

# Venous Thromboembolism Prophylaxis: The role of the nurse in changing practice and saving lives

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## KEY WORDS

Nursing, venous thromboembolism, risk assessment,  
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## ABSTRACT

### Background

Venous thromboembolism (VTE) predominantly afflicts surgical and medical patients in an acute hospital setting. Responsibility for VTE risk assessment and appropriate prophylaxis to prevent this major health burden rests with a variety of clinical staff. All too frequently, however, patients do not undergo VTE risk assessment on admission. This is regardless of the fact that a number are at risk for VTE, receive no prophylaxis and unknowingly are at risk of serious adverse events including death.

### Objective

The broad aims of this paper is to provide evidence based information on VTE and to report on the rate of appropriate VTE prophylaxis pre and post nursing educational sessions.

### Setting

This paper describes a nurse led initiative undertaken at a tertiary level acute care facility in Queensland.

### Subjects

A clinical audit was conducted on 2,063 hospitalised inpatients

### Primary argument

Nurses who are empowered through evidence based education sessions can take responsibility for VTE risk assessment of all admitted patients and ensure appropriate VTE prophylaxis is provided. The rates for appropriate prophylaxis in admitted patients at risk of VTE increased from 27% to 85% ( $p < 0.0001$ ). Through appropriate prophylaxis of patients at risk of VTE, the incidence of VTE will be significantly reduced.

### Conclusions

Nurses who are committed to VTE risk assessment and prophylaxis have the ability to contribute significantly to the reduction of VTE and its subsequent complications.

## INTRODUCTION

VTE is the term that describes two clinical conditions: deep vein thrombosis (DVT) and pulmonary embolism (PE). DVT occurs when a blood clot or thrombus forms in a deep vein, usually restricting blood flow. Pulmonary embolism occurs if the thrombus dislodges and travels to the lungs. Michota (2007) stated that VTE is considered to be the most common preventable cause of hospital related death.

Symptomatic VTE is a major health problem. In Australia, it is estimated that VTE will affect approximately 15,000 individuals and be responsible for over 5,000 deaths each year (Access Economics 2008). The financial burden of VTE on the health care system is considerable and is estimated to be as much as \$1.72 billion (Access Economics 2008). Symptomatic PE results in sudden death in about 25% of cases (Heit et al 2001). The morbidity associated with DVT is often under recognised and includes serious long term complications such as chronic venous insufficiency, chronic oedema, chronic pain and recurrent venous ulceration, collectively known as the post-thrombotic syndrome (Kahn 2006; Ziegler et al 2001).

As the deaths due to VTE occur before treatment can be instituted and the post thrombotic syndrome occurs in spite of treatment, the only way to prevent these complications is to prevent VTE from occurring. VTE is recognised as having a high risk in a proportion of surgical, medical and obstetric clients in the acute care system with about 50% of all cases of VTE in our community occurring following recent hospitalisation (Heit 2003). It is also a significant risk for the chronically ill in the community and to residents of aged care facilities. Effective prophylaxis using anticoagulants and/or mechanical devices such as compression stockings or intermittent pneumatic compression reduce the development of VTE by about 80% (Collins et al 1988; Clagett and Reisch 1988).

The Access Economics Report (2008) also identified that there was lack of a systematic approach to prevent VTE in many Australian hospitals. Internationally and

nationally, the assessment of patients who may be at risk is not uniformly undertaken and despite the availability of evidence based guidelines for VTE prophylaxis, many patients receive no prophylaxis (Cohen et al 2008) and are thus unknowingly at risk for VTE development in hospital and for some weeks following discharge. Many clinicians would advocate that VTE risk assessment and appropriate prophylaxis should be mandatory for all patients requiring hospital admission.

The aims of this paper are twofold. Firstly, the reader is provided with comprehensive, evidence based information on VTE. The risk factors for all categories of clients are identified with the recommended prophylactic management of this avoidable condition. The authors hope the information contained will be a useful resource for clinical nurses and those health professionals who are closely involved in direct patient care. Secondly, this paper reports on an initiative implemented in the Princess Alexandra Hospital, Brisbane where nurses were empowered to make a change to the culture of VTE prevention. This has significant implications for the role of the nurse in the assessment and prevention of VTE and is an example of the success of nurses in implementing major changes to healthcare practice, patient advocacy being a primary concern of the nursing profession (Hanks 2008).

## VTE RISK STRATIFICATION

There are several evidence based guidelines available and clinicians should be aware of the recommendations for patients in their care but also use clinical judgement to treat each client individually. Hospitalised patients can be broadly subdivided into surgical, medical and obstetric groups and the risk within these groups can be identified by the specific conditions or the planned surgical procedure (table 1). Immobility, thrombophilia, oestrogen therapy, active inflammation, strong family history of VTE and/or obesity all are associated with a higher risk for VTE during hospitalisation (ANZ Working Party 2007). The presence of these factors emphasise the importance of individualised VTE risk assessment.

**Table 1: VTE Risk Stratification**

Risk Assessment		
Category	Medical Patients	Surgical Patients
High	Ischaemic Stroke, History of VTE, Decompensated cardiac failure, Active cancer, Acute on chronic lung disease, Acute on chronic inflammatory disease, Age > 60 years (unless well and ambulant)	Hip or knee arthroplasty Major Trauma Hip fracture surgery Other surgery with prior VTE and/or active cancer Major surgery age > 40yrs
Low	Minor medical illness.	All other surgery

**Obstetric patients**

Several factors may increase the risk of VTE during pregnancy including caesarean section, obesity and advanced maternal age. Specific conditions considered to place the mother at high risk include a history of unprovoked or pregnancy associated VTE and the presence of one or more thrombophilia's eg. Antithrombin III deficiency and Antiphospholipid Syndrome.

**VTE PROPHYLAXIS**

For effective VTE prophylaxis of all patients, it is important to assess according to their individual VTE risk, taking into account their clinical condition, the potential bleeding risk and the appropriateness of the prophylaxis for the individual patient. The assessment for VTE prophylaxis should occur on admission to hospital and prophylaxis should commence without undue delay and be re-assessed on a regular basis to ensure prophylaxis remains appropriate.

It is important to note within some groups of patients, VTE risk may persist for weeks. Many of these patients will be discharged from hospital before the risk abates and thus the prophylaxis requires to be prolonged. Continued encouragement of early and frequent ambulation (Geerts et al 2008) and adequate hydration are important principles in all patients regardless of risk category. Two main categories of VTE prophylaxis have been shown to be effective and can be divided into the pharmaceutical agents and mechanical devices.

**Pharmaceutical agents**

The effectiveness of subcutaneous low-dose unfractionated heparin (LDUH), low molecular weight heparin (LMWH), Fondaparinux, Rivaroxaban and Dabigatran for preventing VTE have been well established. There is a requirement for VTE prophylaxis protocols with medical practitioners selecting the dose, dosage interval and brand of prophylactic agent for each individual patient having referred to full product information.

Aspirin may have at best a weak protective effect against DVT but is generally not recommended for prophylaxis (Geerts et al 2008). Adjusted dose warfarin may have a role in some high risk surgical patients but requires close monitoring of its effect (Clagett and Reisch 1988; Mismetti et al 2004)

**Mechanical devices**

Two main types of mechanical devices are widely used in the prevention of VTE Graduated Compression Stockings (GCS) and Intermittent Pneumatic Compression (IPC). The National Institute for Health and Clinical Guidelines (2007) in the United Kingdom states that GCS reduce the risk of DVT by 51%. While studies have generally involved thigh length stockings (Sajid et al 2006), it is accepted that below knee stockings are as effective in reducing the risk of DVT development in most patients. IPC reduces the incidence of DVT and is more effective than GCS in high risk patients in combination with anticoagulants or when anticoagulants are contraindicated (MacLellan and Fletcher 2007).

To be effective, GCS or IPC should be measured and fitted for the individual patient and should be worn continuously during the period of immobility to the return of full ambulation. Patient compliance is essential e.g. ensuring their stockings are not rolled down to the ankle. Incorrectly fitting stockings invariably do not provide the graduated compression required for prophylaxis and can cause more harm than benefit to patients.

#### **Are there any contra-indications to prophylaxis?**

There are contra-indications to prophylaxis and thus the type of prophylaxis selected must be specifically tailored to the individual patient.

#### **Pharmaceutical prophylaxis**

Bleeding is the major complication of anticoagulant treatment and the relative risks for bleeding versus VTE must be considered when commencing anticoagulation. Contraindications to anticoagulant prophylaxis include:

- active bleeding
- high risk of bleeding e.g. thrombocytopenia, history of gastrointestinal bleeding, severe hepatic disease
- prior adverse reaction to heparin
- concurrent anticoagulation
- renal impairment (estimated glomerular filtration rate < 30mls/min)

#### **Mechanical prophylaxis**

Reported complications with GCS and IPC are rare but include the lower limb compartment syndrome, skin ulceration and common peroneal nerve palsy. Most importantly, they should not be used in limbs with severe or critical ischaemia and other contraindications to mechanical prophylaxis include significant peripheral neuropathy, recent skin graft and severe leg deformity.

#### **COMPLIANCE WITH GUIDELINE RECOMMENDATIONS**

All admitted patients should have a VTE risk assessment as part of their hospital admission and receive optimal VTE prophylaxis according to their level of risk and existing contraindications. Adherence

to the VTE prevention guidelines are not embedded into routine clinical practice internationally or in Australia (Cohen et al 2008). Systematic approaches to ensuring appropriate VTE prophylaxis are required. Traditional methods of information dissemination such as didactic education and publication of guidelines do not lead to sustained system change (Tooher et al 2005). Active education, reminders and audit and feedback are methods that have been shown to effect improvement in VTE prophylaxis use (Michota 2007). VTE risk assessment and prescribing of VTE prophylaxis has traditionally been a medical practitioner responsibility and nursing has had limited active role in identifying patients at risk and advocating for the appropriate VTE prophylaxis.

#### **VTE Prophylaxis guideline implementation program**

In November 2005, the Princess Alexandra Hospital in Brisbane commenced a hospital wide VTE prophylaxis guideline implementation project as part of a program undertaken by the National Institute of Clinical Studies. This initiative was based on the three key components of clinician action for quality improvement, published in the Clinicians Toolkit for Quality Assurance by the NSW Government (2001, p.1).

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|--|
| 1. Developing the knowledge and skills for understanding human performance, the systems of care and for minimising and dealing with error. |
| ↓  |
| 2. The application of methods to identify, measure and analyse problems with care delivery.  |
| ↓  |
| 3. Action upon that information to improve both the individual and the systemic aspects of care delivery.                                  |

**1. Developing the knowledge and skills for understanding human performance, the systems of care and for minimising and dealing with error:** A full time VTE Clinical Nurse Consultant was employed to implement a multifaceted hospital wide VTE prophylaxis program in collaboration with a vascular physician. This VTE prevention program included active education, paper based and personal reminders, audit and feedback on appropriate VTE prophylaxis rates.

## 2. The application of methods to identify measure and analyse problems with care delivery:

There was a focus on up skilling and empowering nursing staff to identify patients at risk of VTE, for nurses to initiate mechanical prophylaxis where appropriate and to advocate for optimal pharmaceutical prophylaxis if not appropriately prescribed. In patients attending pre-admission clinic prior to a planned hospital admission, the nurses provided the patient with information on VTE risk and encouraging the patient to discuss the appropriateness of VTE prophylaxis with their medical practitioner.

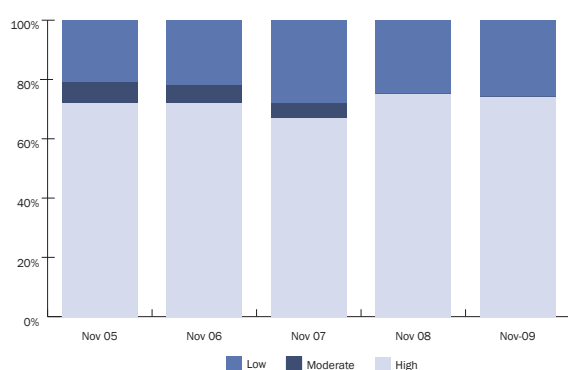
## 3. Action upon that information to improve both the individual and the systemic aspects of care delivery:

An annual bedside clinical audit was conducted to evaluate the effectiveness of the program. A total of 2063 patients have been audited over five years with medical patients accounting for 62% (table 2). Overall, the majority of hospitalised patients were at risk of developing VTE (figure 1) and this nurse-led program has seen whole of hospital appropriate VTE prophylaxis rates in at risk patients improve from 27% in 2005 to 85% in 2009. All yearly results were able to show a highly statistical significance ( $P < 0.000.1$ ) in comparison to the 2005 baseline (figure 2). This improvement in appropriate VTE prophylaxis in at risk patients was not associated with any increase in inappropriate administration of VTE prophylaxis in patients not at risk (figure 3).

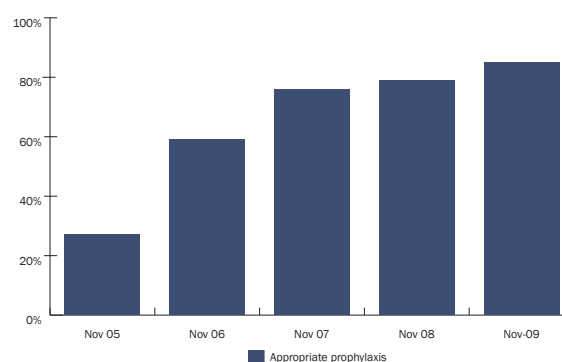
**Table 2: VTE Patient Audit Results 2005-2009**

	Nov 2005	Nov 2006	Nov 2007	Nov 2008	Nov 2009
Total	345	401	520	359	438
Medical patients	230	257	321	200	263
Surgical patients	115	144	199	159	175

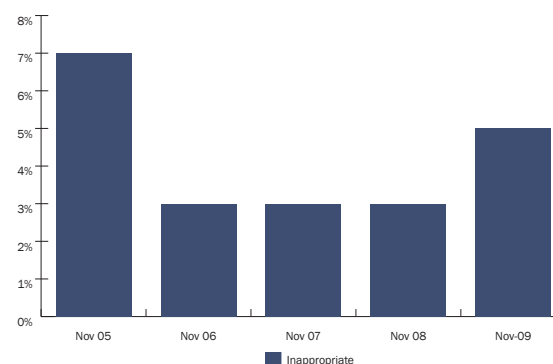
**Figure 1: Risk stratification**



**Figure 2: Appropriate VTE prophylaxis in at risk patients,  $P < 0.0001$  (All Years)**



**Figure 3: Inappropriate VTE prophylaxis in at risk patients**



The nursing team was led by a clinical nurse consultant (CNC) qualified in VTE risk stratification and evidence based VTE prophylaxis. Various educational strategies were implemented including small group sessions, self directed learning packages, module based learning and six monthly workshops. These measures were aimed at upskilling nurses and to encourage them to take ownership of VTE risk assessment. They were supported by the VTE clinical nurse consultant who demonstrated leadership by empowering the nurses to become equal partners with the other team members in the delivery of healthcare (Sorensen et al 2008).

## DISCUSSION

The role and status of nursing has improved dramatically over the last few decades and continually evolves. Many factors have influenced the delivery of high quality healthcare by the nursing profession including health service restructuring, technological advances, increased postgraduate nursing education, a relative shortage of medical practitioners and the increasing recognition of the



expert clinical skills of nurses in providing optimum healthcare (Schober 2007; Gardner and Gardner 2005). Not only is Australia producing highly expert advanced practice nurses and nurse practitioners, the roles of the enrolled and registered nurses working in our public hospital system are also being extended.

Nursing is the largest professional group involved in direct clinical care within the healthcare system. Nurses with expert knowledge and strong leadership skills can have a prominent role in influencing and implementing changes to healthcare practices (Schober 2007). The role of the nurse is extending beyond the traditional boundaries and so a 'patient centred' philosophy should be adopted by all health professionals to improve relationships and reduce the requirement for territorial professional boundaries.

It is anticipated that as other health professions become better educated and more aware of the potential of the nursing role, nurses working beyond the traditional role will become more accepted (Schober 2007). This will be achieved by collaboration with other health professionals and by nurses having the confidence and expert knowledge to contribute effectively to the healthcare team. Collaboration, as stated by Horak et al (2006) is about working effectively together as a team and the cornerstone of this collaborative practice is the patient, their needs and the requirement to achieve optimum outcomes. If there can be increased flexibility between nursing and other health professionals as suggested by Carryer et al (2007) then certain tasks that have traditionally been considered to be non-nursing could quite effectively be undertaken by nurses. An excellent example of this is the nurse's role in risk assessment for VTE (Bonner et al 2008).

Nurses are educated and trained in optimising client healthcare by providing expert nursing, based on an holistic nursing model and a commitment to evidence based practice (Thiel and Ghosh 2008; Gagan and Hewitt-Taylor 2004). It is through the holistic model of care that nurses ensure clients are protected from avoidable adverse events during their stay in healthcare facilities. Such adverse events include

the development of pressure ulceration, healthcare associated infections (chest, urinary tract or wound), falls, medication errors or the development of VTE. Unfortunately, VTE appears to have a considerably lower profile in comparison to the other adverse events but has a higher associated mortality and is the number one target to improve patient safety in hospitals in terms of efficacy and cost effectiveness (Shojania et al 2001).

## CONCLUSION

Nurses can play a major role in VTE prevention if well educated and empowered to change hospital culture as this paper has demonstrated. Their increased level of knowledge undoubtedly leads to an improvement in the delivery of patient care. Appropriately trained nurses are skilled in assessing the risk of VTE in their clients and ensuring prophylactic measures are in place for those clients who are particularly vulnerable to developing VTE. Even in the absence of a medical practitioner, the nurses can initiate appropriate mechanical measures.

It is therefore vital that both hospital and community nurses accept responsibility for ensuring the safety of their clients by routinely assessing for VTE and for checking that the appropriate prophylactic measures have been initiated for all hospitalised patients. Nurses are well positioned to change the culture and improve outcomes for our clients. In doing so, nurses will ensure our health dollar is not wasted and our clients suffering is reduced.

The results in this paper should encourage nurses to work together as key members of the multi-disciplinary team and client advocates in order to reduce the unacceptable incidence of VTE in our community. The nursing profession must adopt a 'can do' attitude and ensure that we actively promote measures to protect the clients who are currently in our care. In doing this, there is no doubt that lives will be saved.

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