

# Implementation of a Clinical Pathway for Emergency Department Out-Patient Management of Deep Vein Thrombosis

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## Abstract

There is good evidence demonstrating that outpatient management of deep venous thrombosis (DVT) is feasible and safe. However, few emergency departments in Ireland have implemented care pathways for outpatient management of DVT. The aim of this study was to examine the safety and efficacy of implementing an Emergency Department (ED)-care pathway for outpatient management of patients with DVT. A retrospective observational study of this care pathway introduced at our institution was performed. The primary outcome measure was the number of hospital admissions avoided by using the care pathway. Two hundred and eighty-four patients presenting to the ED with suspected lower limb DVT, were managed using the care pathway over a 6 month period. Forty-nine patients (17%) had a DVT diagnosed. Thirty-nine patients (81%) were suitable for outpatient DVT management. Ten patients (19%) were admitted to hospital. At 3 months there were no reported cases of the following complications: missed DVT, pulmonary embolism or death.

## Introduction

Deep vein thrombosis (DVT) has a lifetime incidence of 2% to 5%, especially if untreated, mortality due to pulmonary embolism (PE).<sup>1,2</sup> It can result in considerable morbidity and, however, there is good evidence demonstrating that outpatient management is feasible and safe in the majority of patients presenting to Emergency Departments (EDs) with DVT.<sup>2,3</sup> Meanwhile, the feasibility of outpatient ED-directed DVT management in Ireland has not been previously published. The primary aim of this study is to determine if an ED-directed care pathway for outpatient management of patients with suspected DVT management will reduce hospital admission in patients with suspected DVT. The secondary aim was to determine the number of Doppler ultrasound scans performed using the care pathway.

## Methods

This retrospective descriptive study was performed in the Emergency Department (ED) of St. Vincent's University Hospital, Dublin, from July to December 2005. This ED has an annual census of approximately 40,000 patients per year (adults only). The records of patients presenting with suspected lower limb DVT during the study period were reviewed retrospectively by a single data abstractor. Patients with suspected lower limb DVT were identified from laboratory records of D-dimer tests ordered from the ED and confirmed by chart review. Patients with a high probability risk of DVT did not require D-dimer testing and were identified from Doppler Ultrasounds booked from the ED. The following data were retrieved from the patient records: age, sex, D-Dimer level and the result of lower limb Doppler ultrasonography.

A clinical pathway, based on a previously published guideline,<sup>4</sup> was adapted for use by ED staff. The initial step in the pathway was assessment of patients presenting with suspected lower limb DVT using Wells's pre-test probability (PTP) score. D-dimer testing was performed in patients with a low or moderate PTP score. This was followed by lower limb Doppler ultrasonography if clinically indicated. For patients with a high pre-test probability (PTP) score, Doppler ultrasonography was performed without D-dimer testing. If a DVT was confirmed the patient was managed as an outpatient, unless hospital admission was clinically indicated. The criteria for hospital admission were: PE or clinical features suggestive of PE; bilateral DVT or extension to IVC; active bleeding/high risk of bleeding; possibility of lack of compliance with anticoagulant therapy (dementia/iv drug abuse/alcoholism/poor social circumstances); uncontrolled hypertension; congestive heart failure; right heart failure. Ultrasonography was performed with a high-resolution 5 or 7.5MHz linear-array transducer. The deep veins were evaluated for compressibility at 1-cm intervals from the iliac vein to the calf veins. Absence or incomplete compressibility of the vein was used as the diagnostic criteria for DVT. D-dimer testing was performed with the MDA D-Dimer (bioMérieux). This assay has a 97% sensitivity, 46% specificity and a negative predictive value (NPV) of 99% for low and moderate score pre-test probability.<sup>6,7</sup>

## Results

### Baseline clinical characteristics

Two hundred and eighty-four patients presenting to the ED with clinical features suggestive of a lower limb DVT were managed using the care pathway over a 6 month period. Forty-nine patients (17%) had a DVT confirmed on lower limb Doppler ultrasonography. Twenty eight patients with DVT were females (57%) and 21 were males (43%). There were no protocol violations.

### Hospital admission and resource utilisation

Thirty-nine (81%) patients diagnosed with a DVT underwent outpatient management using the care pathway. Ten patients (19%) diagnosed with DVT were admitted to the hospital.

### Safety

There were no missed DVTs, pulmonary emboli or deaths reported in patients managed using the care pathway.

### Cost Savings

Two hundred and eighty-eight bed days were saved by using the care pathway. The cost of a hospital bed at St Vincent's University Hospital during the study period was approximately 630 per day. The bed-day saving was 181,440 (length of stay for DVT treatment was 7.4 days in 2005). The cost of performing a Doppler Ultrasound during the study period was 180. Since 102 Dopplers were not clinically indicated using the care pathway, the total imaging cost saving was 18,360. The overall cost saving therefore was 199,800 over a six month period, or 399,600 annualized.

## Discussion

DVT can result in considerable morbidity and, especially if untreated, mortality. Until recently, and indeed in many

hospitals throughout Ireland, all patients with a diagnosis of a DVT are managed as inpatients. The aim of this study was to implement an ED care pathway for the outpatient management of patients with DVT. The findings of the current study demonstrate that using a care pathway for the outpatient management of patients with a DVT reduces the rate of hospital admission. Before the introduction of this care pathway, all patients with a suspected diagnosis of a lower limb DVT attending St. Vincent's University Hospital ED were admitted for further investigation and management. After the introduction of the care pathway, 81% of patients in this study with a lower limb DVT were managed on an outpatient basis.

Outpatient management began with daily attendance at the ED's Clinical Decision Unit (CDU) for anticoagulation. This was followed by follow-up at a DVT Entry Clinic. This clinic was managed by two ED-based Associate Specialists in General Internal Medicine. A comprehensive clinical assessment was performed at the Entry Clinic. Results of routine blood tests, chest X-Ray and urinalysis were also reviewed. In addition, patients were educated about DVT and given patient information brochures. In addition, in the absence of any contraindications (for example, peripheral vascular disease and diabetes mellitus), patients were prescribed Grade II compression stockings for prevention of Post-Thrombotic Syndrome. Patients with abnormal findings at this clinic underwent further investigation or were referred to the appropriate service as clinically indicated.

Patients with proximal DVTs were warfarinised for 6 months. Patients with distal (calf) DVTs warfarinised for 3 months. At the end of their treatment period, patients were reviewed at the DVT Exit Clinic by one of the two ED-based Associate Specialists in General Internal Medicine. If patients had symptoms of persistent or recurrent DVT, Doppler ultrasonography was repeated. Patients were referred to a Haematology Clinic if they had a persistent or recurrent DVT. If patients were asymptomatic on presentation at the Exit Clinic, warfarin anti-coagulant therapy was discontinued and they were discharged back to the care of their General Practitioner. No significant change in the existing work practices of staff and no new equipment were required in the implementation of this clinical pathway.

In keeping with international guidelines we were confident that a post-test probability of less than 2% (negative D-dimer result with a low or moderate PTP) could allow us to safely discharge this group of patients without the need for Doppler Ultrasound. In this study, ultrasound testing was omitted in 102 patients using these criteria. This resulted in a cost saving of 18,360 during the study period. In addition, there was a cost saving of 181,440 by managing 81% of DVT patients on an out-patient basis using the care pathway. This was achieved by the avoidance of 288 hospital bed days. Before the pathway was introduced the average length of stay at St. Vincent's University Hospital for in-patient management of a lower limb DVT was 7.4 days. The findings of a previous study demonstrated that 83% of patients with lower limb DVT were safely managed on an outpatient basis.

This is the first study detailing the implementation and impact of a care pathway for the outpatient management of patients with lower limb DVT in the ED of an urban Irish tertiary hospital. The limitations of this study include its retrospective design and the absence of a control group. In addition, some patients in whom a DVT was ruled out using the care pathway may have subsequently presented to another hospital with a missed DVT or complications of a missed DVT. In conclusion, we demonstrated that a clinical pathway for the Emergency Department outpatient management of deep vein thrombosis is both feasible and highly cost effective in an urban Irish tertiary hospital.

#### **Potential Conflict of Interest**

The authors received an honorarium from Leo Pharma, manufacturers of the low molecular weight heparin (tinzaparin) used in this study

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