

Economic burden of venous thromboembolism in the general population and after major orthopaedic surgery – results of a systematic literature review

Thomas Steinle¹, Andras Ruppert², Michael Lees³

¹Steinle-Health Economics & Outcomes Research, Munich, Germany; ²IMS Consulting, Cambridge, UK; ³Bayer HealthCare, Uxbridge, UK

Introduction

- ◆ Venous thromboembolism (VTE) – manifesting as deep vein thrombosis (DVT) or pulmonary embolism (PE) – is a severe complication in the general population and in patients undergoing major orthopaedic surgery (MOS), and is therefore a major economic burden on the healthcare system
- ◆ In the EU population, the incidence of DVT was 14.8 per 10,000 per year and the incidence of PE was 9.5 per 10,000 per year¹
- ◆ The estimated total number of symptomatic VTE events per year within six European countries are shown in Figure 1¹
- ◆ For fatal VTE events, 7% were diagnosed antemortem, 34% were sudden fatal PE and 59% were caused by an undiagnosed PE (Figure 2). The lack of routinely performed post-mortem examinations means that many fatal PE remain unrecognized, leading to an underestimation of their incidence¹
- ◆ Almost three-quarters of all VTE-related deaths are from hospital-acquired VTE¹
- ◆ The incidence of DVT in patients undergoing MOS without thromboprophylaxis was estimated as 40–60%²
- ◆ Despite thromboprophylaxis, 1–3% of patients undergoing total knee replacement or total hip replacement develop symptomatic DVT, and 0.4–1.2% develop PE³
- ◆ The incidence of recurrent VTE (DVT and PE) is ~20%^{4,5}
- ◆ Post-thrombotic syndrome (PTS) develops in 33–50% of patients⁶; the cumulative incidence of PTS after MOS is 24.5% after 2 years, 29.6% after 5 years and 29.8% after 8 years

Objective

- ◆ Despite the extensive healthcare burden of VTE, there is no systematic review of the associated costs. The objective of this study was to estimate the healthcare costs of VTE in the general population and in patients undergoing MOS

Methods

- ◆ A literature search was carried out on 8 October 2007 for references published since 1997 in English, French, German or Spanish
- ◆ The search was carried out using Medline (Dialog Data star), the Cochrane Library (including NHS EED), Health Economic and Evaluations Database (HEED) and Inside Conferences (for the identification of convention contributions and poster publications)
- ◆ The literature search included the following search terms and keywords: 'deep vein thrombosis OR pulmonary embolism OR venous thromboembolism OR thromboembolism' AND 'cost of illness OR cost of disease OR economic burden OR economics OR healthcare cost OR cost'
- ◆ Included studies had to identify and measure, in clinical practice, healthcare utilization and the economic consequences of VTE and associated complications, including recurrent VTE, PTS and bleeding events
- ◆ The included analyses primarily used healthcare claims databases, prospective/retrospective patient chart reviews and decision analytic modelling
- ◆ A total of 1,038 full research articles and abstracts were screened for inclusion
 - 951 of these articles were excluded
 - Excluded studies: studies which were not cost-of-disease studies; cost-of-disease studies of VTE with a sole focus on specific subpopulations other than MOS patients; cost minimization, cost-effectiveness or cost utility analyses of diagnostic procedures, screenings or interventions in indications other than VTE prevention or treatment in MOS patients; cost-of-disease studies in other indications; published comments or letters
 - 87 articles were assessed in detail and of these 17 cost-of-disease studies were identified that met the inclusion criteria and were included in the review

Results

The economic burden of all-cause VTE

- ◆ When inpatient and outpatient costs are considered, total cost of VTE in the European studies was approximately €4,000 for DVT and €4,500 for PE^{7,8} (\$10,804–33,200 in the US)
- ◆ These costs are mainly driven by hospitalization for initial and recurring events^{9,10}
- ◆ The mean costs of inpatient care for treatment of DVT or PE in four European countries (Sweden, Italy, The Netherlands and France) was €5,278 per patient per year (Figure 3)
- ◆ Outpatient costs over a 1-year period were about 30% of inpatient costs⁷
- ◆ Development of PTS is a significant cost driver⁹
 - Most cases of PTS develop within 1–2 years of acute DVT
 - 3.8% of patients developed PTS during a median follow-up period of 558 days
 - Following VTE, the total cost for treating PTS was €3,778 per patient¹¹

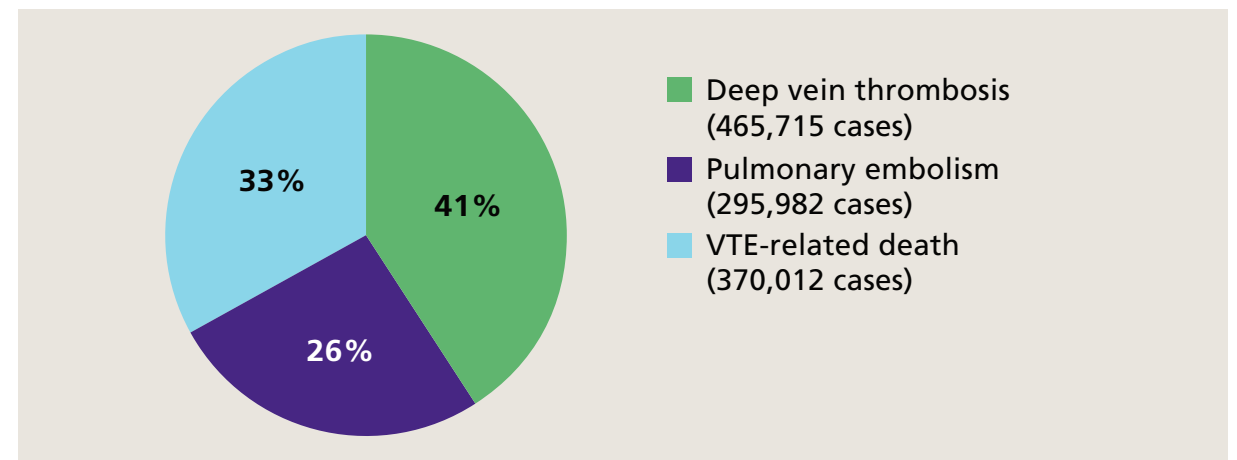


Figure 1. The estimated total number of symptomatic venous thromboembolism (VTE) events per year within six European countries (France, Germany, Italy, Spain, Sweden and UK).¹

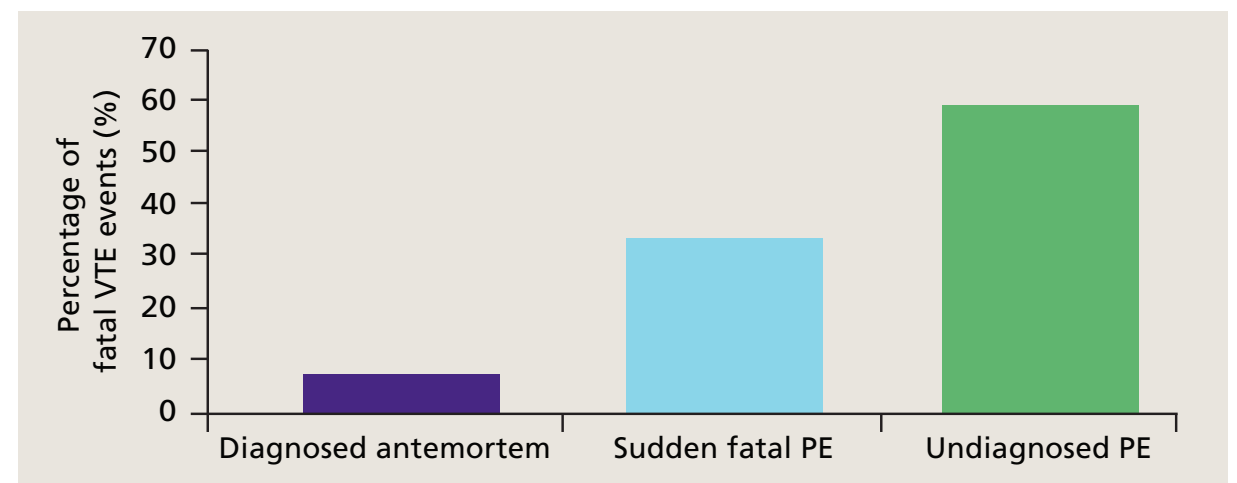


Figure 2. Relative distribution of diagnosed and undiagnosed pulmonary embolism (PE) among fatal venous thromboembolism (VTE) events.¹

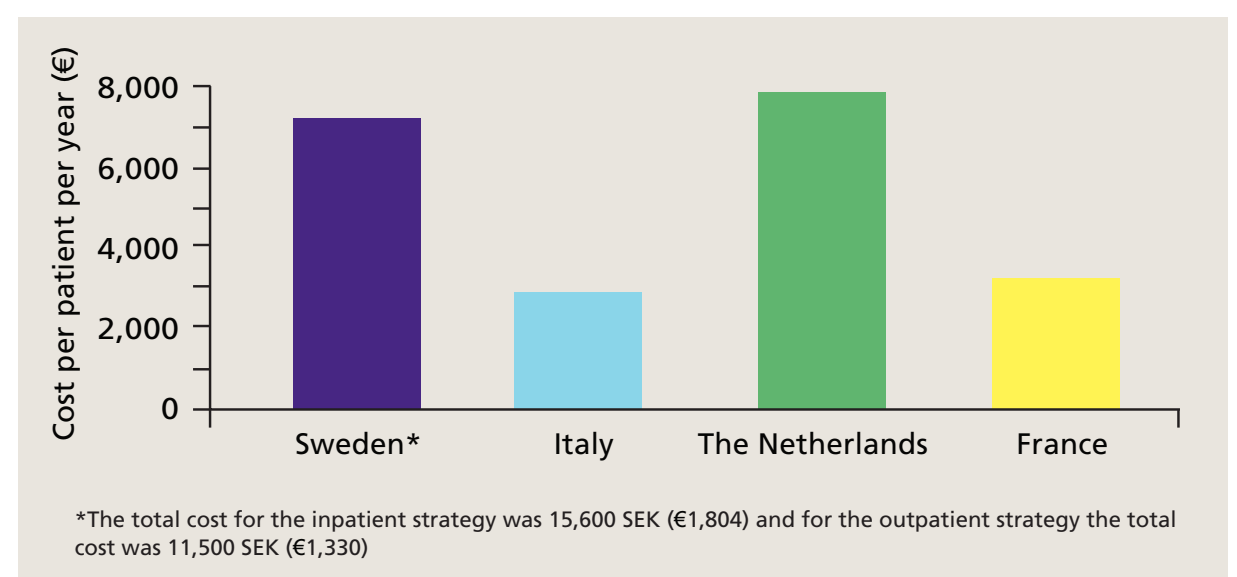


Figure 3. The total cost of inpatient care per patient per year with deep vein thrombosis or pulmonary embolism in four European countries.

Economic consequences of VTE following MOS

- ◆ In a European cost-of-disease study, the annual cost of prophylaxis and treatment of VTE events associated with MOS were estimated using a decision tree with different health states related to VTE events after MOS¹¹
 - Annual treatment costs per patient for VTE were €8,265
 - The main cost drivers were inpatient care and hospitalization for recurrent events (DVT, PE and PTS)
 - In a French study, the cost of re-admissions due to post-discharge events was considerably higher than in-hospital events: the total inpatient cost of DVT and PE associated with MOS were €1,527 and €2,177 per patient, respectively, whereas the total cost for a re-admission due to DVT or PE was €2,682 and €4,111 per patient, respectively
 - Despite the low cost of prophylaxis, the overall costs of VTE accounted for approximately 50% of the costs associated with MOS^{11,12}
- ◆ US charges for surgical admission were \$52,037 for patients with VTE, compared with \$34,485 for those without VTE

Long-term complications related to VTE

- ◆ Complications associated with VTE and its treatment, including development of PE after DVT, haemorrhage, heparin-induced thrombocytopenia, recurrent VTE events, and PTS, were frequent and had significant economic impact^{9,10,13,14}
- ◆ In the US, the 1-year cumulative incidence was ~24% for recurrent DVT and ~6.5% for PE after MOS¹⁵
- ◆ The additional annual treatment costs of recurrent DVT and PE in the US were estimated at up to \$6,400 per patient¹⁵

Conclusions

- ◆ VTE occurs frequently and is a major cost and resource burden for healthcare systems, particularly after MOS
- ◆ The costs of treating VTE and related complications are substantial, whereas the cost of prophylaxis is relatively low
- ◆ Prophylaxis regimens that can reduce the incidence of VTE might enable significant cost savings to be achieved, and will reduce the economic burden of this disease

References and disclosures

- Cohen AT et al. *Thromb Haemost* 2007;98:756–764.
- Geerts WH et al. *Chest* 2004;126:3385–4005.
- Edelsberg J et al. *Am J Health Syst Pharm* 2001;58 (Suppl 2):S4–S13.
- Hansson PO et al. *Arch Intern Med* 2000;160:769–774.
- Leizorovicz A. *Haemostasis* 1998;28(Suppl 3):1–7.
- Kahn SR. *Curr Opin Pulm Med* 2006;12:299–303.
- Levy E et al. *Value Health* 2001;4:102.
- Van den Belt AG et al. *Thromb Haemost* 1998;79:259–263.
- MacDougall DA et al. *Am J Health Syst Pharm* 2006;63:55–515.
- Bullano MF et al. *J Manag Care Pharm* 2005;11:663–673.
- Tilleul P et al. *Clin Appl Thromb Hemost* 2006;12:473–484.
- Ollendorf DA et al. *Am J Health Syst Pharm* 2002;59:1750–1754.
- Spyropoulos A. *J Manag Care Pharm* 2007;13:475–486.
- O'Brien JA, Caro JJ. *Pharmacoeconomics* 2002;20:603–615.
- Caprini JA et al. *Value Health* 2003;6:59–74.

This study was supported by Bayer HealthCare AG and Scios, Inc. Rivaroxaban is in clinical development and not yet licensed.

Poster P165 presented at the 20th International Congress on Thrombosis (ICT), Athens, Greece; 25–28 June 2008