



Contents lists available at ScienceDirect

Future Healthcare Journal

journal homepage: <https://www.sciencedirect.com/journal/future-healthcare-journal>

The role of health policy in the prevention of venous thromboembolism in the UK National Health Service—Learning from the past, looking to the future



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ARTICLE INFO

Keywords:

Venous thromboembolism
Prevention
Health policy

ABSTRACT

Venous thromboembolism is the third most common cause of cardiovascular death globally and many diagnoses are preventable. The UK NHS has led international efforts to reduce VTE, particularly hospital-associated VTE, through coordinated national policy action and world-leading research. Despite this, VTE remains an important cause of morbidity and mortality in the UK, as underlined by the recent COVID-19 pandemic. Future reductions in VTE incidence/deaths will require progress on several fronts: a better understanding of case mix; revisiting VTE risk assessment, focussing on thromboprophylaxis failure and improving awareness of VTE amongst clinicians and the public. Changes to healthcare delivery, with care increasingly delivered outside of hospital, alongside changing disease patterns, including the rise in obesity, have huge implications for VTE and will dramatically alter prevention. The UK, with its nationalised healthcare model and long history of policy action on VTE, provides a unique lens through which to study past successes and future priorities for VTE prevention.

Introduction

Venous thromboembolism (VTE), which describes both deep vein thrombosis and pulmonary embolism, is an important cause of chronic morbidity and the third most common cause of cardiovascular death globally, after myocardial infarction and ischaemic stroke. VTE is associated with huge healthcare costs, with diagnosis and treatment estimated to cost the US health service \$7–10 billion annually, and clinical negligence claims in the UK National Health Service (NHS) amounting to £108 million from 2013 to 2019.¹ Over half of VTEs develop following hospital admission - so-called hospital-associated thrombosis (HAT) - and the NHS has led internationally in introducing national health policy to reduce these. Despite significant progress, VTE-related deaths remain common, and increased further during the COVID-19 pandemic, leading to a renewed focus on how we might better prevent disease, including the role of national policy. In this article, we summarise prior national improvement work aimed at reducing HATs, discuss the challenges with measuring good practice and defining preventable

VTE, and suggest areas of focus for a future national VTE prevention programme.

Looking back

The national VTE prevention programme

Reducing VTEs 'acquired' during a hospital admission have been a focus of national healthcare policy since the NHS VTE prevention programme was inaugurated in 2009. Patients who develop HATs are, by definition, in direct contact with medical services and therefore amenable to targeted prevention, including through anticoagulant medication (whose efficacy at preventing VTE was established by the early 2000s).² VTE risk assessment, which helps clinicians balance the risk of thrombosis and bleeding when making a decision about anticoagulation, has been an important complementary strategy for standardising care across a national healthcare system. Mandatory risk assessment has been a cornerstone of HAT prevention strategy in England, with rates of

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<https://doi.org/10.1016/j.fhj.2024.100016>

risk assessment monitored nationally, and financial penalties levied on hospitals failing to meet nationally set standards. Mandating risk assessment drove rapid and sustained improvements in risk assessment rates in hospitals and has been associated with a gradual decline in HAT-related death.³ A causal role for mandatory risk assessment in reducing HAT-related death is supported by a demonstrable reduction in the number of HATs linked to inadequate/inappropriate pharmacoprophylaxis.³

Hospitals in England mainly use a VTE risk assessment model developed by expert consensus - the Department of Health model - but this, and other validated VTE risk assessment models (RAMs) have issues. All perform poorly at stratifying patients into risk groups and may better predict patients at risk of thromboprophylaxis failure given their validation in cohorts where patients received pharmacological prophylaxis as part of standard care.⁴ Alternatives to RAM-driven prescribing strategies are being explored, including 'opt-out' approaches where pharmacoprophylaxis is given to everyone without risk factors for bleeding. Given risk assessment has been so central to national policy, establishing the optimal population-based prescribing approach is clearly a priority for the future.

Since the inception of the national improvement programme, there have been other important systemic changes relevant to HAT prevention in addition to the national risk assessment strategy. The National Institute of Clinical Excellence has produced new national guidance on VTE prevention, the number of hospital-based VTE specialist nurses has increased and the VTE exemplar network led by King's College London has been expanded. Moreover, there has been a shift towards enhanced recovery/minimally invasive surgery, which reduces the risk of VTE, and increased patient awareness through third sector involvement. In elective orthopaedic surgery, where VTE is an important cause of post-surgical mortality, the dramatic decrease in mortality has largely been independent of the anticoagulant strategy used, instead reflecting the shift to enhanced recovery protocols.⁵

Measuring good VTE prevention practice

Monitoring the impact of VTE prevention interventions has proved difficult, even in a nationalised health system like in the UK and we are far from having an accurate picture of VTE rate, the rate of VTE-related death or an understanding of the subset of diagnoses that could have been prevented. Given the national focus on HAT prevention, measuring HAT incidence seems a logical starting point, although figures can be misleading, with studies from the US indicating a higher VTE incidence in hospitals with better VTE prevention practices, possibly as a result of surveillance bias.⁶ Measuring HAT incidence is also complicated by omissions and inaccuracies in medical coding with studies showing that routinely available hospital data has a high specificity but poor sensitivity for identifying HAT when compared to retrospective case review.⁷

Recognising these issues, the NHS in England has focussed on the subset of patients that die from VTE. While many deaths are not preventable, the presence of harm is clear and the rigour applied to death certification process - through the coronial and medical examiner system - reduces the chance of false positive cases (although an underappreciation of VTE still exists).

Monitoring the completion of VTE risk assessments - but not other important clinical processes such as prescribing and administration of pharmacological prophylaxis - has been another important tool for monitoring prevention practice nationally. The future utility of this metric is the subject of debate given only a tiny proportion of patients lack a completed risk assessment on admission, but there is also risk that withdrawing this measure could mean VTE prevention is deprioritised due to less external scrutiny.

Looking to the future, the UK should look to improve the monitoring of prevention practices. This might involve:

- using new methodological approaches to datasets including novel information extraction software to enhance data accuracy

- bringing other datasets online eg primary care data or local databases that screen for 'VTE-positive' radiology reports
- changing the focus of what we study eg monitoring prophylaxis administration using electronic prescribing systems rather than the completion of VTE risk assessments

Looking to the future

Which diagnoses are 'preventable'?

VTE prevention in the UK and worldwide has focussed on HATs as these patients have direct contact with healthcare services prior to developing VTE and so can be more easily targeted for prevention. However, people outside of hospital also have patient-specific, disease-specific, and treatment-specific factors that increase VTE risk and may also stand to benefit from thrombo-prophylaxis.

The COVID-19 pandemic underlined this point as acutely ill patients were increasingly managed at home. While patients unwell with COVID-19 but without pneumonia had a low overall risk of VTE and did not benefit from preventive anticoagulation medications, there have been no studies in virtual wards covering other conditions eg pneumonia or inflammatory bowel disease where patients would traditionally be admitted to hospital. With the current pressures on hospital bed usage, the use of virtual wards in the UK is expanding to these groups and there is a need to identify optimal prevention strategies in patient populations who were not previously considered by the national prevention programme.

What are the future national priorities for the prevention of venous thromboembolism?

Despite considerable progress, thousands of patients continue to die from VTE in the UK each year and the number increased substantially in the latest data from the period of the COVID-19 pandemic (to over 16,000 deaths/year).⁸ While the cause of the increase is debated, VTE clearly remains a pressing public health concern. In [Table 1](#), we set out the key priorities for a future improvement programme in the UK.

Reducing the burden of disease will require a focus on upstream factors that influence risk at a population level. For example, obesity is known to increase VTE risk, and this has huge implications for overall population incidence given that over a quarter of the UK adult population is obese, and the proportion is only set to rise.⁹ While the public is well drilled on the impact of lifestyle on other cardiovascular diseases such as ischaemic heart disease and stroke, a similarly strong public discourse does not exist for VTE.¹⁰

Over a third of VTE-related deaths occur in patients without a recent hospital admission and preventing VTE in this group is underexplored.¹¹ In addition to targeting upstream factors such as obesity, we need to consider how we might better manage transitory risks, such as acute infection, particularly as more care is moved out of hospital.

While preventing VTE is preferable, prompt recognition and treatment of VTE is another important aspect of reducing VTE-related death. Many individuals who die from VTE have multiple healthcare contacts in the weeks leading up to death, but the correct diagnosis is not made. An improved understanding of VTE-related symptoms amongst both the public and in healthcare staff may allow diagnoses to be made more promptly and is in keeping with disease specific charity messaging eg, 'Let's Talk Clots' campaign led by Thrombosis UK.

There is also scope for further improving rates of HAT and HAT-related mortality and dividing patients into categories can help better frame these opportunities ([Table 2](#)).

Patients developing HATs after 'inadequate' prophylaxis could potentially benefit from better adherence to guidelines, although this subgroup is relatively small as a proportion of the total number of HATs, making up about 10% of cases in a recent national audit.¹¹ Even within

Table 1
Recommendations for a future national VTE prevention improvement programme.

Theme	Key areas of focus
Understanding case mix: Understand who gets VTE and who dies from VTE in the UK	- Define the characteristics of individuals developing and dying from VTE in the UK including: basic demographics; comorbidities; covid status; healthcare contacts proximate to diagnosis/death - Evaluate how the characteristics of those developing and dying from VTE changed in the pandemic
Enhancing quality: Understand how good current VTE prevention practice is, where the gaps are and how we might address these	- Maintain high standards of local VTE risk assessment - Target the causes of delayed/missed anticoagulant doses - Spread best practice in relation to local VTE prevention teams: their role; funding; and activities - Spread best practice in relation to local HAT identification and investigation - Reform national monitoring of VTE prevention performance
Supporting research: Define the areas we don't understand and support relevant research efforts	- Evaluate new population-level approaches to prophylaxis – ‘opt-out’ vs RAM-driven - Improve risk assessment models in specific patient populations eg obstetrics - Understand the optimal approach to weight-based dose adjustment of anticoagulants - Evaluate enhanced prophylaxis in specific high-risk groups e.g. after lower limb immobilisation - Evaluate the role of intermittent pneumatic compression in specific patient groups eg low risk surgical patients - Research new pharmacological agents that have a better bleeding profile
Raising awareness: Increase awareness of VTE among the public and healthcare professionals	- Improve public understanding of lifestyles factors influencing VTE risk - Improve the recognition of VTE among healthcare staff through targeted education

Table 2
Patient subgroups developing hospital-associated thrombosis.

Subgroup	Definition
Risk model failure	Patients who do not receive thromboprophylaxis as they are deemed low risk
Inadequate/inappropriate prophylaxis	Patients who do not receive adequate prophylaxis as guidelines are not followed properly
Prophylaxis failure	Patients that develop HAT despite receiving prophylaxis in line with guidelines
Complex	Patients at high risk of VTE for who pharmacological prophylaxis is reasonably withheld due to a high bleeding risk

this group, most patients have prophylaxis *prescribed* in line with guidelines, but doses are missed or delayed for other reasons.¹¹

Almost half of HATs occur in patients where pharmacological prophylaxis is appropriately administered – so called ‘prophylaxis failure’.¹¹ Research is needed to explore if new approaches could prevent better VTE in this group. The solution is unlikely to lie with low molecular weight heparin, as larger doses are known to be associated with increased bleeding risk. Instead, we need a new generation of anticoagulants - that afford better protection against VTE without an associated increase in bleeding risk - and perhaps wider use of intermittent pneumatic compression.

New approaches to risk assessment will also be important in reducing HATs. Risk assessment needs to be more dynamic, responding to changes in a patient’s clinical condition and integrating new information as it becomes available through an admission. Ideally, we need models with better discrimination, although there may be too many unknowns to improve predictive accuracy so that other approaches eg to ‘opt-out’, might be preferable.

Conclusions

Venous thromboembolism remains an important cause of morbidity and mortality internationally with huge associated healthcare costs. The size of the impact is likely underappreciated due to underdiagnosis and issues with data reporting. The reporting issues may be surmountable using new datasets and methodological approaches, and this should be a key priority.

The preventability of VTE events that develop in the community outside of hospital admission is underexplored. These often occur in the presence of known risk factors, both fixed and transient, and there is an increasing need to focus on this group as healthcare delivery is moved out of acute hospitals.

HATs are an important cause of preventable harm, and even where unavoidable, earlier diagnosis could reduce their impact, including death. Great progress has been made in reducing HATs but address-

ing common causes of inadequate prophylaxis may drive further improvements. Risk assessment has had a huge impact on HATs nationally, but recent research has prompted the need to consider new population-based approaches. Many HATs occur where there is prophylaxis failure and better anticoagulants are required to reduce risk in this group.

There is no doubt that coordinated national action on VTE prevention is needed. The UK already leads the world in several areas, and national healthcare bodies should capitalise on the experience, infrastructure and interest that already exists.

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