical relevance of these events, especially in the absence of an associated DVT of the lower limbs. Interestingly, this 30% increase in the number of PE is in line with the proportion of additional isolated PE diagnosed in our study. Extrapolating the 30% discrepancy between V/Q scan and CT scan to our study, we assume an extra 50 cases of PE were diagnosed with CT scan in 2013 which represent one sixth of the total number of PE. Although not based on a standardised analysis, Huang et al. also observed a significant increase in PE incidence between 1985 and 2009 in Worcester metropolitan statistical area residents (21). The observed threefold increase in the annual incidence of PE closely paralleled the introduction of CT scan. Using the United States Nationwide Inpatient Sample, Wiener et al. observed an 81% increase in the incidence of PE after introduction of CT scan in the diagnostic strategies of PE (22). It is likely that over time expanded access to higher resolution diagnostic imaging and growing awareness of VTE have led clinicians to refer additional patients for evaluation (21) and thus, to increase the number of PE diagnoses. These data support our hypothesis of an over diagnosis of less clinically relevant VTE events in 2013. Nevertheless, verification of our hypothesis in our dataset is impossible due to the absence of mortality records in the 1998 study.

In order to compare the 2013 VTE incidence with what was reported in 1998, we only included in our analysis symptomatic VTE cases. In 2013, there were an additional 57 PE cases incidentally found and although we do not have the corresponding number in 1998 it is very unlikely that the number of asymptomatic cases was as high as 2013 due to the lower resolution and availability of CT scans at that time.

Other studies in western countries have recently reported either stability or an increase in VTE incidence over the last 15 years (23–28). Based on administrative data, Alotaibi et al. reported an unchanged incidence of VTE in Alberta, Canada (23). However, due to identification of cases through administrative databases, misclassification remains possible. Three studies reported an increase in VTE incidence (25–27). A German study restricted the analysis to young people (age <40 years) admitted to hospital for VTE (27). An increase in the overall number of VTE events was observed, especially in young women; however, no formal description of VTE incidence was reported in this study. In Italy, Dentali et al. found an increase in the incidence of in-hospital treated PE (between 2002 and 2012 (25). In 2002, the incidence was 48.8 per 100,000 inhabitants as compared with 62.0 per 100,000 in 2012. However, the incidence of isolated PE was not reported in that study limiting comparison with our data. Similar to our findings, administrative data recorded between 1999 and 2009 in the Worcester area, MA, USA, also showed an increase from 30 to 48% of the proportion of PE patients among VTE cases (Huerta) (26); however, no precise incidence of VTE was reported in the publication. In these two latter studies, as well as in an Australian study, there was a 30% decrease in the case fatality rate or overall mortality from VTE over ten years of observation (25, 26, 28).

Our study has several strengths. First, the well-defined geographic area warrants a very low rate of VTE diagnoses made outside of the Brest district. The natural limits of this area, located in the West end of Europe and surrounded by the sea at the North, West and South, and the distribution of healthcare providers ensure a potential very low migration flow and a small number of

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diagnoses of VTE made outside of the district. Indeed, patients living at the eastern end of the district are located at least 40 km away from the nearest centre providing VTE assessment outside of Brest district, whereas the closest centre providing VTE assessment in the Brest district is only 5 km away. Second, contrasting with other studies where cases were extracted from commercial insurance (24), hospital discharge (22, 29–31), or Medicare databases (32-34), we collected results of imaging tests directly where they were performed and importantly, thrombosis experts reviewed and adjudicated all charts in order to validate VTE cases. This ensures a minimal risk of misclassification since no formal diagnostic algorithm for VTE was recommended to attended physicians. Furthermore, there is no documented loss because of decline to participate since no written consent was required. Third, by using the same diagnostic criteria in the same administrative area as in 1998 cases, we ensured accurate comparison of the 2013 VTE incidence with that of 1998. Fourth, changes in incidence rates cannot be explained by changes in demographic characteristics of the population, since incidence rates were age- and sex-standardised. Lastly, our study is the first to assess variations of VTE incidence in hospitals and in the community within a well-defined geographic area.

The first limitation of our study is the chance to under-recognition of cases, for instance unlisted well-documented cases. In order to minimise this limitation, we regularly and actively asked all radiologists, nuclear physicians, and vascular medicine physicians to send us results of imaging tests. A research coordinator went on-site once a month and had full access to imaging reports. For DVT, it is unlikely we missed cases since ultrasonography is a widely available non-invasive imaging test. There were not only vascular medicine physicians participating to the study, but also radiologists performing ultrasound evaluation of DVT. We cannot either exclude that some patients were diagnosed with VTE outside of the Brest district, for example when travelling. However, general practitioners usually refer their patients to our clinic for anticoagulation control or assessment of duration of anticoagulation, minimising the risk of missing cases. As discussed above, the second important limitation of the study was the chance of over-recognition of cases, mainly symptomatic PE, related to changes in diagnostic workup of VTE between 1998 and 2013. However, diagnostic strategies are likely to be more accurate in 2013 as compared with 1998 and it is important to further investigate whether the recognition of PE that were not diagnosed in the past is associated with modification of VTE prognosis. The third limitation of the study is that apart from number of inpatient cases and patients with past history of VTE, we could not compare neither trends in VTE risk factors nor modifications of case-fatality rate between 1998 and 2013 since we did not collect such information in 1998. Furthermore, there has not been continuous surveillance of VTE events between 1998 and 2013 that could have demonstrated more precise trends in PE incidence.

In conclusion, we found a 28 % reduction in the standardised incidence of overall symptomatic VTE between 1998 and 2013, consistent with an improvement of VTE management and prevention. This reduction in the overall incidence of VTE was mainly due to a 47 % decrease in the incidence of symptomatic isolated DVT, which diagnostic criteria and diagnostic methods remained unchanged between 1998 and 2013. Conversely, the overall incidence of symptomatic PE appeared stable: whether or not this observation was related to changes in PE diagnostic strategies remains to be determined. Further studies are needed to address the clinical and therapeutic relevance of these additional PE.

What is known about this topic?

- Venous thromboembolism (VTE) is the third most common cardiovascular illness after acute coronary syndrome and stroke.
- In 1998 we estimated the incidence of VTE to be 1.8/1,000.

What does this paper add?

- In 2013, the overall incidence of VTE was 1.57/1,000.
- Between 1998 and 2013 there was a significant 38 % reduction in the overall incidence of VTE.
- We observed a significant 47 % reduction in the incidence of isolated DVT but no modification in the incidence of PE.

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Conflicts of interest

None declared.

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