

A Pharmacoeconomic Study of Traditional Anticoagulation versus New Oral Anticoagulation for Treatment of Venous Thromboembolism in the Emergency Department

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Background

- Patients with venous thromboembolism (VTE) (deep vein thrombosis (DVT) and pulmonary embolism (PE)) are commonly diagnosed and treated in the emergency department (ED) as outpatients.
- Traditionally, patients are initially anticoagulated with low molecular weight heparin (LMWH) and warfarin.
- Patients return to the ED daily for medication administration and laboratory testing of the international normalized ratio (INR) to assess their anticoagulation status.
- From a hospital perspective, each ED visit is costly.
- EINSTEIN-DVT and EINSTEIN-PE are phase III clinical trials that showed non-inferiority of rivaroxaban, a new oral anticoagulant (NOAC), to warfarin/LMWH for VTE treatment.
- Rivaroxaban does not require therapeutic monitoring or bridging but is more expensive and not on hospital formularies for this indication.
- There is limited data on the health care cost comparison between using traditional and NOAC therapy in ED patients for VTE treatment.

Methods

Study Design

- Retrospective Cohort Study (January 1, 2010 to December 31, 2012)
- Cost Minimization Analysis

Inclusion Criteria

- VTE cases identified from the St. Paul's Hospital and Mount St. Joseph Hospital ED Discharge Database

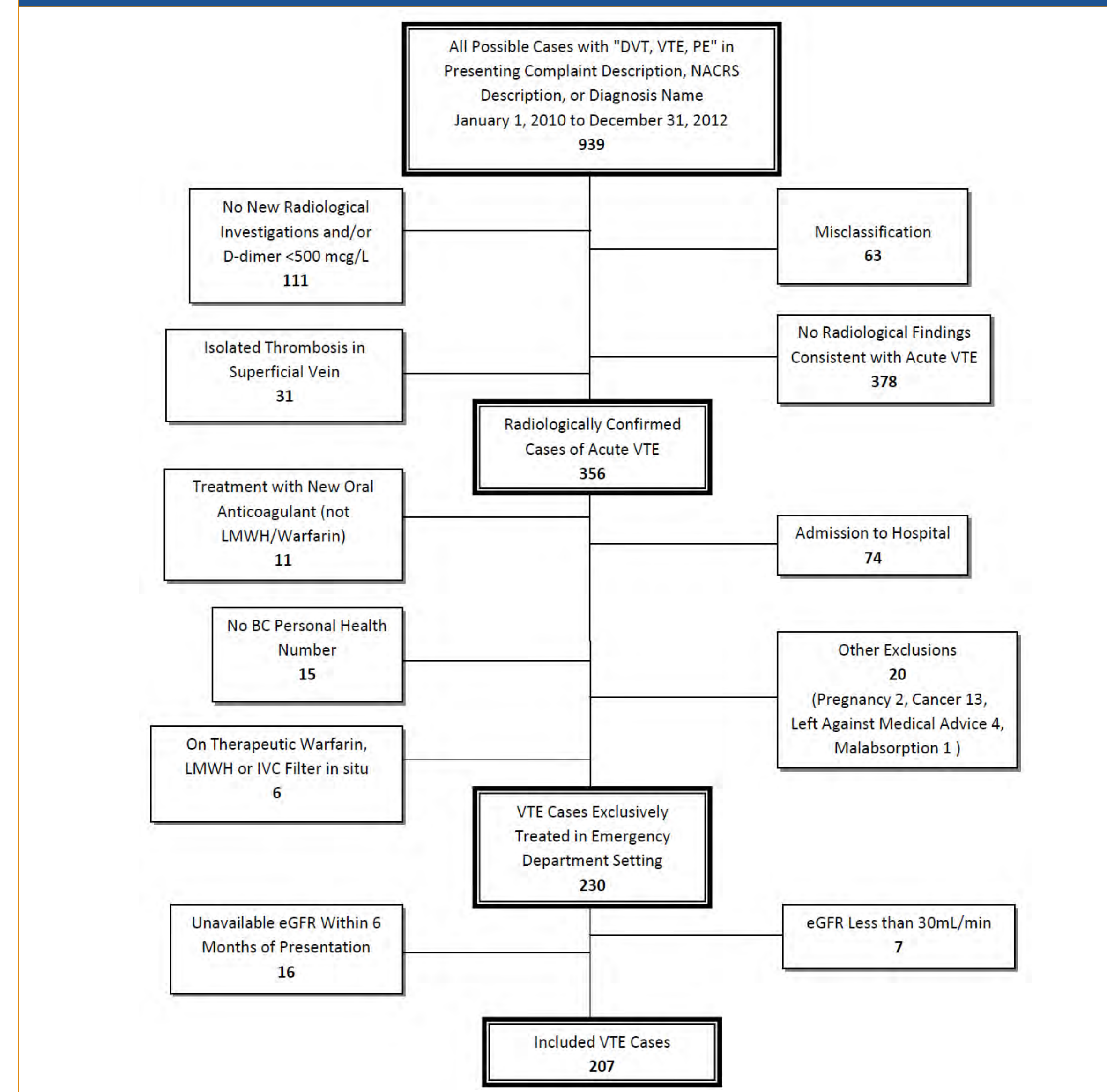
Exclusion Criteria

- Admission to hospital
- Treatment with NOAC
- No BC personal health number
- On therapeutic warfarin or LMWH, IVC Filter in situ
- Pregnancy
- Active cancer treatment at time of diagnosis
- Left against medical advice
- eGFR ≤ 30mL/min or if unavailable within 6 months of diagnosis

Outcomes

- Cost difference between traditional and rivaroxaban therapy for VTE treatment in the ED
- Therapeutic anticoagulation rate on discharge
- Mean number of ED visits
- All-cause readmission
- All-cause mortality
- Major bleeding (defined as hemoglobin drop ≥ 20g/L)

Figure 1. Retrospective Cohort Flow Diagram



Results

Table 1. Baseline Characteristics

| | Warfarin/LMWH – Retrospective Cohort (n=207) | Rivaroxaban – EINSTEIN* (n=4150) | Standard – EINSTEIN* (n=4131) |
|------------------------------------|--|----------------------------------|-------------------------------|
| Age (years, mean ± SD) | 56.3 ± 17.6 | 57.0 ± 17.0 | 57.0 ± 16.8 |
| Male Sex, % | 63.3 | 55.5 | 56.3 |
| Risk Factor Associated with VTE, % | | | |
| Previous VTE | 31.9 | 19.1 | 19.8 |
| Known | 5.8 | 5.9 | 5.7 |
| Thrombophilic Condition | | | |
| Recent Surgery/Trauma | 22.7 | 18.1 | 17.7 |
| Immobilization | 15.4 | 15.6 | 15.5 |
| Estrogen Therapy | 2.9 | 8.4 | 8.2 |
| Active Cancer | 1.9 | 5.6 | 4.8 |
| Unprovoked | 57.0 | 57.0 | 63.8 |

*From pooled analysis

Table 2. Clinical Outcomes Relating to Emergency Department

| | Retrospective Cohort (n=207) |
|---|------------------------------|
| Therapeutic Anticoagulation** at Discharge, n (%) | 130 (63.2) |
| Mean Number of Emergency Department Visits | 7.18 (Range 1-21) |

**Defined as INR between 2.0-3.0 for 2 consecutive days

Table 3. Clinical Outcomes - Compared with EINSTEIN Trials

| | Retrospective Cohort (n=207) | Rivaroxaban – EINSTEIN-DVT (n=1718) | Standard – EINSTEIN-DVT (n=1711) | Rivaroxaban – EINSTEIN-PE (n=2412) | Standard – EINSTEIN-PE (n=2405) |
|---|------------------------------|-------------------------------------|----------------------------------|------------------------------------|---------------------------------|
| Readmissions, n (%) | 21 (10) | - | - | - | - |
| Related to VTE or anticoagulation complications | 4 (1.9) | - | - | - | - |
| All-Cause Mortality, n (%) | 5 (2.4) | 38 (2.2) | 49 (2.9) | 58 (2.4) | 50 (2.1) |
| Time in Therapeutic Range (TTR), % | - | - | 58 | - | 62.7 |
| Major Bleeding, n (%) | 8 (3.9) | 14 (0.8) | 20 (1.2) | 26 (1.1) | 52 (2.2) |

Table 4. Cost Minimization Analysis (Hospital Perspective)

a) First Visit

| | Traditional Anticoagulation Warfarin/LMWH | | | New Oral Anticoagulation Rivaroxaban | | |
|---|---|--------------|-----------------|--------------------------------------|--------------|-----------------|
| | Unit Cost (p) | Quantity (q) | Total (p*q) | Unit Cost (p) | Quantity (q) | Total (p*q) |
| Fixed Costs Per Visit (Personnel, Supplies) | \$166.00 | 1 | \$166.00 | \$166.00 | 1 | \$166.00 |
| Variable Costs Per Visit | | | | | | |
| Laboratory CBC | \$15.25 | 1 | \$15.25 | \$15.25 | 1 | \$15.25 |
| Laboratory INR | \$10.68 | 1 | \$10.68 | \$10.68 | 1 | \$10.68 |
| Medication: Dalteparin (18000U prefilled syringe) | \$55.56 | 1 | \$55.56 | \$55.56 | 0 | \$0.00 |
| Medication: Warfarin | \$0.01 | 1 | \$0.01 | \$0.01 | 0 | \$0.00 |
| Medication: Rivaroxaban | \$2.84 | 0 | \$0.00 | \$2.84 | 1 | \$2.84 |
| Total Costs | | | \$247.50 | | | \$194.77 |

b) Subsequent Visit(s)

| | Traditional Anticoagulation Warfarin/LMWH | | | New Oral Anticoagulation Rivaroxaban | | |
|---|---|--------------|------------------|--------------------------------------|--------------|---------------|
| | Unit Cost (p) | Quantity (q) | Total (p*q) | Unit Cost (p) | Quantity (q) | Total (p*q) |
| Fixed Costs Per Visit (Personnel, Supplies) | \$166.00 | 1 | \$166.00 | \$166.00 | 0 | \$0.00 |
| Variable Costs Per Visit | | | | | | |
| Laboratory CBC | \$15.25 | 0 | \$0.00 | \$15.25 | 0 | \$0.00 |
| Laboratory INR | \$10.68 | 1 | \$10.68 | \$10.68 | 0 | \$0.00 |
| Medication: Dalteparin (18000U prefilled syringe) | \$55.56 | 1 | \$55.56 | \$55.56 | 0 | \$0.00 |
| Medication: Warfarin | \$0.01 | 1 | \$0.01 | \$0.01 | 0 | \$0.00 |
| Medication: Rivaroxaban | \$2.84 | 0 | \$0.00 | \$2.84 | 0 | \$0.00 |
| Total Costs Per Visit | | | \$232.25 | | | \$0.00 |
| Mean Number of Subsequent Visits | | | 6.18 | | | 0 |
| Total Costs – Subsequent Visit(s) | | | \$1435.31 | | | \$0.00 |

Cost Minimization Analysis
 = Total Costs (Traditional) – Total Costs (NOAC)
 = (\$247.50 + \$1435.31) - (\$194.77 + \$0.00)
 = **\$1488.04 Savings/VTE event (in favour of NOAC)**

Conclusions

- Only 63.2% of the cohort was therapeutically anticoagulated at discharge.
- From a hospital perspective, there is an average of \$1488.04 savings per VTE event in favour of rivaroxaban compared to traditional therapy.
- Other perspectives will be addressed in subsequent cost analyses.