Venous thromboprophylaxis in UK medical inpatients

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SUMMARY

We prospectively assessed the implementation of venous thromboembolism (VTE) prophylaxis guidelines and the impact of grand round presentation of the data in changing clinical practice. Two NHS teaching hospitals were studied for 24 months from January 2003. Patients were risk stratified according to the THRIFT (thromboembolic risk factor) consensus group guidelines and compared with the recommendations of the THRIFT and ACCP (American College of Chest Physicians) consensus groups. Six months following presentation of the initial results, a further analysis was made to assess changes in clinical practice.

1128 patients were assessed of whom 1062 satisfied the inclusion criteria for thromboprophylaxis. 89% of all patients were stratified as having high or moderate risk of developing VTE. Of these only 28% were prescribed some form of thromboprophylaxis—4% received the THRIFT-recommended and 22% received the ACCP-recommended thromboprophylaxis. The vast majority (72%) received no thromboprophylaxis at all. Reassessment, following data presentation at grand rounds, showed a significant increase to 31% in patients receiving THRIFT ($P < 0.0001$) and ACCP ($P=0.002$) recommended thromboprophylaxis. However, the proportion of patients receiving no form of prophylaxis barely changed (72% to 69%: $P=0.59$).

We found a gross underutilization of thromboprophylaxis in hospitalized medical patients. A simple grand-round presentation of the data and recommended guidelines to clinicians significantly increased the proportion of patients receiving recommended thromboprophylaxis but did not increase the overall proportion of patients receiving it. We therefore conclude that a single presentation of guidelines is not enough to achieve the desired levels. Such presentations may only serve to make DVT (deep venous thromboembolism) aware clinicians prescribe prophylaxis more accurately.

INTRODUCTION

Venous thromboembolism (VTE) is a serious and potentially fatal condition with an annual incidence of 1–3 per 1000 per year.[1–5] It commonly manifests in the deep veins of the leg, but may occur in other sites such as the upper limbs, cerebral, intra-abdominal, liver, portal and retinal veins. When parts of the thrombus dislodge and are transported via the blood flow, embolization occurs (usually through the heart to the vasculature of the lungs).[3]

While VTE is the most important preventable cause of mortality in hospitalized patients, contributing to approximately 10% of all hospital deaths,[7] the case fatality rate varies widely. Large natural history studies[2,3,8] found that 12–25% of all VTE events were fatal: more recent trials found much lower figures, around 1–3% (5–10% for pulmonary embolism).[9–11] Goldhaber *et al.* (2000) found that 54% of patients in whom symptomatic VTE developed during hospitalization were either general medical or nonsurgical oncology inpatients.[13] Mismetti *et al.*, in their meta analysis of 17 randomized clinical trials, identified the risk of DVT in hospitalized medical patients who received no thromboprophylaxis (excluding patients with acute myocardial infarction and ischaemic stroke) to be approximately 20%.[14] Moreover in the landmark MEDENOX study, the use of Enoxaparin at a dose of 40 mg resulted in 63% relative risk reduction in VTE (from 14.9% in those randomized to a placebo to 5.5% in the treatment arm).[15,16]

It is clear therefore, that in order to reduce venous thromboembolism incidence, prevent fatality, and minimize recurrence and complications, hospitalized medical patients who are deemed to be at increased risk should undergo appropriate prophylaxis. The importance of improved recognition of at-risk patients, better risk stratification and avoidance of risk exposure where possible, cannot be overemphasized. Indeed, the Seventh American College of Chest Physicians' (ACCP) Consensus Conference in 2004

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Table 1 **Categorization of patients by risk (THRIFT II Consensus Group) [Ref. 28]**

Risk level	*Risk of DVT*	*Risk of proximal DVT*	*Risk of fatal PE*	*Patient group*
Low	<10%	<1%	0.01%	Minor medical illness
Moderate	10–40%	1–10%	0.1–1%	Major medical illness: heart or lung disease, inflammatory bowel disease, cancer
High	40–80%	10–30%	1–10%	Major illness in patients with previous DVT, PE or thrombophilia Lower limb paralysis

THRIFT=thromboembolic risk factor; DVT=deep vein thrombosis; PE=pulmonary embolism

produced guidelines on antithrombotic therapy stipulated that:

> 'In acutely ill medical patients who have been admitted to the hospital with congestive heart failure or severe respiratory disease, or who are confined to bed and have one or more additional risk factors, including active cancer, previous VTE, sepsis, acute neurological disease, or inflammatory bowel disease, prophylaxis with UFH [unfractionated heparin (Grade 1A)] or LMWH [low molecular weight heparin (Grade 1A)] is recommended. In medical patients with risk factors for VTE, and in whom there is a contraindication to pharmacological prophylaxis, the use of mechanical prophylaxis with graduated compression stocking (GCS) or intermittent pneumatic compression pump (IPC) (Grade 1C+) is recommended'.[17,18]

We designed an observational study to assess the practice of VTE prophylaxis in medical inpatients in two major teaching hospital trusts and studied the impact of raising the awareness of current practice through grand round presentation.

METHODS

Over a 24-month period from January 2003, a prospective survey was carried out by our team on medical in-patients at two English teaching hospitals. Each patient's VTE risk was stratified in keeping with the THRIFT consensus group guidelines (Table 1) by interviewing the patient and reviewing their medical history. The type of prophylaxis being employed was ascertained through patient and staff interviews along with the examination of the drug charts. This was compared with the recommended guidelines of the THRIFT and ACCP Consensus groups (Table 2)

Only two methods of prophylaxis were in use: fixed dose low molecular weight heparin (LMWH) and thromboelastic disease prevention stockings (TEDs). Primary prophylaxis was defined as the use of these methods in asymptomatic cases. Secondary prophylaxis was defined as the management of a diagnosed or suspected PE or DVT with therapeutic anticoagulation. Only primary prophylaxis was considered in our study.

Patients whose stay in hospital was less than 24 hours were not considered, since such a short period may not allow sufficient time for the medical teams to initiate prophylaxis. Patients already receiving anticoagulants prior to admission and those who were receiving anticoagulant therapy for diagnosed or suspected VTE or other conditions, were considered as ineligible for the study. Furthermore, any patient who had one of the stipulated contraindications to prophylaxis (Table 3) was excluded. After the first round of data collection was completed the results were analysed and presented at grand rounds in each hospital. Six months later, a further assessment of VTE prophylaxis was made at each hospital. The results were

Table 2 **Scoring sheet employed in this study**

Degree of risk	*Patient group*	*THRIFT guideline prophylaxis*	*ACCP guideline prophylaxis*
Low	Minor medical illness	TED stockings	None
Moderate	Major medical illness: heart or lung disease, cancer, inflammatory bowel disease, rheumatological disease, severe infection Age >70 Minor illness in patients with previous DVT, PE or thrombophilia	40 mg Enoxaparin (LMWH) and TED stockings	40 mg Enoxaparin (LMWH)
High	Major illness in patients with previous DVT, PE or thrombophilia Lower limb paralysis	40 mg Enoxaparin (LMWH) and TED stockings	40 mg Enoxaparin (LMWH)

ACCP=American College of Chest Physicians; TED=thromboelastic disease prevention stockings; LMWH=low molecular weight heparin. See Table 1 for key to other abbreviations

Table 3 **Contraindications for use of prophylaxis**

LMWH	*TED stockings*
Haemorrhage	Peripheral ischaemic vascular disease
Bleeding diathesis	Gangrene
Extensive dissection	Recent skin graft
Hemorrhagic stroke	Gross oedema of legs
Allergy	Pressure sores to heels
Heparin induced thrombocytopaenia	Cellulitis

See Table 2 for key to abbreviations

Table 4 **Patient numbers stratified according to risk of developing deep venous thromboembolism (DVT)**

Risk category for DVT	*Pre-audit*	*Post-audit*	*Total (%)*
High	375	54	429 (40.4)
Moderate	416	99	515 (48.5)
Low	71	47	118 (11.1)
			1062 (100)

Table 5 **Prophylaxis received by high-risk patients**

Prophylaxis	*Pre-audit*	*Post-audit*	*Total (%)*
None	261	38	299 (69.7)
LMWH	55	0	55 (12.8)
LMWH and TEDs	21	16	37 (8.6)
TEDs	38	0	38 (8.9)
Total	375	54	429 (100)
Any prophylaxis (%)	30.4	29.6	(30.3)
THRIFT agreement (%)	5.6	29.6	(8.6)
ACCP agreement (%)	20.3	29.6	(21.4)

See Tables 1 and 2 for key to abbreviations

compared by Fisher's exact test to determine if there was any significant alteration of practice.

RESULTS

Of the 1128 patients fully assessed, 1062 were able to be evaluated. The remaining 66 fell into the secondary prophylaxis category or had a contra-indication to prophylaxis and, hence, were excluded. Whereas 48.5% (515/1062) and 11.1% (118/1062) were deemed moderate and low risk of developing VTE, respectively, 40.4% (429/1062) were stratified as high risk (Table 4).

The combined percentage of patients with moderate and high risk was 88.9% (944/1062). Of this category 71% (673/944) did not receive any form of prophylaxis (Tables 5 and 6). The total proportion who underwent some form of thromboprophylaxis was 29% with only 8.7% receiving THRIFT-recommended and 23.2% receiving ACCP-recommended prophylaxis (Table 7).

Table 6 **Prophylaxis received by moderate risk patients**

Prophylaxis	*Pre-audit*	*Post-audit*	*Total (%)*
None	306	68	374 (72.6)
LMWH	82	0	82 (15.9)
LMWH and TEDs	14	31	45 (8.7)
TEDs	14	0	14 (2.7)
Total	416	99	515 (100)
Any prophylaxis (%)	26.4	31.3	(27.4)
THRIFT agreement (%)	4.6	31.3	(8.7)
ACCP agreement (%)	23.1	31.3	(24.7)

See Tables 1 and 2 for key to abbreviations

Table 7 **Prophylaxis received by moderate- and high-risk patients pre- and post-audit**

	Pre-presentation (%)	*Post-presentation (%)*	*Total (%)*
No prophylaxis	567 (71.7)	106 (69.3)	673 (71)
Any prophylaxis	224 (28.3)	47 (30.7)	271 (29)
THRIFT correct prophylaxis	35 (4.4)	47 (30.7)	82 (8.7)
THRIFT incorrect prophylaxis	756 (95.6)	106 (69.3)	862 (91)
ACCP correct prophylaxis	172 (21.7)	47 (30.7)	219 (23)
ACCP incorrect prophylaxis	619 (78.3)	106 (69.3)	725 (77)
Total	791 (100)	153 (100)	944 (100)

See Tables 1 and 2 for key to abbreviations

Although 30.3% (130 of 429) of high-risk patients did receive some form of thromboprophylaxis only 8.6% (37 of 429) were given the THRIFT-recommended and only 21.4% (92/429) the ACCP-recommended thromboprophylaxis (*see* Table 5). Similarly, 27.4% (141 of 515) of patients with moderate risk did receive some form of thromboprophylaxis but only 8.7% (45 of 515) were given the THRIFT-recommended and only 24.7% (127/515) the ACCP-recommended thromboprophylaxis (*see* Table 6).

The pre- and post-audit data demonstrated a change of practice with an increase in the proportion of high- and moderate-risk patients receiving the recommended thromboprophylaxis from 4.4 to 30.7% according to the THRIFT recommendations; there was, however, an

Table 8 ***P* Values for audits (Fishers exact test)**

	Any prophylaxis	*THRIFT correct versus incorrect prophylaxis*	*ACCP correct versus incorrect prophylaxis*
Moderate	0.38	<0.0001	0.09
High	1.0	<0.0001	0.15
Moderate + high	0.59	<0.0001	0.002

THRIFT=thromboembolic risk factor; ACCP=American College of Chest Physicians

increase from 21.7% to 30.7% according to the ACCP recommendations (*see* Table 7).

The changes seen in prescribing correctly versus incorrectly (according to THRIFT recommendations) were significant both on aggregate ($P<0.0001$) and when segregated according to risk (moderate $P<0.0001$; high $P<0.0001$) (Table 8). However, the changes seen in prescribing correctly versus incorrectly (according to ACCP recommendations) were significant ($P=0.002$) only when looking at the combined high and moderate risk category (*see* Table 5). Levels of any thromboprophylaxis were not significantly affected by the audit whether in aggregate or separately for high and moderate risk patients (*see* Table 5).

DISCUSSION

Statement of principal findings

Within the hospitals studied, we have shown that there was a significant lack of VTE prophylaxis in medical inpatients. In fact, prophylaxis was consistently underutilized and only implemented correctly (according to THRIFT guidelines) in moderate- and high-risk patients at a rate of 4.4% pre-audit. Even after guideline presentation this figure only rose to 30.7%. Therefore, based on our survey, medical inpatient VTE prophylaxis is underemployed, in contrast to the practice on many surgical wards.[19]

Strengths and weaknesses of the study

This study is the first purely prospective analysis of thromboprophylaxis prescribing in English hospitals published and the first study to assess the success of a methodology employed to try and change such practice. However, it is worth noting that due to constraints of time and manpower we were unable to assess as many hospitals as we would have liked—we ended up with complete data from only two teaching hospitals. Moreover, we accept that a more useful long-term analysis would look at the effects of this prescribing and assess the clinical consequences of the prescribing patterns—namely, rates of VTE development in relation to prescribing pattern.

Strengths and weaknesses in relation to other studies—particularly any differences in results

Several studies from around the world have consistently shown a lack of prophylaxis for medical inpatients. In an American retrospective study of 100 medical patients with established VTE risk factors, only 31% were prescribed pharmacological prophylaxis.[20] In a similar Canadian retrospective study of 446 eligible medical patients at two teaching hospitals only 146 patients (33%) received some form of VTE prophylaxis.[21] Furthermore, an Italian retrospective study showed that 46.4% of the eligible 112 medical patients they studied received prophylaxis.[22] Finally, a case–control comparative study from Saudi Arabia found that 39% of the 249 medical patients they investigated received VTE prophylaxis.[23] Our study showed a similar trend of thromboprophylaxis underutilization. In contrast to these findings, Campbell *et al.*, in a retrospective study of over 200 medical patients in the Scottish and northern English hospitals, found that prophylaxis was implemented in a high proportion of general medical patients at a rate of 71%.[19] They concluded that additional efforts to promote prophylaxis were unlikely to be cost effective. Our study, in keeping with the other studies, found lower rates of thromboprophylaxis in England—however, raising awareness locally resulted in a significant improvement in the proportion of patients undergoing recommended thromboprophylaxis. The fact that our study was prospective and larger leads us to believe that it is a truer reflection of the *actual* state of affairs.

Meaning of the study: possible mechanisms and implications for clinicians or policymakers

There are several reasons that might explain why prophylaxis is not a widespread practice on medical wards. Recently, the Seventh American College of Chest Physicians' consensus statement highlighted some of these factors.[17] First, many practitioners believe (incorrectly) as a result of their own observations that VTE is uncommon and that anticoagulation is unwarranted. However, it is critical to remember that the majority of VTE events are clinically silent and the condition remains underdiagnosed. Secondly, there is unjustified anxiety about bleeding risk despite the reassuring meta-analyses and randomized control trials which demonstrate little or small increases in the absolute risk of major bleeding with the use of LMWH. Finally, cost issues may deter some practitioners, yet health economics studies have consistently proven that broad application of pharmacological prophylaxis is highly cost effective.[17]

Our findings before and after presenting the data locally suggest that a significant proportion of clinicians were responsive in the context of a one-off grand round.

However, the change was not sufficient enough to attract an acceptably high level of prophylaxis implementation. While our study showed that there was a statistically significant improvement in recommended prophylaxis rates post audit, the vast majority of moderate- and high-risk patients (71%) still did not receive any prophylaxis. Furthermore, the improvement in correct prophylaxis rates was mainly achieved by converting incorrect prophylaxis to correct prophylaxis—indeed, overall (any) prophylaxis did not show statistically significant improvement. This suggests that perhaps we influenced the prescribing behaviour of DVT-aware clinicians by making them prescribe correctly without affecting the DVT-unaware clinicians who continue not to prescribe DVT prophylaxis. The audit loop compares unfavourably with surgical inpatients which have shown much better prophylaxis rates and better improvements after the audit cycle was completed.[24–26] It is of note that the following strategies which were carried out by our surgical colleagues were not done by our group: (*a*) making a risk assessment protocol available (leaving notes and laminated copies of the protocol on wards); (*b*) targeting vulnerable patient subgroups; (*c*) regularly assessing implementation of protocol at nursing and medical ward rounds; and (*d*) devising a new hospital protocol emphasizing risk assessment and using LMWH.[27,28]

In order to tackle this problem we therefore recommend a three-pronged approach.

First, in an attempt to improve the current unsatisfactory situation, in the short term all medical patients should have a DVT prophylaxis tick sheet attached to their drug charts once they are admitted. This sheet should be based on the THRIFT consensus guidelines until the National Institute of Clinical Excellence (NICE) produce their report (expected 2007). Secondly, in the long term, the concept of DVT needs to be addressed more appropriately within the context of medical and nursing education. Emphasis should be placed on the potential serious hazards of developing DVT, and the ease and cost effectiveness with which we are able to prevent it in both medical and surgical patients. Thirdly, raising awareness periodically is definitely needed in view of the high turnover of hospital medical and nursing staff across all UK hospitals. We suggest the empowerment of dedicated antithrombotic teams charged with the task of periodically raising awareness and auditing prophylaxis rates would ensure the continuity required to achieve acceptably high rates of prophylaxis. Ward pharmacists may prove instrumental in bridging this gap in the short term.

Unanswered questions and future research

We hope that through these simple measures we will be able to produce more DVT-aware health professionals and look forward to analysing the impact of any future changes on prophylaxis practice and consequential incidence of venous thromboembolism.

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