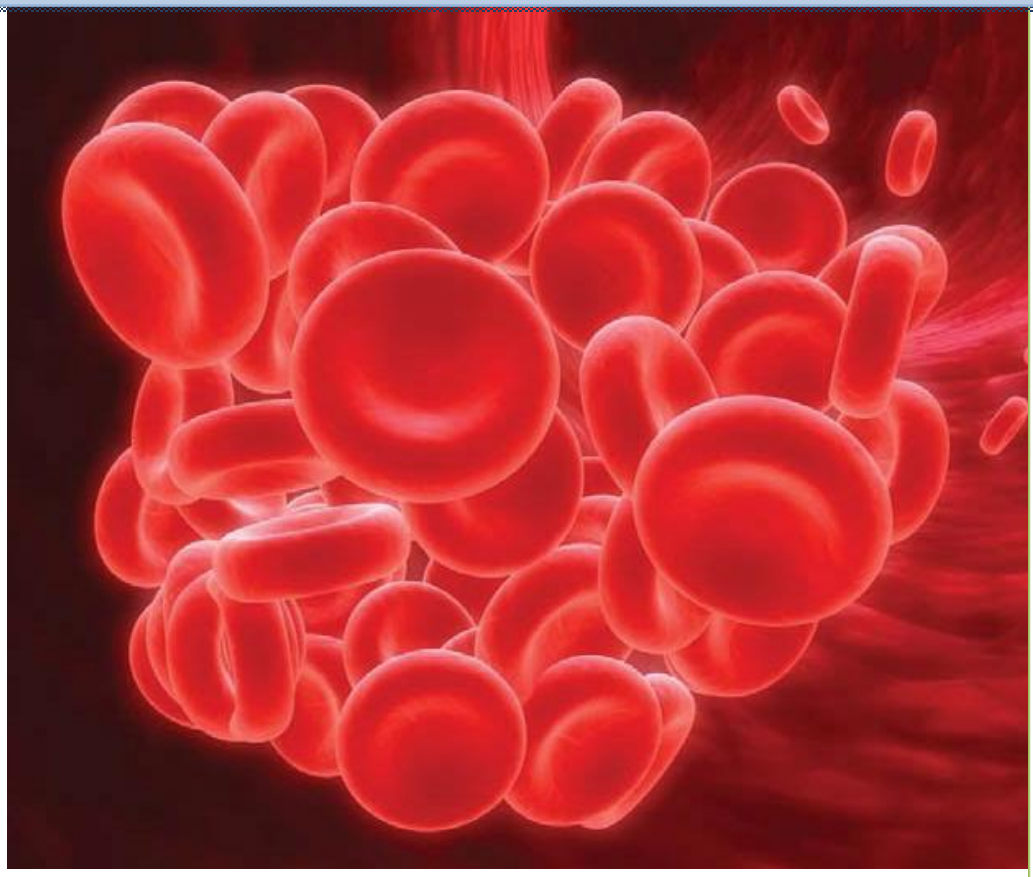
NZ VTEP
NEW ZEALAND VENOUS THROMBOEMBOLISM PREVENTION
Venous Thromboembolism: THE TAMEABLE TIGER

June 2012

# *National Policy Framework:* VTE Prevention in Adult Hospitalised Patients in NZ



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Health and Disability Commissioner
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**Comment from Anthony Hill, Health and Disability Commissioner**

Having reviewed a number of complaints relating to possible deficiencies in thromboprophylaxis management, it seems there are significant differences between the practices of different District Health Boards, and even between wards within a DHB regarding the risk assessment and prevention of VTE. I regard venous thromboembolism prevention as a key patient safety initiative that has a very strong evidence base for being able to prevent harm to patients, as well as save resources. I support the standardisation of 'best practice' so that it becomes standard practice throughout New Zealand. I agree with the four-step plan to integrate VTE prevention quality improvement initiatives by ensuring top-level clinical and executive leadership buy-in, as well as a multi-disciplinary approach. In particular, I look forward to the introduction of standardised formal risk stratification on a routine basis, along with prophylaxis guidelines and education. I commend the work of the VTE Prevention group in its endeavours.

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# PREFACE

## POTENTIALLY PREVENTABLE PROBLEM

Venous thromboembolism (VTE) is the term used for a combination of the formation of a thrombus in a vein or veins of the systemic venous system, (usually in the lower limbs or abdomen/pelvis), and the embolisation of a thrombus to the pulmonary arterial system via the inferior vena cava and right heart chambers. The commonest clinical presentation in the spectrum of VTE is as a deep venous thrombosis (DVT), but it may present as a pulmonary embolism (PE).

The risk of developing VTE increases tenfold in patients admitted to hospital versus non-hospitalised persons, with contributing factors being general ill health, malignancy, reduced mobility and poor fluid intake, as well as surgical procedures, particularly orthopaedic and other high-risk surgeries. [1]

About 10% of all patients experiencing a PE will die as a result of their PE. [2, 3] Morbidity from VTE for survivors and the resulting costs to the health care system can also be substantial. Approximately 30-50% of patients with DVT will develop post-thrombotic syndrome (PTS), characterised by persistent lower limb oedema and pigmentation. [4, 5] Severe PTS with lower limb ulceration occurs in 5-10% of cases, [6] and 2-4% of patients will suffer chronic pulmonary hypertension following a PE. [7]

In Australia, approximately 30,000 people are hospitalised as a result of VTE annually, the majority of which are related to prior hospitalisation for surgery or acute illness, and VTE has been estimated to result in about 2,000 deaths annually. [8, 9]

In the United Kingdom (UK), VTE has been estimated to result in 25,000 deaths annually, a number around 25 times higher than the number of people who die each year from hospital-associated methicillin-resistant staphylococcus aureus (MRSA). [10]

A retrospective study in 2008 at a large NZ hospital showed that 106 patients were harmed by hospital-associated VTE in that year. In the same hospital, data collected prospectively over 12 months during 2010 and 2011 have shown that more than 150 patients per year develop hospital-associated VTE. [11] By extrapolation across the 20 District Health Boards (DHBs) in NZ, this could mean that in excess of 1,500 patients per year develop hospital-associated VTE in NZ. This figure is likely to be a good approximation if one takes into account the following:

The incidence of VTE is about 1 per 1,000 of the population and the risk increases with age. [12-14] This incidence predicts for a NZ VTE event rate of around 4,000 patients per year, which would be consistent with an estimated figure of about 1,200 to 1,500 events per year in the Auckland region, for an indicative one third of the population (Ockelford private communication). About 25-50% of VTE events are hospital-associated [15] This therefore could predict for a hospital-associated VTE event rate of around 2,000 patients per year in NZ, with approximately one third of these episodes being PE.

Assuming that 10% of PE are rapidly fatal, [16] approximately 60 patients (3%) per year will die as a result of hospital-associated VTE. This figure does not include mortality indirectly related to the VTE event, such as that related to bleeding on treatment-dose anticoagulation.

VTE therefore represents a significant cost to the NZ health care system. One of the most significant determinants of cost is the downstream consequences of post-thrombotic syndrome and pulmonary hypertension. NZ data of costs are lacking; in Australia chronic venous insufficiency has been reported to cost the Australian Healthcare System $200m annually, [14] and each case of VTE has been reported as costing in excess of $10,000. [14]

VTE prevention in hospitalised patients is widely recognised internationally as a major ongoing opportunity to improve patient safety, having a strong evidence base for improvements in patient outcomes. [17] In a broad range of patients, effective thromboprophylaxis can reduce the risk of DVT, proximal DVT, and fatal as well as non-fatal PE by more than 60%. [18]

A great deal of progress has been made internationally in making VTE prevention a priority in healthcare. In July 2011, the Global VTE Prevention Forum was established with membership from NZ, Australia, England, Germany, Japan, the United States of America and Canada in order to provide a global platform to share learning and best practice, exchange views and information about effective prevention and management of VTE, and provide leadership to improve patient care and reduce further avoidable deaths through VTE prevention. At the Forum, the International Consensus Statement on VTE Prevention was signed by all the member countries, including NZ, (see Appendix 1).

VTE prevention programmes incorporating multifaceted improvement strategies including audit and feedback, documentation and decision support aids, provider and patient education and policy development have been found to significantly improve the quality of VTE prophylaxis and rates of risk assessment in adult hospitalised patients. [1, 19] All hospitals therefore need to have a robust VTE prevention programme, and in order to be optimally effective, a systems-based approach should be taken to in-hospital VTE prevention, incorporating a whole of hospital approach and active multidisciplinary health care professional involvement.

## PURPOSE OF THIS POLICY FRAMEWORK

This Policy Framework aims to guide DHBs and health providers with planning and progressing improved prevention of hospital-associated VTE in adult hospitalised patients. It has been compiled in consultation with the multidisciplinary membership of the NZ VTE Prevention Steering Group and key opinion leaders drawn from a range of clinical sub-specialities and the Medical Colleges.

This Policy Framework utilises current knowledge about effective ways of implementing VTE prevention activities in hospitals, and includes:

- clinical guidance on appropriate thromboprophylaxis for all adult patients;
- data definitions to enable DHBs / health providers to do pilot evaluations to understand the extent of the problem in their organisations; and,
- resources developed to assist and promote in-hospital VTE prevention.

# PLAN FOR DELIVERY OF A ROBUST IN-HOSPITAL VTE PREVENTION PROGRAMME

**An effective in-hospital VTE prevention programme needs to incorporate a multifaceted range of processes and measures to enable and support VTE prevention, ensure that preventative measures are individualised for each patient, and balance the patient's risk of clotting and bleeding.**

The key elements required for an effective and sustainable in-hospital VTE prevention quality improvement programme are: [20]

- a VTE prevention quality improvement framework for use to plan and guide progress in preventing hospital-associated VTE in adult hospitalised patients;
- an organisation-specific VTE prevention plan detailing clear time-specific goals and measurable outcomes;
- high-level organisational buy-in, support and infrastructure for the VTE prevention initiative;
- focussed multidisciplinary VTE prevention steering / working group/s;
- clear identification of current problem issues with VTE prevention in the organisation, and data quantifying the extent of the problem issues;
- reliable data collection and tracking of both VTE prevention-related key performance indicators and adverse outcome events associated with prophylaxis;
- a standardised VTE risk assessment tool, based on current best evidence and best practice, that is embedded into day-to-day patient care;
- organisational guidance that promotes and supports the VTE risk assessment process and use of appropriate thromboprophylaxis, and the monitoring of the implementation, impact and outcomes of such guidance;
- educational and information resources regarding VTE risk and prevention for all involved health care professionals and for patients.

## STEP 1. OBTAIN ORGANISATIONAL SUPPORT

**In-hospital VTE prevention quality improvement initiatives require top-level clinical and executive leadership buy-in and support in order to be optimally effective.**

As a starting point hospital leadership need to be made fully aware of the following:

- The current status of VTE prevention in the organisation, including the incidence of hospital-associated VTE, patient readmission rates with hospital-associated VTE within 90 days of discharge, patient mortality rates within 30 days of a procedure, and the prevalence of appropriate thromboprophylaxis;
- Bleeding and other prophylaxis-related complications, including readmission rates, return to theatre rates for bleeding, bleeding-related infection rates due to thromboprophylaxis;
- How the VTE-related quality improvement initiative will align with the strategic goals of the organisation, for example, reducing preventable hospital-associated VTE and the associated readmission rates.

**The VTE risk assessment process needs to be routinely embedded as part of the prescribing process.**

Full organisational support is also crucial to support the change management processes associated with improving in-hospital VTE prevention, such as, routine VTE risk assessment. Existing thromboprophylactic strategies, prescribing practices and perceptions of effectiveness of VTE prevention modalities are commonly challenged by such initiatives.

## STEP 2. ESTABLISH A MULTIDISCIPLINARY VTE PREVENTION TEAM

**Multidisciplinary teamwork is essential for optimising VTE prevention activities in hospitals, and consideration of this needs to drive the approach in assembling an effective VTE prevention team.**

The VTE prevention team should include doctor, pharmacist and nurse representation, since these are the frontline health care professionals actively engaged in VTE prevention-related activities on a day-to-day basis. Inclusion of individuals who are actively engaged in quality improvement activities within the organisation is also required. Additional team members should be drawn, as needed, from key individuals who work in those areas in which Plan-Do-Study-Act (PDSA) / learning cycles are occurring, resident medical officer (RMO) representatives, and other individuals in the organisation who are passionate about the need to improve VTE prevention.

The team leader requires expertise and active involvement in anticoagulation and VTE prevention-related activities, and also needs to be capable of engaging effectively with senior clinical and executive leadership within the hospital to influence change.

The extent of involvement of individual team members within the group is best assigned according to professional expertise and time available to commit to VTE prevention-related activities.

Regular team meetings are essential to ensure ongoing progression of the VTE prevention-related activities.

## STEP 3. DETERMINE THE INCIDENCE OF HOSPITAL-ASSOCIATED VTE AND CURRENT STATUS OF VTE PREVENTION ACTIVITIES

**Identification of the current status of VTE prevention and any associated problem issues and barriers is the crucial first step in any VTE prevention-related quality improvement initiative, since this provides the baseline information needed to evaluate and assess interventions and document their effectiveness.**

As a starting point, each DHB / health provider should establish:

- The incidence of hospital-associated VTE in their organisation;
- A clear picture of any historical and/or current VTE prevention-related activities and resources in their organisation;
- The presence of VTE-related problem issues and requirements;
- The nature and frequency of side effects associated with prophylaxis.

Baseline data should therefore be collected to define and confirm the current status of VTE prevention and any problems / barriers; for example, VTE risk assessment not being reliably done to assess patients' clotting and bleeding risk, and guide appropriate thromboprophylaxis. Once any issues have been identified, targeted mitigation strategies can then be formulated.

A very useful methodology for use to initially assess and define, and subsequently address any problems with VTE prevention is the 'Toyota A3 Process', which is designed to facilitate collaborative in-depth problem-solving; (so-termed because it utilises a reporting format on an A3 piece of paper). [21]

The A3 methodology is rooted in the more basic PDSA / learning cycle, and drives problem-solvers to clearly identify and address the root cause/s of the problem/s in a step-wise, structured manner in order to increase the likelihood of success with problem solving.

**The steps involved in the Toyota A3 Process are:** [21]

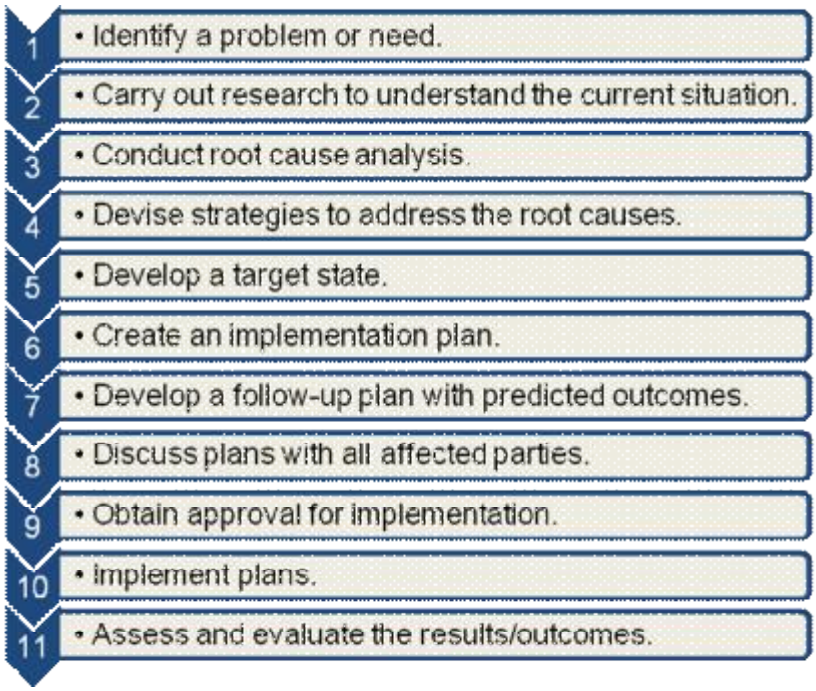


**FIGURE 1. TOYOTA A3 PROCESS**

Steps 1 to 7 are the 'Plan' steps, Step 6 is the planning of the 'Do' step, and Step 11 is the 'Study' step. Based on the evaluation, another problem may be identified and the A3 process starts again ('Act') utilising another A3 sheet of paper for that problem.

This methodology is currently used for the VTE prevention stream at Counties Manukau District Health Board (CMDHB) as part of the 'Zero Patient Harm' initiative, and an example of such an A3 used is shown in Appendix 6.

Document all steps on the A3 report and update regularly as the VTE prevention initiative progresses.

The contents of the A3 report will answer questions relevant to the problem, such as:

- What is it we are trying to do?
- What is the current state?
- What is the root cause?
- What are the potential difficulties that need to be overcome?
- What solutions are there to these difficulties?
- What do we have to do to get these solutions implemented?

- What measures can we put in place to ensure the solutions work?

Once an area of the hospital has completed the PDSA / learning cycles, and fully refined and rolled-out the VTE prevention processes, the VTE prevention team and staff in that area should widely communicate their success story to encourage, promote and support similar achievement in other areas of the organisation.

## STEP 4. DEVELOP A COMPREHENSIVE PLAN FOR VTE PREVENTION USING A WHOLE OF HOSPITAL SYSTEMS-BASED APPROACH

**Each DHB / health provider needs to compile a VTE prevention plan that details their goals, strategic priorities, timelines for achievement, and quality indicators to be utilised to improve the structure, processes, and outcomes of VTE prevention.**

All DHBs / health providers in NZ require sustainable systems in place to support routine VTE risk assessment and appropriate prophylaxis in adult hospitalised patients. This National Policy Framework has therefore been designed to guide and assist VTE prevention teams with formulating their project plans for VTE prevention, (see Appendix 2).

For clinical staff guidance, DHBs / health providers should also implement use of VTE prevention and management guidelines, which are based on best evidence and best practice.

Significant improvements in compliance with guideline recommendations could be achieved by training and supporting multidisciplinary hospital teams to adopt a system based approach to patient VTE risk assessment and management.

A whole-of-hospital approach to VTE prevention should be utilised by DHBs / health providers in order to achieve the following:

- All admitted adult patients systematically assessed for their VTE and bleeding risk, (see Appendix 3 for examples of VTE risk assessment tools / guidance), and the risk status documented in the patients' notes;
- All adult inpatients at risk of VTE managed with appropriate thromboprophylaxis, and all measures documented in the patients' notes;
- Increased multidisciplinary team awareness and knowledge of appropriate VTE prevention measures and strategies;
- VTE prophylaxis guidance adopted and disseminated, and supported by training in its use;
- Increased use of evidence based guidelines and recommendations to support best practice VTE prophylaxis in adult hospitalised patients;

- Improved patient safety and reduced VTE-related morbidity and mortality;

- DHBs / health providers having sustainable systems in place to support routine VTE risk assessment and prophylaxis management in adult hospitalised patients;

- DHBs / health providers having sustainable systems in place to document adverse events associated with the use of prophylaxis and to monitor inappropriate prophylaxis use.

## HEALTH CARE PROFESSIONAL TRAINING AND EDUCATION

**Real sustained improvement in preventing hospital-associated VTE comes from educated health care professionals who understand the rationale, risks and strategies for VTE prevention.**

The ENDORSE (Epidemiologic International Day for the Evaluation of Patients at Risk for Venous Thromboembolism in the Acute Hospital Care Setting) study, in which the hospital charts of patients in 358 hospitals in 32 countries were reviewed to assess the prevalence of VTE risk and determine the proportion of at-risk patients receiving appropriate prophylaxis, reported that a large proportion of at-risk patients did not receive appropriate thromboprophylaxis; (only 59% of surgical patients and 40% of medical patients at risk of VTE were found to have received appropriate preventive treatment). [22]

Similarly, in 2006/2007, parallel audits evaluating the use of thromboprophylaxis at two large NZ hospitals showed that only 25% of eligible patients received thromboprophylaxis, and that although 96% of eligible surgical patients received some form of thromboprophylaxis, 45% of these surgical patients received the incorrect dose of pharmacoprophylaxis. [23]

These findings reinforce the need for hospital-wide VTE prevention strategies to include comprehensive education for all involved health care professionals, to ensure that patient VTE risk is routinely assessed and that eligible patients receive appropriate thromboprophylaxis.

VTE prevention education for health care professionals should be included in undergraduate curricula and in clinical induction programmes for junior staff. Such education packages are best designed in consultation with the target health care professional groups to ensure that the education is ‘fit for purpose’ and well accepted.

VTE prevention education for health care professionals needs to include the following information:

- pathophysiology of VTE;

- organisational VTE prevention guidelines;

- when and how to assess patients' VTE risk using the approved VTE risk assessment tool for the organisation;
- roles and responsibilities for appropriate patient screening and VTE risk assessment, thromboprophylaxis prescribing, monitoring and management, and clinical judgment;
- predictability and preventability of VTE by using thromboprophylaxis in specific patient groups, (such as, general medical patients);
- the risks, benefits and appropriate use and application of mechanical prophylaxis;
- the risks, benefits and appropriate use of pharmacological prophylaxis;
- patient education;
- key performance indicators and auditing thereof;
- root cause analysis of VTE events;
- discharge planning.

Other forums that provide opportunities for communication of key messages about VTE prevention to staff include multidisciplinary ward rounds, ward handover meetings, grand rounds and leadership walk-rounds.

## PATIENT ENGAGEMENT AND EDUCATION

Provision of patient knowledge of VTE prevention can promote patient involvement in safety by encouraging participation in recommended activities, such as, early ambulation and increasing fluid intake. Increased patient knowledge can also promote adherence to pharmacological thromboprophylaxis and allow patients to self-assess and self-report VTE symptoms, thereby enabling timely medical assistance. [24]

All adult patients should therefore receive verbal and written information about VTE prevention on admission and at discharge. Examples of patient information leaflets currently used for this purpose in NZ hospitals are shown in Appendix 4.

In addition, patients assessed as being at high risk of VTE should be provided with specific counselling about the recommendations, including the benefits and risks of thromboprophylaxis, and the signs and symptoms that they should look out for, particular in the post-discharge period.

Particularly in non-acute care situations, prior to or on admission to a health care facility, patients could be engaged in self-assessing their own VTE and bleeding risk, for

example, by completing a self-assessment VTE risk assessment tool. An example of one such tool being piloted in NZ is shown in Appendix 4.

## CLINICAL GUIDANCE

**This National Policy Framework for VTE prevention contains clinical guidance on appropriate VTE prophylaxis for adult hospitalised patients. This clinical guidance is written in general terms, since the development of a comprehensive explicit evidence-based clinical guideline for NZ is out of scope of this initiative.**

**All decisions regarding the use of prophylaxis represent a balance between benefit and risk, especially when using pharmacological prophylactic regimens. The decision to administer thromboprophylaxis should always be based on the individual patient's risk of bleeding and the benefits of prevention or treatment.**

**Comprehensive knowledge of the current best evidence and best practice for VTE prevention is important for VTE prevention team members, both to inform the scope and direction of VTE prevention quality improvement initiatives, and to increase the team's credibility in discussions with clinical staff, hospital leadership and patients.**

**Recommended guidelines for use in NZ are:**

- **National Health and Medical Research Council (NHMRC) VTE Prevention Guideline; [25]**
- **American College of Chest Physicians (ACCP) Antithrombotic Guidelines, 9th edition; [17]**
- **Institute for Health and Clinical Excellence (NICE) Clinical Guideline CG92 2010 CG92 2010; [19]**
- **American College of Physician (ACP) Guidelines; [26]**
- **Reducing the risk of thrombosis and embolism during pregnancy and the puerperium. [27]**

**The NHMRC VTE Prevention Guideline (2009)** provides recommendations on thromboprophylaxis for adult hospitalised patients undergoing all major types of surgery, patients with acute medical illnesses, trauma patients, patients admitted to intensive care units, cancer patients, and patients hospitalised during pregnancy and during the post-partum period. [25]

**The updated ACCP Guidelines (9th edition)** are complex. They emphasise that the decision to administer thromboprophylaxis should always be based on the individual patient's risk of bleeding and the benefits of prevention or treatment, and consequently provides comprehensive risk stratification recommendations for most major clinical areas of care. [17]

**The NICE Clinical Guideline (CG92)** provides guidance about the care and treatment of adult inpatients, aged 18 or over, who are at risk of developing hospital-associated DVT, (including patients admitted for day-case procedures). [28]

**The ACP Clinical Practice Guidelines (2011)** provides clinical recommendations guidance on thromboprophylaxis for hospitalised nonsurgical patients, (medical patients and patients with acute stroke). [26]

## VTE RISK ASSESSMENT TO DETERMINE APPROPRIATE PROPHYLAXIS

**A number of patient-specific factors, such as, acute medical illnesses, surgical procedures and duration and nature of immobilisation are known to predispose patients to increased risk of VTE or bleeding, and should be considered in the decision to prescribe and administer thromboprophylaxis. [17]**

**Many cases of hospital-associated VTE are preventable through effective risk assessment and appropriate thromboprophylaxis to reduce the risk of fatal and non-fatal DVT and PE. [25]**

**Patient-specific factors that increase VTE risk are: [25]**

- older age, particularly over 60 years;
- pregnancy and the puerperium;
- disseminated or locally advanced cancer or active treatment for malignancy;
- previous VTE;
- varicose veins;
- marked obesity;
- prolonged severe immobility;
- use of oestrogen-containing hormone replacement therapy, or oral contraceptives in women;
- inherited or acquired thrombophilia;
- acute or acute-on-chronic chest infection;
- heart failure;
- myocardial infarction,
- stroke with immobility;
- some forms of cancer chemotherapy;
- acute inflammatory bowel disease;
- all surgical procedures, particularly abdominal, pelvic, thoracic or orthopaedic surgical procedures;
- leg injury that requires surgery or prolonged immobilisation.

**The level of VTE risk for the patient is also influenced by the following:**

- type of surgery;
- type of anaesthesia;
- duration of immobility;
- duration of surgery; and
- surgical complications.

For example, major joint surgery and curative surgery for cancer carry a very high risk of VTE.

**Patient-specific factors that increase bleeding risk are:** [25]

- significant renal impairment (reduced creatinine clearance for renally excreted anticoagulants);
- current active major bleeding (i.e. at least 2 units of blood/blood products transfused in 24 hours);
- current chronic, clinically significant and measurable bleeding over 48 hours;
- inherited or acquired bleeding disorders, e.g. haemophilia or other coagulation factor abnormality, coagulopathy or disseminated intravascular coagulation (DIC);
- severe platelet function disorder or thrombocytopenia (pharmacological prophylaxis not recommended with platelet count <50,000/µL);
- recent central nervous system (CNS) bleeding;
- intracranial or spinal lesion;
- recent major surgical procedure of high bleeding risk;
- active peptic ulcer or active ulcerative gastrointestinal disease;
- liver failure or prolonged obstructive jaundice;
- concomitant use of medications that may affect clotting (e.g. anticoagulants, antiplatelet agents, selective/non-selective nonsteroidal anti-inflammatory drugs (NSAIDs);
- neuraxial block or recent lumbar puncture.

## STRUCTURED APPROACH TO VTE PREVENTION

**To ensure that a structured approach to VTE prevention is utilised that considers the cumulative risk from multiple risk factors, VTE risk assessment tools have been designed that stratify individual patient risk to guide appropriate thromboprophylaxis, (see Appendix 3).**

To ensure that a structured, comprehensive approach is taken to VTE prevention for all adult hospitalised patients, the following step-wise approach should be utilised: [29]

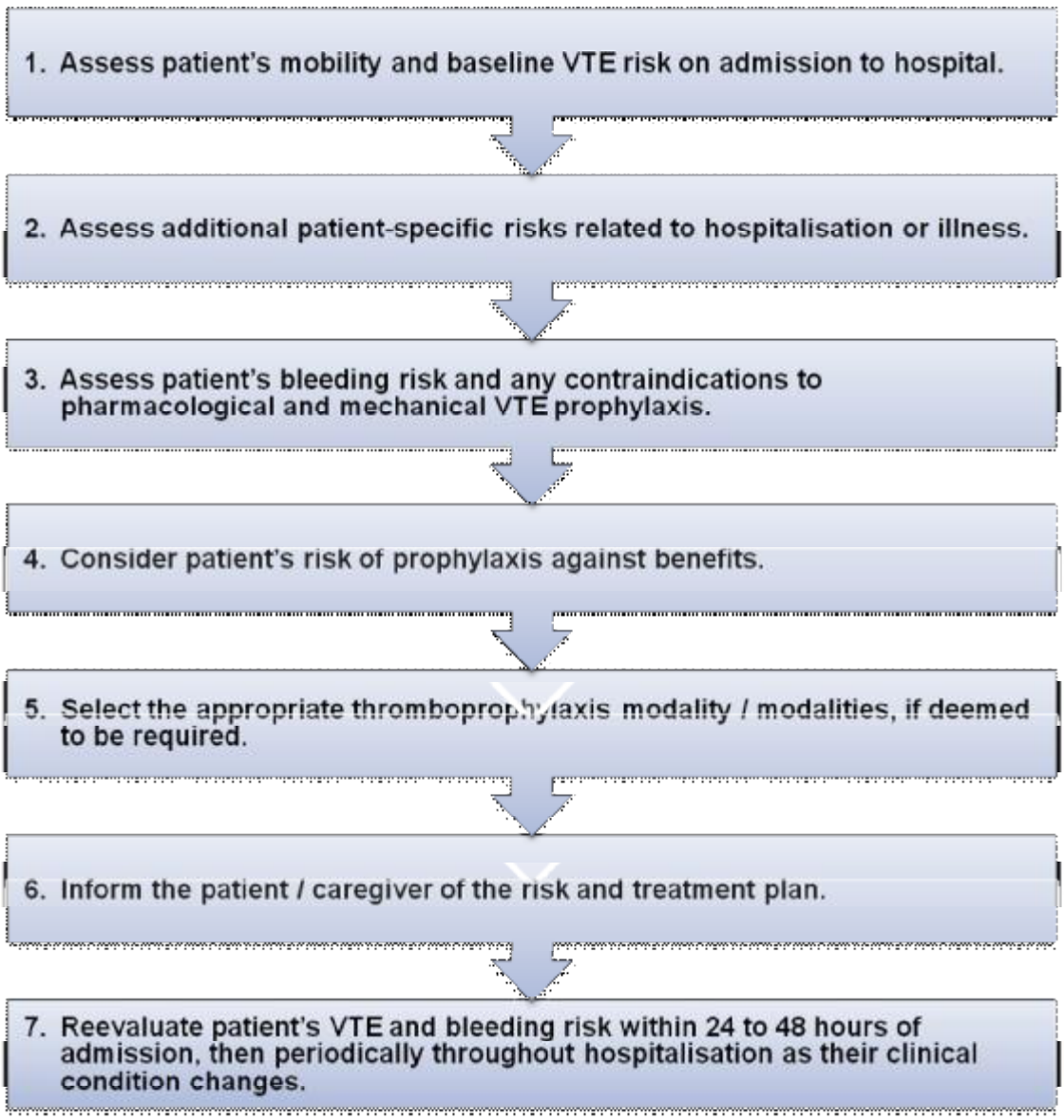


**FIGURE 2. STRUCTURED VTE PREVENTION RISK ASSESSMENT PROCESS**

## PHARMACOLOGICAL VTE PROPHYLAXIS

Explicit evidence based guidelines, such as the NHMRC, ACCP, NICE and ACP Guidelines, local organisational guidelines and clinical judgment are recommended for use to inform decision making regarding the appropriate choice of antithrombotic drug/s for individual patients.

Antithrombotics available for use in NZ are:

- low molecular weight heparins (LMWHs), (e.g. enoxaparin, dalteparin);
- unfractionated heparin (UFH);
- factor Xa inhibitors, (e.g. rivaroxaban);
- warfarin;
- direct thrombin inhibitors, (e.g. dabigatran);
- aspirin.

Pharmacological VTE prophylaxis should be continued until the patient is back to their baseline mobility, and frequently needs to be continued post-discharge from hospital, for example, after hip and knee replacement surgery.

Bleeding is the major potential complication of pharmacological thromboprophylaxis, since it is a side-effect of all antithrombotics, and this risk may be exacerbated by the concomitant use of other drugs that increase bleeding risk, such as, low dose aspirin or clopidogrel. Bleeding as a result of surgery can also complicate pharmacological VTE prophylaxis, the consequences of which can vary with different surgical procedures and different anatomical sites.

Some pharmacological prophylaxis agents, such as enoxaparin and dabigatran, (see Figure 19. CMDHB Dabigatran Patient Information Card), require a reduction in dose or should be avoided in patients with renal impairment, (consult the medicine data sheets for more specific information about each antithrombotic). These factors may alter the benefit-harm assessment.

Local organisational guidance needs to be consulted regarding the timing of commencement of pharmacological thromboprophylaxis in relation to neuraxial anaesthesia.

## MECHANICAL VTE PROPHYLAXIS

Mechanical VTE prophylaxis devices are used to increase venous outflow and reduce venous stasis. These devices can be used alone, particularly in patients who have been assessed as being at risk of VTE and have a high risk of bleeding, [30] for example, with

major trauma. When used alone, mechanical devices are however less effective in preventing VTE in high risk patients than when used in combination with pharmacological VTE prophylaxis.

Factors to consider in the decision to utilise mechanical VTE prophylaxis devices are the patient's clinical condition, the surgical procedure, local guidelines, comorbidities and patient preference.

The currently used mechanical prophylaxis devices are: [25]

- graduated compression stockings (GCS) or antiembolism stockings (thigh or knee length);
- intermittent pneumatic compression (IPC) devices (thigh or knee length);
- venous foot pumps (VFP).

Involved staff members require full training in the correct use of these devices, to ensure optimal outcomes from use.

To be effective, IPC and GCS must be used consistently, which makes patient compliance one of the challenges of mechanical prophylaxis. To promote compliance, patients need to be provided with information to ensure that they understand the reason for use of the device.

## INTERMITTENT PNEUMATIC COMPRESSION (IPC)

IPC devices are available in knee and thigh lengths, and use an air pump to create intermittent pulses of compressed air, inflating and deflating an airtight sleeve, or series of chambers beginning at the ankle and moving up the leg. The resultant 'milking' effect assists venous emptying, thereby mimicking the natural calf muscle contractions that promote venous return in active people.

IPC devices require accurate settings for patient safety and comfort. The use of knee-high devices may be preferable to thigh-high devices, because they are easier to put on, are more comfortable, and do not have the risk of causing popliteal compression.

Use of IPC devices may be contraindicated in patients with peripheral arterial disease or arterial ulcers because the ischemic disease can be exacerbated. [25]

## GRADUATED COMPRESSION STOCKINGS (GCS)

**Despite the common use of GCS in many settings, the net benefits and risks of this intervention remain uncertain.** [31]

GCS are available in knee and thigh lengths, and are used to apply pressure on the leg, with the greatest amount of pressure at the ankle and then gradually decreasing pressure moving up the leg.

GCS require accurate patient measurements to provide proper fit and to be effective. The length of the stocking is however a controversial issue and evidence is lacking, (except in stroke patients), that one length of stocking is more effective than another. Thigh length stockings can be difficult to fit. [28]

Different brands of GCS can vary in the amount of compression that they provide. Therefore, prior to use, extra care should be taken to check that the stocking provides the correct degree of compression.

DVT and PE are common after stroke. A study assessing the effectiveness of thigh-length GCS to reduce DVT after stroke indicated that use of GCS was associated with the development of skin breaks, ulcers, blisters, and skin necrosis. [32] GCS should therefore preferably not be used in patients with stroke and, if they are used, careful attention should be given to the condition of the underlying skin.

The ACP Guideline on VTE prophylaxis in hospitalised non-surgical patients, (medical patients and patients with acute stroke), does not recommend the use of GCS because they have not been shown to be effective in preventing VTE or in reducing mortality, and they are associated with lower-extremity skin breakdown. [26]

In addition, use of GCS is contraindicated in patients with the following conditions: [25]

- severe leg oedema;
- skin graft;
- lower leg dermatitis;
- morbid obesity preventing correct fitting of stockings;
- severe peripheral arterial disease;
- diabetic neuropathy;
- severe lower limb deformity.

## VENOUS FOOT PUMPS (VFP)

VFP stimulate the venous plantar plexus, a large vein located in the foot, which imitates the physiologic pumping action of weight-bearing, thereby increasing blood circulation in the leg.

Use of VFP may be contraindicated in patients with peripheral arterial disease or arterial ulcers because the ischemic disease can be exacerbated. [25]

## SURGICAL PATIENTS

**The possibility of developing VTE during or after a surgical procedure varies with the nature of the procedure, including its duration, and with perioperative care. [17]**

**Surgery, particularly major orthopaedic surgery involving the lower extremity and major surgery for cancer, is a major risk factor for the development of VTE. In addition, a cumulative effect on VTE risk occurs in surgical patients who have additional risk factors for VTE. [17]**

**Assessment of the individual patient's risk of both VTE and bleeding should always be carried out prior to prescribing thromboprophylaxis to determine if thromboprophylaxis is indicated and appropriate.**

Total hip replacement (THR), total knee replacement (TKR) and hip fracture are associated with a high risk of DVT, as a result of the accompanying blood vessel trauma, venous stasis and coagulation activation. This VTE risk increases in patients with additional risk factors, such as, previous VTE, malignancy, hypercoagulability and older age (>60 years).

Before thromboprophylaxis was used routinely in surgical patients, calf DVT, (which is often clinically silent), occurred in 40-80% of patients, PE in 4-10% of patients, and fatal PE in 0.2-5% of patients. Effective thromboprophylaxis prophylaxis has been shown to reduce the risk of DVT by at least 50%. [17]

Studies have indicated that the postoperative period of risk for VTE after THR and TKR extends well beyond the period of initial hospitalisation for surgery. [33-36] These findings have resulted in the recommendations that optimally effective pharmacoprophylaxis should be continued for an extended period of time post-discharge from hospital.

Regional anaesthesia for THR or TKR seems to be associated with a lower risk of VTE than general anaesthesia, without increased bleeding risk. [37]

The 9th ACCP Guideline now includes aspirin 160mg as an acceptable but less effective option for the prevention of VTE in major orthopaedic surgery. [17] (In NZ, 150mg aspirin would need to be used instead of 160mg, since the latter strength is not commercially available).

### TOTAL HIP REPLACEMENT

Use LMWH, rivaroxaban or dabigatran and continue for up to 35 days following THR. [25] Start anticoagulant prophylaxis postoperatively.

Use GCS, IPC or a VFP until the patient is fully mobile, irrespective of whether or not pharmacological prophylaxis is used. Mechanical prophylaxis should begin on admission to hospital. [28]

## HIP FRACTURE SURGERY

Use LMWH for up to 35 days following hip fracture surgery. [25] If 150mg aspirin is prescribed instead of LMWH, ensure that VFP are also used. The time of commencement of prophylaxis depends on the timing of surgery, but if surgery is performed acutely, postoperative start is acceptable.

## TOTAL KNEE REPLACEMENT

Use LMWH, rivaroxaban or dabigatran for up to 14 days following TKR. [25] Start anticoagulant prophylaxis postoperatively. If 150mg aspirin is prescribed instead of LMWH, ensure that VFP are also used.

Use GCS, IPC, or a VFP until the patient is fully mobile, irrespective of whether or not pharmacological prophylaxis is used. Mechanical prophylaxis should begin on admission to hospital. [28]

## LOWER LEG FRACTURES AND INJURIES WITH IMMOBILISATION

Use LMWH for all patients admitted to hospital with a lower leg fracture or injury with immobilisation in a brace or a plaster cast. Consider continuing LMWH for the entire period of immobilisation. [25] Warfarin is an acceptable alternative, particularly for extended use on an outpatient basis. If 150mg aspirin is prescribed instead of LMWH, ensure that VFP are also used.

## GENERAL AND MAJOR GYNAECOLOGICAL SURGERY

Following general or major gynaecological surgery, use LMWH or UFH for up to 9 days or until the patient is fully mobile. [25]

Use GCS for all patients, whether or not pharmacological thromboprophylaxis is used, until the patient is fully mobile. [25]

## TRAUMA AND SPINAL SURGERY

Consider using thromboprophylaxis for all patients admitted to hospital for trauma surgery or spinal surgery. Only start anticoagulant thromboprophylaxis when primary haemostasis has been established. [25]

Where appropriate and not contraindicated, consider the use of VFP from hospital admission and commence LMWH or UFH postoperatively for trauma patients undergoing surgery, as soon as haemostasis has been achieved. [25]

## NEUROSURGERY

Use IPC following neurosurgery, until the patient is fully mobile. [25]

Use pharmacoprophylaxis with extreme caution in patients following neurosurgery because of the potentially devastating consequences of bleeding. Where appropriate and not contraindicated, use LMWH or UFH. [25]

## CANCER PATIENTS UNDERGOING SURGERY (SEE ALSO CANCER PATIENTS)

Patients with cancer are at high risk for VTE. The risk varies by cancer type, patient demographics and history, chemotherapy regimen, and hospitalisation status. [28]

In the absence of contraindications, use thromboprophylaxis for all cancer patients undergoing general surgical procedures, including abdominal or pelvic surgery or neurosurgery. [25]

Use LMWH or UFH and continue for at least 7 to 10 days following major general surgery for cancer. [25]

Consider using extended thromboprophylaxis with LMWH for up to 28 days after major abdominal or pelvic surgery for cancer, particularly in patients who are obese, slow to mobilise or have a past history of VTE. [25]

## POST-CAESAREAN SECTION: SEE MEDICAL PATIENTS - PREGNANCY AND CHILDBIRTH

## MEDICAL PATIENTS

**Although many hospitalised medical and stroke patients have one or more risk factors for VTE, there is less evidence for a positive risk-benefit ratio in these patients than in surgical patients.**

**Pharmacological thromboprophylaxis should therefore not be routinely prescribed for medical and stroke patients without prior evaluation of their VTE and bleeding risk. [26]**

More than 25-50% of all VTE cases are associated with hospitalisation, [15] and up to 50–75% of these cases occur in medical patients. [38] Although most VTE events occur in medically ill hospitalised patients, extended prophylaxis cannot however be recommended in acutely ill hospitalised medical patients. Two large randomised controlled trials (MAGELLAN and ADOPT) examined the role of extended pharmacologic prophylaxis in this patient group, and the results of both of these trials showed that the added bleeding risk outweighed any benefit gained from reduction in major VTE. [39, 40]

In addition, no standard accepted risk-assessment formula currently exists to identify which medical patients are likely to benefit from VTE prophylaxis. A number of risk scoring systems have been described, one of which (the Padua score) has been prospectively evaluated. [41] The clinical judgment of the prescriber is therefore also a key factor in the decision to prescribe thromboprophylaxis. [26]

The role of GCS in medical patients is uncertain. The CLOTS-1 trial showed that thigh length stockings were ineffective compared to no stockings. [32] The CLOTS-2 trial showed that thigh length stockings were more effective than below knee stockings. [42] Current evidence suggests that GCS are, at best, only modestly effective at preventing VTE in patients with stroke and immobility, which raises the question of effectiveness in other groups of medical patients. [31] In addition, they have been shown to cause more instances of lower extremity skin damage. [26]

The ACP recommendations for medical (including stroke) patients are: [26]

1. Assess the risk for thromboembolism and bleeding in medical (including stroke) patients prior to initiation of prophylaxis of VTE.

2. Use heparin or a related drug for pharmacological VTE prophylaxis, unless the assessed risk for bleeding outweighs the likely benefits.

3. Do not use GCS as mechanical prophylaxis for VTE prevention.

## STROKE

Consider the use of LMWH for selected patients admitted to hospital with ischemic stroke, in particular those with lower limb paresis, after assessment of bleeding risk. [25]

Pharmacoprophylaxis is not recommended for haemorrhagic stroke patients due to the risk of intracranial bleeding. [25]

GCS are not recommended for VTE prophylaxis in patients who are admitted to hospital with stroke, since their use is associated with skin breakdown in 5% of patients. [32, 42] The potential role of IPC in this setting is unknown.

## GENERAL MEDICAL

VTE prophylaxis for medical patients should be based on the individual patient's assessed level of risk of clotting and bleeding.

Mechanical prophylaxis has been reported to provide no benefit and resulted in clinically important harm to patients with stroke. [43]

## CANCER PATIENTS (SEE ALSO: CANCER PATIENTS UNDERGOING SURGERY)

Patients with cancer are at high risk for VTE. The risk varies by cancer type, patient demographics and history, chemotherapy regimen, and hospitalisation status. [44]

The largest study to date of thromboprophylaxis in cancer patients on chemotherapy shows that the use of a heparin product significantly reduces the risk for thromboembolic events, with no apparent increase in bleeding. [25] Pharmacological or mechanical VTE prophylaxis should not however be routinely offered to ambulant cancer patients receiving chemotherapy, unless deemed clinically indicated and appropriate as per the VTE risk assessment process. [28]

## PREGNANCY AND CHILDBIRTH

Pregnancy and the postpartum period are associated with an increased risk of VTE. Although one half to two-thirds of VTE occur antepartum, the daily risk of VTE is highest in the postpartum period. UK data show that risk factors for VTE were present in up to 75% of women who died from PE, [45] and guidelines recommend that all women should have a VTE risk assessment carried out at the time of booking and a plan regarding thromboprophylaxis discussed and implemented. [46] Risk factors should be reviewed if women are admitted to hospital during pregnancy and in the postpartum. A personal history of VTE confers the highest risk of recurrent VTE during pregnancy. Other risk factors such as increased BMI, immobility, and family history are independent of pregnancy, but others such as preeclampsia, postpartum haemorrhage, and caesarean section (CS) are specific to pregnancy.

Australian and NZ consensus recommendations [27] endorsed by the Australasian Society of Thrombosis and Haemostasis and the Society of Obstetric Medicine of Australia and NZ have recently been published, but the authors stress that they developed pragmatic recommendations supported by low-level evidence given the paucity of data from clinical trials in this area.

The recommendations note the increased risk of VTE in women who deliver by CS and recommend thromboprophylaxis with LMWH for all women who deliver by emergency CS. Women who deliver by elective CS should only receive chemical thromboprophylaxis in the presence of other risk factors. [27]

Alternatives to pharmacological thromboprophylaxis, in women at increased risk of VTE where it is contraindicated, include IPC during the caesarean section and postpartum for up to 24 hours, or GCS. [25]

## PATIENTS CURRENTLY ON ANTIPLATELET / ANTICOAGULANT THERAPY

In patients already on antiplatelet therapy to treat other conditions, consider using additional mechanical or pharmacological VTE prophylaxis if the patient is assessed as being at high risk of VTE. [25] Also consider the patient's bleeding risk and comorbidities in the decision to use additional VTE prophylaxis. [25]

If the risk of VTE outweighs the risk of bleeding, consider using pharmacological VTE prophylaxis according to the reason for admission. [25]

Do not use additional pharmacological or mechanical VTE prophylaxis for patients who are taking warfarin and who are within their target therapeutic range, or for patients who are having full anticoagulant therapy, such as, LMWH or UFH.

In patients undergoing surgery who are already on warfarin, temporarily stop warfarin beginning about 5 days before surgery and consider bridging anticoagulation with LMWH or UFH, with consideration of the patient's risk for thromboembolism, and after discussion with the relevant specialities. Restart warfarin approximately 12-24 hours post-surgery, provided adequate haemostasis has been achieved and there is no evidence of ongoing bleeding. [47]

# METRICS:

## DATA DEFINITIONS AND MEASUREMENT SPECIFICATIONS

**Key metrics are used to assess and understand the scope of hospital-associated VTE and assess and track performance with VTE prevention quality improvement.**

**All of these key metrics apply to adult patients aged ≥ 18 years with a length of hospital stay (LOS) of ≥ 24 hours.**

Three types of measures are included in this National Policy Framework:

**Process measures**: To determine whether the processes which directly affect the outcome are being implemented to impact the outcome measure. (For example, the delivery of timely prophylactic antibiotics to reduce surgical site infection).

**Outcome measures**: To determine whether the team is achieving what it is trying to accomplish and articulates the picture of success. (For example, if the team wants to reduce falls it should measure the number of falls).

**Balancing measures:** To determine whether improvements in one part of the system have been made at the expense of other processes in other parts of the system. (For example, in a project to reduce the average length of stay for a group of patients, the team should also monitor the percentage of readmissions within 30 days for the same group).

### PROCESS MEASURES

#### MEASUREMENT 1. RATE OF VTE RISK ASSESSMENT WITHIN 24 HOURS OF ADMISSION

**Improvement is noted as increase in the rate. The target rate and time frame can be set by the organisation, for example, 90% of all admitted adult patients, with a LOS of ≥ 24 hours, are required to be VTE risk assessed within 24 hours of admission, by the end of the current year.**

**Aim:** Increase the percentage of adult hospitalised patients (≥ 18 years) with a LOS of ≥ 24 hours who have a VTE risk assessment within 24 hours of hospitalisation to at least 90%.

**Measure:** The percentage of adult hospitalised patients (≥ 18 years) with a LOS of ≥ 24 hours who have a VTE risk assessment within 24 hours of admission.

**Population definition:** Adult patients (≥ 18 years) admitted to the hospital for ≥ 24 hours for a medical or surgical condition.

**Data of interest:**

- Number of adult patients (LOS of ≥ 24 hours) who are assessed for VTE risk within 24 hours of admission.
- Number of adult patients who are hospitalised for ≥ 24 hours for a medical or surgical condition.

**Numerator/denominator definitions:**

- **Numerator:** Number of adult patients hospitalised for ≥ 24 hours for a medical or surgical condition who are assessed for VTE risk within 24 hours of admission to the hospital.
- **Denominator:** Number of adult patients who are hospitalised for ≥ 24 hours for a medical or surgical condition.

**Method/source of data collection:**

The best method of data collection is from prospective review of clinical notes and medication charts, since this provides the opportunity for real-time improvement of VTE prevention for patients during hospitalisation, and for educating and prompting health care professionals regarding VTE risk and appropriate thromboprophylaxis.

An alternative, but less ideal method is to carry out retrospective reviews of the clinical notes of all adult patients hospitalised during a specific target period, for example, the previous month, to determine the appropriateness of VTE prophylaxis. This method does not however provide opportunity for real-time improvement of VTE prevention.

## MEASUREMENT 2. PREVALENCE OF APPROPRIATE VTE PROPHYLAXIS

**This is a sensitive indicator of how well the various care delivery steps come together, including the VTE risk assessment process to determine and drive appropriate VTE prophylaxis. Improvement is noted as an increase in the prevalence.**

**There are two methods of VTE prophylaxis, pharmacological and mechanical, and several types of prophylaxis within each method. The numerator will not only need to capture which type of prophylaxis was received by the patient, but also if there was documentation of a reason for the patient not receiving one or both types of prophylaxis.**

**Aim:** Increase the percentage of at-risk adult hospitalised patients with a LOS ≥ 24 hours receiving appropriate VTE prophylaxis within 24 hours of admission, (or other time period set by the VTE prevention team).

**Measure:** Percentage of adult hospitalised patients with a LOS ≥ 24 hours for whom VTE prevention is indicated who receive appropriate thromboprophylaxis.

**Data of interest:**

- Number of patients with a LOS ≥ 24 hours who receive appropriate thromboprophylaxis as per organisational guidelines during hospitalisation.
- Number of adult hospitalised patients with a LOS ≥ 24 hours who are candidates for VTE prophylaxis.

**Numerator/denominator definitions:**

- **Numerator:** Number of patients with a LOS ≥ 24 hours who are appropriate candidates for VTE prophylaxis receiving VTE prophylaxis as per organisational guidelines
- **Denominator:** Total number of adult hospitalised patients with a LOS ≥ 24 hours who are appropriate candidates for VTE prophylaxis

**Method/source of data collection:**

The best method of data collection is from prospective review of clinical notes and medication charts, since this provides the opportunity for real-time improvement of VTE prevention for patients during hospitalisation, and for educating and prompting health care professionals regarding VTE risk and appropriate thromboprophylaxis.

An alternative, but less ideal method is to carry out retrospective reviews of the clinical notes of all adult patients hospitalised during a specific target period, for example, the previous month, to determine the appropriateness of VTE prophylaxis. This method does not however provide opportunity for real-time improvement of VTE prevention.

## OUTCOME MEASURE

### MEASUREMENT 3. INCIDENCE OF HOSPITAL-ASSOCIATED VTE DURING HOSPITALISATION, OR WITHIN 90 DAYS OF DISCHARGE

**This measure evaluates the proportion of adult patients who develop VTE during the course of hospitalisation, or within 90 days of discharge (hospital-associated VTE).**

**This measure also indicates how well the care delivery steps come together to prevent hospital-associated VTE, which is the main desired outcome of a robust in-hospital VTE prevention programme.**

**DVT of the lower extremity is subdivided into either calf vein or proximal vein (popliteal, femoral, or iliac vein) thrombosis. Proximal vein thrombosis is of greater importance clinically, since it is more commonly associated with serious disease. More than 90% of cases of acute PE are caused by emboli emanating from the proximal veins of the lower extremities.** [48]

**Aim:** Reduce the incidence of hospital-associated VTE.

**Measure:** Number of hospitalised adult patients with a LOS ≥ 24 hours who develop a VTE event, (specifically, proximal lower extremity DVT / PE), during hospitalisation, or within 90 days of discharge.

**Data of Interest:**

- No. of adult patients with a LOS ≥ 24 hours who develop hospital-associated VTE, (specifically, proximal lower extremity DVT / PE).

**Numerator/denominator definitions:**

- **Numerator:** Number of adult patients who develop confirmed proximal lower extremity DVT / PE during hospitalisation, or who are readmitted within 90 days of discharge with proximal lower extremity DVT / PE.

- **Denominator:** Total number of patient-days (for the month being audited) for adult hospitalised patients with a hospital stay of > 24 hours

**Method/source of data collection:**

The best method of data collection is to set up a reporting system with the radiology department and the anticoagulation service to prospectively identify cases of DVT and PE as they are diagnosed.

Clinical coding data can also be used to assist in the identification of readmissions with hospital-associated VTE. However, while the ICD 10 coding system plays an important

role in hospital administrative data, the system does not facilitate easy identification of VTE. Coding accuracy is also critical to allow proper identification of VTE.

**Frequency of data evaluation:**

Monthly

## BALANCING MEASURE

### MEASUREMENT 4. INCIDENCE OF BLEEDING DURING HOSPITALISATION FROM PHARMACOLOGICAL VTE PROPHYLAXIS

**A very important consideration after major system changes is the identification of unintended consequences. Balancing measures answer the question whether improvements in one part of the system were made at the expense of other processes in other parts of the system.**

**Bleeding is the most serious and common complication of pharmacological thromboprophylaxis. For each patient, the potential benefit from VTE prevention needs to be balanced against the potential harm from induced haemorrhagic side effects.**

**Risk factors for bleeding, (such as, active peptic ulcer disease, liver disease, thrombocytopenia, post-surgical haemostasis, neuraxial anaesthesia), must be thoroughly assessed before any decision to prescribe pharmacological thromboprophylaxis. Daily clinical assessments of bleeding and monitoring of haemoglobin help to identify any source of bleeding early.**

**The risk of anticoagulant bleeding varies according to type of anticoagulant, (mode of administration, half-life, and reversibility), and patient risk factors, (medical/surgical, coagulopathy). Prophylactic doses usually cause less bleeding than therapeutic doses. The definition of major and minor bleeding is not however standard across studies and the reported incidence of bleeding from pharmacological prophylaxis varies, (see definition of major bleeding complications in Glossary).**

**Managing anticoagulation-associated bleeding depends on the location and severity of bleeding. It usually necessitates promptly removing the anticoagulant, giving an antidote if available, and giving support treatment using transfusions.**

**Monitoring and formal auditing of anticoagulation-related adverse events, particularly bleeding episodes, should be routinely performed.**

**Aim:** Reduce the risk of anticoagulation-related bleeding in adult hospitalised patients receiving pharmacological VTE prophylaxis.

**Measure:** Percentage of adult hospitalised patients who receive pharmacological VTE prophylaxis who experience an anticoagulation-related bleeding event.

**Data of interest:**

- Number of adult hospitalised patients receiving pharmacological VTE prophylaxis who experience an anticoagulation-related bleeding event, (see Glossary for definitions of major and minor bleeding).

**Numerator/denominator definitions:**

- **Numerator:** Number of adult hospitalised patients who experience a bleeding event related to pharmacological VTE prophylaxis.
- **Denominator:** Total number of adult hospitalised patients receiving pharmacological VTE prophylaxis.

**Method/source of data collection:**

- The best method of data collection is to prospectively monitor all anticoagulation-related bleeding events.

**Frequency of data evaluation:**

- Monthly

## DATA COLLECTION

The purpose of collecting data for VTE prevention-related quality improvement is to regularly monitor performance and progress PDSA / learning cycles, and also to identify any unintended consequences. Examples of audit tools currently used for this purpose in NZ hospitals are shown in Appendix 5.

Monthly collection of data from 20 randomly selected patient records from each area of care in the hospital can provide sufficient information to compile a monthly report for the organisation.

To ensure that data collection is routinely and consistently carried out, the VTE prevention team should ideally designate this responsibility to a specified individual.

The VTE prevention metrics and the tools utilised for data collection should first be piloted and refined using short iterative PDSA / learning cycles, to ensure that the collected data are useful to inform the quality improvement processes.

Independent reviewers can be utilised to assist with developing and refining audit tools to help ensure that collected data is both useful and of high quality. For example, questions that such reviewers might be asked to consider as regards the usefulness of a data collection tool to evaluate the appropriateness of thromboprophylaxis for adult hospitalised patients are: [20]

- Did the reviewers arrive at the same VTE risk level?
- Did they agree on the absence or presence of contraindications to thromboprophylaxis?
- Did they share the same conclusion about whether the patient was receiving adequate VTE prophylaxis?

Data can be collected prospectively from current inpatients' clinical records, or retrospectively from clinical records of discharged patients. An advantage of prospectively collected data is that this enables staff to be alerted if systems or care deficits are identified, thereby providing opportunities for immediate improvement of patient safety and quality of VTE prevention.

Sequential piloting of the data collection tool can also be used to help refine the fields / criteria included in the tool, such as, the specific patient groups who should or should not be included in the sampling, and the methodology to be used for performance tracking; for example, collecting data at baseline before introducing the intervention, and then again after introducing the intervention. Collection of at least 20 data points before the intervention and then as many as required after introduction of the intervention enables results to be tracked and trended using run charts.

Sampling strategies that are commonly used are convenience sampling, where patients are selected solely because they are available, for example, on a ward, and random sampling, where patients who are representative of a specific population or care area are randomly selected using a selection tool such as a random number generator.

## SYSTEMATIC INVESTIGATION OF VTE EVENTS

Root cause analysis is one example of a process used to systematically investigate cases of hospital-associated VTE, (clots that develop during hospitalisation or within 90 days post-discharge), (see Figure 3). All DHBs / health providers should communicate the findings of any systematic investigation to all stakeholders, and also use the findings to inform their VTE prevention quality improvement initiative.

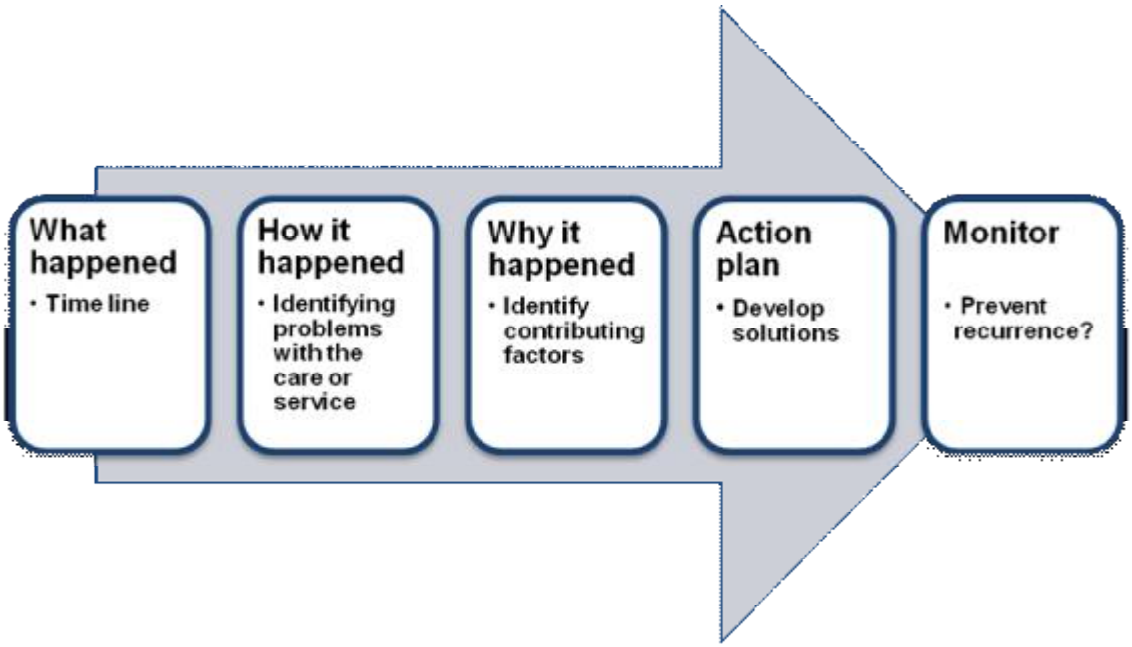


**FIGURE 3. ROOT CAUSE ANALYSIS PROCESS**

# ABBREVIATIONS

ACCP: American College of Chest Physicians

ACP: American College of Physicians

CS: Caesarian section

DHB: District Health Board

IPC: Intermittent pneumatic compression

GCS: Graduated compression stockings

LMWH: Low molecular weight heparin

NHMRC: National Health and Medical Research Council

NICE: National Institute for Health and Clinical Excellence

NZ: New Zealand

PDSA: Plan-Do-Study-Act

PTS: Post-thrombotic syndrome

RMO: Resident medical officer

THR: Total hip replacement

TKR: Total knee replacement

UFH: Unfractionated heparin

UK: United Kingdom

VFP: Venous foot pumps

VTE: Venous thromboembolism

# GLOSSARY

**Appropriate management of VTE prevention:**

- *Appropriate non-receipt of any form of prophylaxis when the patient has no VTE risk factors;*
- *Appropriate receipt of pharmacological prophylaxis when VTE risk factors are present and the patient has no contraindications for pharmacological prophylaxis;*
- *Appropriate receipt of mechanical prophylaxis, when VTE risk factors are present and the patient has contraindications for pharmacological prophylaxis.*

**Hospital-associated VTE:**

- *Is that which is not clinically evident or suspected at the time of admission, but is diagnosed during or up to 90 days after hospital admission.*

**Major bleeding:** [49]

- *Fatal bleeding, and/or*
- *Symptomatic bleeding in a critical area or organ, such as, intracranial, intraspinal, intraocular, retroperitoneal, intraarticular or pericardial, or intramuscular with compartment syndrome, and/or*
- *Bleeding causing a fall in haemoglobin level of 20 g $L^{-1}$ (1.24 mmol $L^{-1}$) or more, or leading to transfusion of two or more units of whole blood or red cells, and/or*
- *Surgical site bleeding that requires a second intervention - open, arthroscopic, endovascular - or a haemarthrosis of sufficient size as to interfere with rehabilitation by delaying mobilisation or delayed wound healing, resulting in prolonged hospitalisation or a deep wound infection, and/or*
- *Surgical site bleeding that is unexpected and prolonged and/or sufficiently large to cause haemodynamic instability, as assessed by the surgeon. There should be an associate fall in haemoglobin level of at least 20 g $L^{-1}$ (1.24 mmol $L^{-1}$), or transfusion, indicated by the bleeding, of at least two units of whole blood or red cells, with temporal association within 24 hours to the bleeding.*

**Minor bleeding:**

- *Bleeding that is not actionable and does not cause increased length of hospitalisation. Examples include, but are not limited to, bruising, haematoma, nosebleeds, or haemorrhoidal bleeding. Minor bleeding may include episodes that lead to discontinuation of anticoagulation.*

**Proximal lower extremity DVT:**

- *DVT in the legs that occur at or above the popliteal vein, which is located behind the knee.*

**VTE:**

- *The presence of DVT or PE objectively confirmed by at least one of compression ultrasonography, venography, ventilation-perfusion lung scanning, CT pulmonary angiography, or a conventional pulmonary arteriogram.*

# APPENDICES

## APPENDIX 1. GLOBAL VTE PREVENTION FORUM


**INTERNATIONAL CONSENSUS STATEMENT ON VTE PREVENTION**

**Venous Thromboembolism (VTE) is a significant international patient safety issue as the number one cause of preventable hospital mortality. VTE is the immediate cause of death in 10% of all patients who either die in hospital or within three months after admission. Proven, effective measures are available to prevent and treat DVT and PE in high-risk individuals. Yet today the majority of individuals who could benefit from such proven services do not receive them. To reduce harm associated with VTE we endorse the application of a system-wide approach to VTE prevention on a global scale, that seeks to:**

- **Raise levels of public awareness and information around the risks of VTE;**
- **Improve professional education about VTE prevention;**
- **Develop a systematic approach to VTE prevention for hospitalised patients;**
- **Ensure that every hospital develop a formal strategy, in the form of a written institution-wide VTE prevention policy**
- **Develop a system for monitoring compliance with VTE best practice;**
- **Improve VTE metrics in national and international data collections; and**
- **Make VTE prevention a priority for health policy makers.**

VTE not only kills, but can also have devastating co-morbidities which significantly impact on the quality of life for those patients who survive a blood clot. Safe and effective methods of VTE prevention have been known for many years, but despite this, implementation of VTE prevention best practice still remains largely unaddressed in many hospitals worldwide.

The only way to truly address this public health challenge is for national health systems to prioritise the development of systematic and integrated approaches to VTE prevention that can be implemented in primary, secondary and tertiary settings.

In recent years, it has become apparent in some countries that reducing avoidable death and chronic ill health from hospital acquired VTE is both achievable and desirable in addressing the human and financial costs of VTE. Estimates of the overall annual costs of VTE and its complications, namely chronic venous insufficiency (CVI), vary from US$720 million-1 billion in Western European countries[i], to US$3 billion in the USA[ii].

**With VTE now becoming a priority patient safety issue for a number of healthcare systems around the world, clinicians from across the world have demonstrated their support for the development of a global initiative to share VTE prevention best practice, modelled on the tried and tested approaches taken by international VTE exemplars.**

The Global VTE Prevention Forum has been established as a unique platform for policy decision makers, clinicians and multidisciplinary teams to share learning, best practice and exchange views and information. Its main aim is to improve patient care through more effective treatment and prevention of VTE. The forum agrees that VTE should now be seen as a priority for national health systems as a means of reducing further avoidable death in hospital patients around the world.

Clinical or policy representatives from any country with an established VTE prevention programme, or those with a desire to learn from existing best practice, are encouraged to join the Global VTE Prevention

Forum, which held its inaugural meeting during the XXIII Congress of the International Society on Thrombosis and Haemostasis (ISTH) in Kyoto, Japan on 24 July 2011.

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Dr. Fumimaro Takaku, Chairman, National Patient Safety Campaign "PARTNERS" President, The Japanese Association of Medical Sciences and President, Japanese Society for Quality and Safety in Health Care

**Vice Chairman:**

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Dr James Douketis MD, Professor of Medicine, McMaster University & Director of Vascular Medicine, St. Joseph's Healthcare, Hamilton, (Canada )

Professor Greg Maynard MD, MSc, SFHM, Clinical Professor of Medicine; Director, Center for Innovation and Improvement Science, University of California, San Diego, (USA)

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Samuel Z. Goldhaber, MD, North American Thrombosis Forum (USA)

Professor Beverley Hunt, Medical Director, Lifeblood; the Thrombosis Charity (England)

Ms Yoshiko Kinoshita, RN, PhD, Institution of Nursing care, NTT Medical Centre Tokyo (Japan)

Dr Takao Kobayashi, Director, Hamamatsu Medical Centre (Japan)

Dr Shunzo Koizumi, Professor Emeritus Saga University and Director, Shichijo Clinic (Japan)

Dr Masayuki Kuroiwa, Instructor, Department of Anesthesiology, Faculty of Medicine, Kitazato University (Japan)

Dr Mashio Nakamura, Associate Professor, Department of Cardiology and Nephrology, Mie University Graduate School of Medicine (Japan)

Dr Takeshi Nakano, Chairman of Japanese Society of Pulmonary Embolism Research; Professor Emeritus at Mie University (Japan)

Dr Masatoshi Watanabe, Team Leader, Patient Safety Promoting Unit, Health Policy Bureau, Ministry of Health, Labour and Welfare (Japan)

Dr Masato Sakon, Director, Nishinomiya Municipal Central Hospital (Japan)

Professor Sebastian Schellong, Professor of Angiology, Director of the Centre of Vascular Diseases, University of Dresden, (Germany)

Dr Norimasa Seo (Japan), Chief, VTE Prevention Team, National Patient Safety Campaign; and Clinical Professor, Faculty of Medicine, Kagawa University

Dr Vinod Singh, Honorary Clinical Senior Lecturer in Medicine & Consultant physician in acute stroke and acute internal medicine, North Shore Hospital, Auckland (New Zealand)

Luke Slawomirski, Australian Commission on Safety & Quality in Healthcare (Australia)

Dr Naruo Uehara, (Japan), Director, National Patient Safety Campaign & Professor, Quality and Health Systems, Tohoku University School of Medicine

Dr Norikazu Yamada, Associate Professor, Department of Cardiology and Nephrology, Mie University Graduate School of Medicine (Japan)

Dr Chikao Yasuda, Assistant Professor, Department of Surgery, Kinki University School of Medicine & Division of Patient Safety, Kinki University Hospital (Japan)

**Faculty Secretariat:**

James Tyrrell (UK), Poonam Arora (UK), Tim Brown (UK)

**Support**

The Global VTE Prevention Forum is a result of a joint patient safety initiative between the National VTE Prevention Programme in England and the National Patient Safety Campaign in Japan, which together form the joint secretariat of the Global VTE Prevention Forum. We are grateful to Boehringer Ingelheim Ltd and Bayer Plc for their educational grants which helped facilitate the first meeting of the Global VTE Prevention Forum.

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**References**

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**FIGURE 4. INTERNATIONAL CONSENSUS STATEMENT ON VTE**

## APPENDIX 2. VTE PREVENTION PROJECT PLAN TEMPLATE [30] AND DRIVER DIAGRAM

| PROJECT BACKGROUND | |
|---|---|
| **Project Title**: | [name of ] Hospital Venous Thromboembolism (VTE) Prevention Project |
| **Project Aim:** | To improve the VTE risk assessment of all inpatients at risk of VTE and improve the use of appropriate VTE prophylaxis in patients at risk. |
| **Project Background:** | The prevention of VTE in acute care hospitals has been recognised nationally and internationally as a priority patient safety issue because of the strong evidence base for preventive measures and high potential for improvements in patient outcomes.<br>In Australia each year over 30,000 people are hospitalised with primary or secondary blood clots in their legs or lungs referred to as VTE. Most of the VTE cases that are treated in hospital settings are related to prior hospitalisation for either surgery or acute illness. VTE results in an estimated 5,000 deaths annually and many survivors develop long term and costly complications.<br>It is essential that a VTE risk assessment be performed on each patient admitted to [name of hospital] before deciding whether or not to use preventive measures and on the most appropriate measures to use.<br>Preventive measures such as anti-clotting medication, intermittent pneumatic compression, anti-embolic stockings and early mobilisation are known to be effective in reducing the incidence of VTE, but are used inconsistently. |
| **Project Benefits:**<br><br>**(global)** | This project will result in:<br>▪ Improvements in systematic assessment & documentation of VTE risk in inpatients<br>▪ Improvements in use & documentation of appropriate prophylaxis in patients at risk of VTE<br>▪ Increased awareness of VTE prevention measures and strategies across disciplines<br>▪ A VTE prophylaxis policy adopted and disseminated, supported by training in its use<br>▪ Increased use of evidence based guidelines & recommendations to support best practice VTE prophylaxis in hospitalised patients |

| | |
|---|---|
| | ▪ Improved patient safety and reduced VTE related morbidity |
| **Project Objectives:**<br><br>**(local and measurable)** | 1. Introduction of a new hospital VTE prophylaxis policy<br>2. All inpatients are systematically assessed for VTE risk & the result is documented in the patient notes<br>3. All inpatients at risk of VTE receive appropriate VTE prophylaxis and VTE prophylaxis measures are documented in the patient notes<br>4. The hospital has sustainable systems in place to support routine VTE risk assessment and VTE prophylaxis management inpatients. |

| **SCOPE OF THE PROJECT IN YOUR HEALTH SERVICE** *Insert organisation name below* | | |
|---|---|---|
| **Organisational Context** | *Why is the project important for your health service? E.g. To reduce the morbidity and mortality associated with VTE* | |
| **This project will include:** | | **This project will not include:** |
| *What's in, e.g. which wards or clinical units will you include* | | *What's out, e.g. which wards/units are not included in this project.* |
| **Project Deliverables:** | *What will you be delivering at the end of the project? NOTE: these are the products you will have at the end of the project, e.g. a policy, orientation program, risk assessment & management pathway, improved awareness levels etc.* | |

| | |
|---|---|
| **Success Criteria:** | *How you will measure the success of the project? NOTE: the success criteria must be specific and measurable.* |
| **Resources:** | *What are the resources required to undertake the project, important to be fair and reasonable, consider: people, space to meet and access to a computer & internet, etc.* |
| **Linkages:** | *Are there opportunities for this program to gain leverage or support from other groups? For example: medication safety groups, quality improvement processes or programs, risk management programs.* |

| | |
|---|---|
| **Project Assumptions:** | Project assumptions are circumstances and events that need to occur for the project to be successful but are outside the total control of the project team. They are listed as assumptions if there is a HIGH probability that they will in fact happen. |
| **Constraints:** | *Project Constraints are aspects about the project that cannot be changed and are limiting in nature. Constraints generally surround four major areas: Scope, Cost, Schedule (Time), and Quality.*<br><br>*Factors that are pre-determined that affect the project: imposed dates, dependences on other committees.*<br><br>*Examples here can be specific. NOTE: only include time and* |

| | |
|---|---|
| | *money if you can quantify them.*<br><br>*Scope: If project scope is expanded, it is expected that the project schedule must also expand to accommodate the increased workload.*<br><br>*Resources: If the project is constrained by access to resources, including skills, people and infrastructure or equipment* |

| **COMMUNICATION PLAN** | *Who is important to make this project successful?* | | |
|---|---|---|---|
| **Stakeholders** | **Who** | **What are their information needs?** | **How & When are you going to let them know?** |
| | | | |
| | | | |
| | | | |
| | | | |

| PROJECT TEAM ROLES | | | |
|---|---|---|---|
| **Executive Sponsor:** | *Who fulfils this role and what do they do?*<br><br>*Role of the Executive Sponsor* | | |
| **Clinical Leaders:** | *Who fulfils this role and what do they do?*<br><br>*Role of the Clinical Leader* | | |
| **Project Team Coordinator:** | *Who fulfils this role and what do they do?*<br><br>*Role of the Project Coordinator* | | |
| **Project Team Members:** | *Who fulfils this role and what do they do.*<br><br>*Role of Project Team Members* | | |
| **Start Date:** | | **Completion Date:** | |
| **Executive Sponsor** | **Name:** | **Signature & Date:** | |

**FIGURE 5. NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL (NHMRC) 'STOP THE CLOT' VTE PREVENTION PROJECT PLAN TEMPLATE**

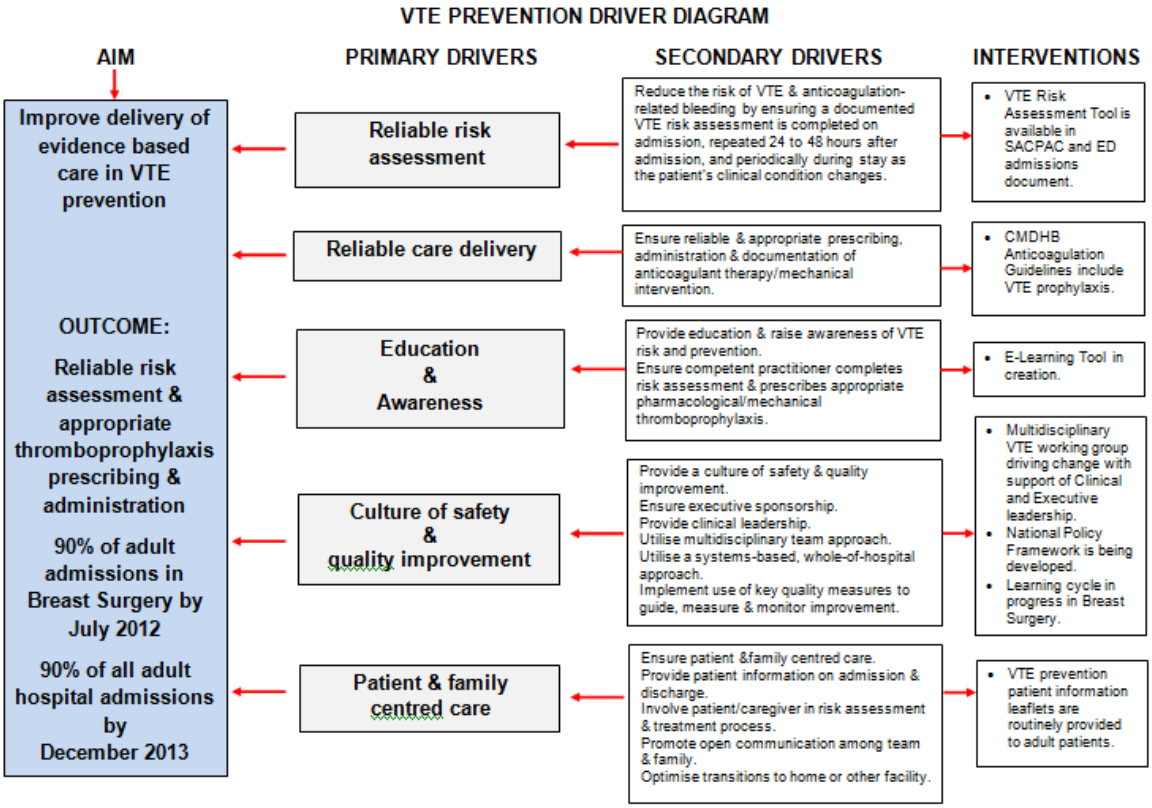
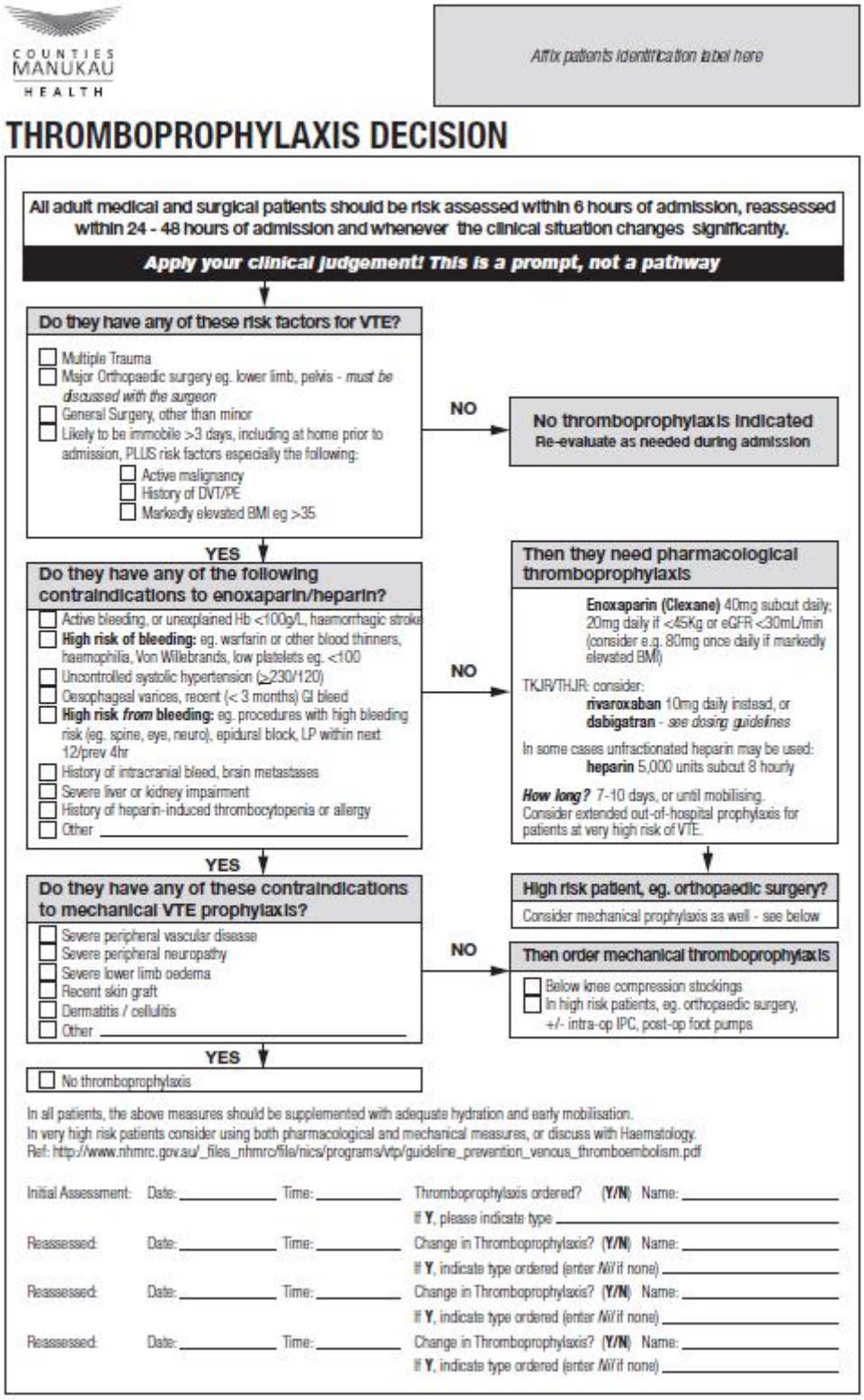



**FIGURE 6. COUNTIES MANUKAU DISTRICT HEALTH BOARD VTE PREVENTION PROGRAMME DRIVER DIAGRAM**

## APPENDIX 3. VTE RISK ASSESSMENT TOOLS / GUIDANCE



COUNTIES MANUKAU HEALTH

Affix patients identification label here

# THROMBOPROPHYLAXIS DECISION

**All adult medical and surgical patients should be risk assessed within 6 hours of admission, reassessed within 24 - 48 hours of admission and whenever the clinical situation changes significantly.**

***Apply your clinical judgement! This is a prompt, not a pathway***

**Do they have any of these risk factors for VTE?**

- ☐ Multiple Trauma
- ☐ Major Orthopaedic surgery eg. lower limb, pelvis - *must be discussed with the surgeon*
- ☐ General Surgery, other than minor
- ☐ Likely to be immobile >3 days, including at home prior to admission, PLUS risk factors especially the following:
  - ☐ Active malignancy
  - ☐ History of DVT/PE
  - ☐ Markedly elevated BMI eg >35

NO → **No thromboprophylaxis indicated**
Re-evaluate as needed during admission

YES ↓

**Do they have any of the following contraindications to enoxaparin/heparin?**

- ☐ Active bleeding, or unexplained Hb <100g/L, haemorrhagic stroke
- ☐ **High risk of bleeding:** eg. warfarin or other blood thinners, haemophilia, Von Willebrands, low platelets eg. <100
- ☐ Uncontrolled systolic hypertension (≥230/120)
- ☐ Oesophageal varices, recent (< 3 months) GI bleed
- ☐ **High risk *from* bleeding:** eg. procedures with high bleeding risk (eg. spine, eye, neuro), epidural block, LP within next 12/prev 4hr
- ☐ History of intracranial bleed, brain metastases
- ☐ Severe liver or kidney impairment
- ☐ History of heparin-induced thrombocytopenia or allergy
- ☐ Other _____

NO → **Then they need pharmacological thromboprophylaxis**

**Enoxaparin (Clexane)** 40mg subcut daily; 20mg daily if <45Kg or eGFR <30mL/min (consider e.g. 80mg once daily if markedly elevated BMI)

TKJR/THJR: consider:
**rivaroxaban** 10mg daily instead, or
**dabigatran** - *see dosing guidelines*

In some cases unfractionated heparin may be used:
**heparin** 5,000 units subcut 8 hourly

***How long?*** 7-10 days, or until mobilising. Consider extended out-of-hospital prophylaxis for patients at very high risk of VTE.

YES ↓

**Do they have any of these contraindications to mechanical VTE prophylaxis?**

- ☐ Severe peripheral vascular disease
- ☐ Severe peripheral neuropathy
- ☐ Severe lower limb oedema
- ☐ Recent skin graft
- ☐ Dermatitis / cellulitis
- ☐ Other _____

NO → **High risk patient, eg. orthopaedic surgery?**
Consider mechanical prophylaxis as well - see below

**Then order mechanical thromboprophylaxis**

- ☐ Below knee compression stockings
- ☐ In high risk patients, eg. orthopaedic surgery, +/- intra-op IPC, post-op foot pumps

YES ↓

☐ No thromboprophylaxis

In all patients, the above measures should be supplemented with adequate hydration and early mobilisation.
In very high risk patients consider using both pharmacological and mechanical measures, or discuss with Haematology.
Ref: http://www.nhmrc.gov.au/_files_nhmrc/file/nics/programs/vtp/guideline_prevention_venous_thromboembolism.pdf

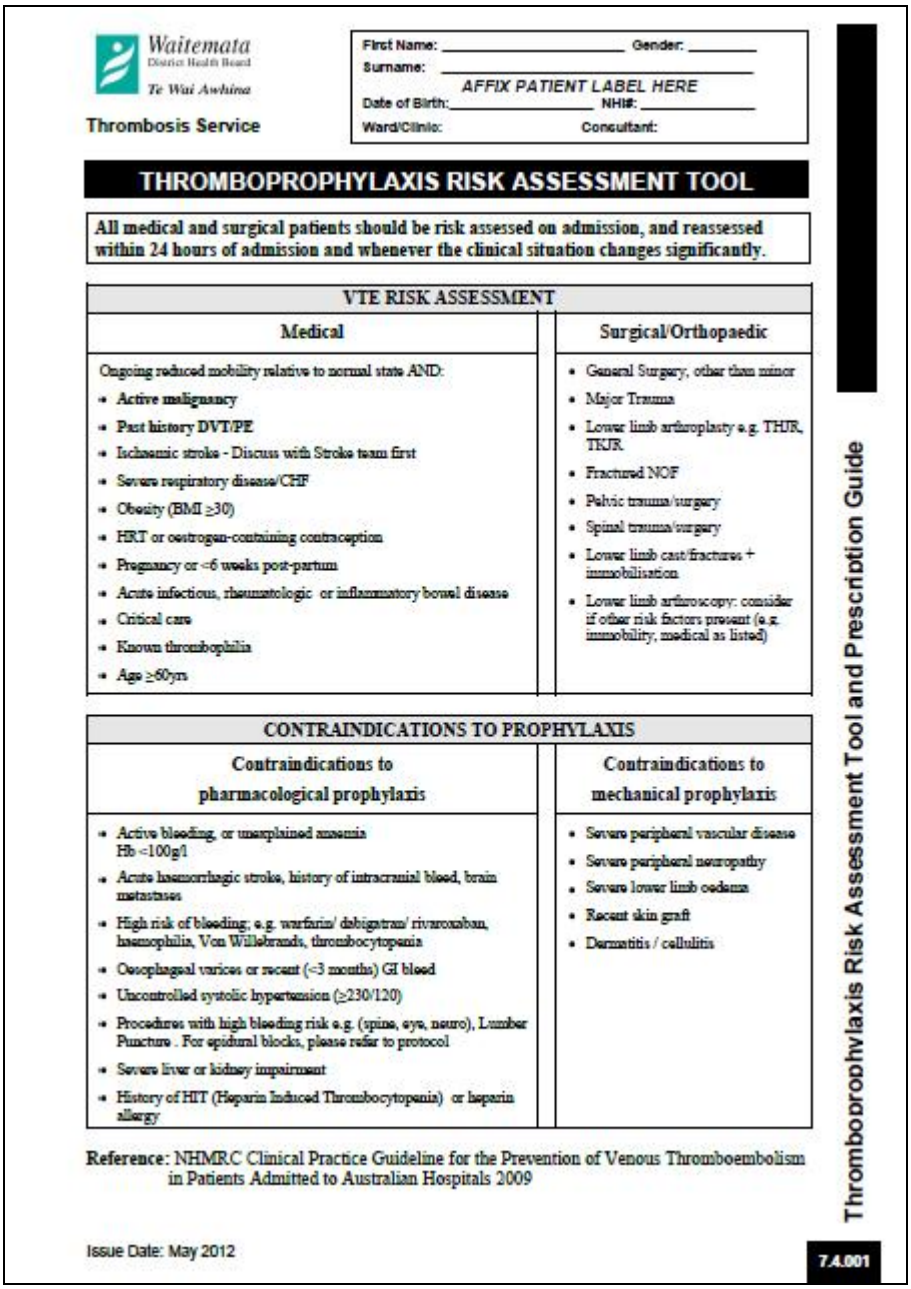
Initial Assessment: Date:_____ Time:_____ Thromboprophylaxis ordered? **(Y/N)** Name:_____
If **Y**, please indicate type _____

Reassessed: Date:_____ Time:_____ Change in Thromboprophylaxis? **(Y/N)** Name:_____
If **Y**, indicate type ordered (enter *Nil* if none) _____

Reassessed: Date:_____ Time:_____ Change in Thromboprophylaxis? **(Y/N)** Name:_____
If **Y**, indicate type ordered (enter *Nil* if none) _____

Reassessed: Date:_____ Time:_____ Change in Thromboprophylaxis? **(Y/N)** Name:_____
If **Y**, indicate type ordered (enter *Nil* if none) _____

**FIGURE 7. COUNTIES MANUKAU DISTRICT HEALTH BOARD VTE RISK ASSESSMENT TOOL**



Waitemata District Health Board
Te Wai Awhina

Thrombosis Service

First Name: _____ Gender: _____
Surname: _____
AFFIX PATIENT LABEL HERE
Date of Birth: _____ NHI#: _____
Ward/Clinic: Consultant:

## THROMBOPROPHYLAXIS RISK ASSESSMENT TOOL

**All medical and surgical patients should be risk assessed on admission, and reassessed within 24 hours of admission and whenever the clinical situation changes significantly.**

### VTE RISK ASSESSMENT

| Medical | Surgical/Orthopaedic |
|---|---|
| Ongoing reduced mobility relative to normal state AND:<br>• **Active malignancy**<br>• **Past history DVT/PE**<br>• Ischaemic stroke - Discuss with Stroke team first<br>• Severe respiratory disease/CHF<br>• Obesity (BMI ≥30)<br>• HRT or oestrogen-containing contraception<br>• Pregnancy or <6 weeks post-partum<br>• Acute infectious, rheumatologic or inflammatory bowel disease<br>• Critical care<br>• Known thrombophilia<br>• Age ≥60yrs | • General Surgery, other than minor<br>• Major Trauma<br>• Lower limb arthroplasty e.g. THJR, TKJR<br>• Fractured NOF<br>• Pelvic trauma/surgery<br>• Spinal trauma/surgery<br>• Lower limb cast/fractures + immobilisation<br>• Lower limb arthroscopy: consider if other risk factors present (e.g. immobility, medical as listed) |

### CONTRAINDICATIONS TO PROPHYLAXIS

| Contraindications to pharmacological prophylaxis | Contraindications to mechanical prophylaxis |
|---|---|
| • Active bleeding, or unexplained anaemia Hb <100g/l<br>• Acute haemorrhagic stroke, history of intracranial bleed, brain metastases<br>• High risk of bleeding; e.g. warfarin/ dabigatran/ rivaroxaban, haemophilia, Von Willebrands, thrombocytopenia<br>• Oesophageal varices or recent (<3 months) GI bleed<br>• Uncontrolled systolic hypertension (≥230/120)<br>• Procedures with high bleeding risk e.g. (spine, eye, neuro), Lumbar Puncture . For epidural blocks, please refer to protocol<br>• Severe liver or kidney impairment<br>• History of HIT (Heparin Induced Thrombocytopenia) or heparin allergy | • Severe peripheral vascular disease<br>• Severe peripheral neuropathy<br>• Severe lower limb oedema<br>• Recent skin graft<br>• Dermatitis / cellulitis |

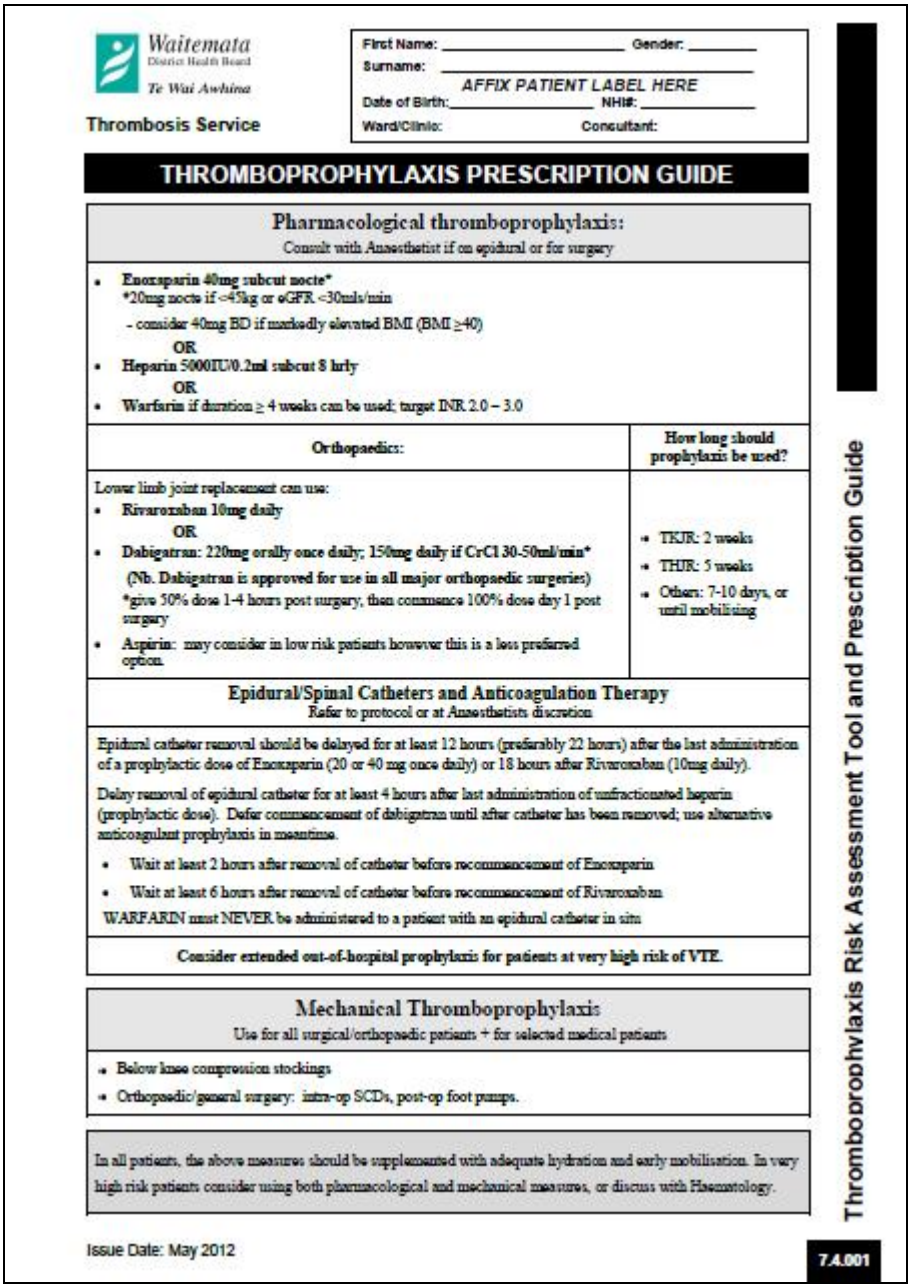
**Reference:** NHMRC Clinical Practice Guideline for the Prevention of Venous Thromboembolism in Patients Admitted to Australian Hospitals 2009

Issue Date: May 2012

7.4.001

Thromboprophylaxis Risk Assessment Tool and Prescription Guide

**FIGURE 8. WAITEMATA DISTRICT HEALTH BOARD VTE RISK ASSESSMENT TOOL**



Waitemata District Health Board
Te Wai Awhina

Thrombosis Service

First Name: _____ Gender: _____
Surname: _____
AFFIX PATIENT LABEL HERE
Date of Birth: _____ NHI#: _____
Ward/Clinic: Consultant:

## THROMBOPROPHYLAXIS PRESCRIPTION GUIDE

### Pharmacological thromboprophylaxis:

Consult with Anaesthetist if on epidural or for surgery

- **Enoxaparin 40mg subcut nocte***
  *20mg nocte if <45kg or eGFR <30mls/min
  - consider 40mg BD if markedly elevated BMI (BMI ≥40)

  **OR**
- **Heparin 5000IU/0.2ml subcut 8 hrly**

  **OR**
- **Warfarin if duration ≥ 4 weeks can be used; target INR 2.0 – 3.0**

| Orthopaedics: | How long should prophylaxis be used? |
|---|---|
| Lower limb joint replacement can use:<br>• **Rivaroxaban 10mg daily**<br>**OR**<br>• **Dabigatran: 220mg orally once daily; 150mg daily if CrCl 30-50ml/min***<br>**(Nb. Dabigatran is approved for use in all major orthopaedic surgeries)**<br>*give 50% dose 1-4 hours post surgery, then commence 100% dose day 1 post surgery<br>• **Aspirin:** may consider in low risk patients however this is a less preferred option. | → TKJR: 2 weeks<br>→ THJR: 5 weeks<br>→ Others: 7-10 days, or until mobilising |

### Epidural/Spinal Catheters and Anticoagulation Therapy

Refer to protocol or at Anaesthetists discretion

Epidural catheter removal should be delayed for at least 12 hours (preferably 22 hours) after the last administration of a prophylactic dose of Enoxaparin (20 or 40 mg once daily) or 18 hours after Rivaroxaban (10mg daily).

Delay removal of epidural catheter for at least 4 hours after last administration of unfractionated heparin (prophylactic dose). Defer commencement of dabigatran until after catheter has been removed; use alternative anticoagulant prophylaxis in meantime.

- Wait at least 2 hours after removal of catheter before recommencement of Enoxaparin
- Wait at least 6 hours after removal of catheter before recommencement of Rivaroxaban

WARFARIN must NEVER be administered to a patient with an epidural catheter in situ

**Consider extended out-of-hospital prophylaxis for patients at very high risk of VTE.**

### Mechanical Thromboprophylaxis

Use for all surgical/orthopaedic patients + for selected medical patients

- Below knee compression stockings
- Orthopaedic/general surgery: intra-op SCDs, post-op foot pumps.

In all patients, the above measures should be supplemented with adequate hydration and early mobilisation. In very high risk patients consider using both pharmacological and mechanical measures, or discuss with Haematology.

Issue Date: May 2012

7.4.001

Thromboprophylaxis Risk Assessment Tool and Prescription Guide

**FIGURE 9. WAITEMATA DISTRICT HEALTH BOARD THROMBOPROPHYLAXIS PRESCRIPTION GUIDE**

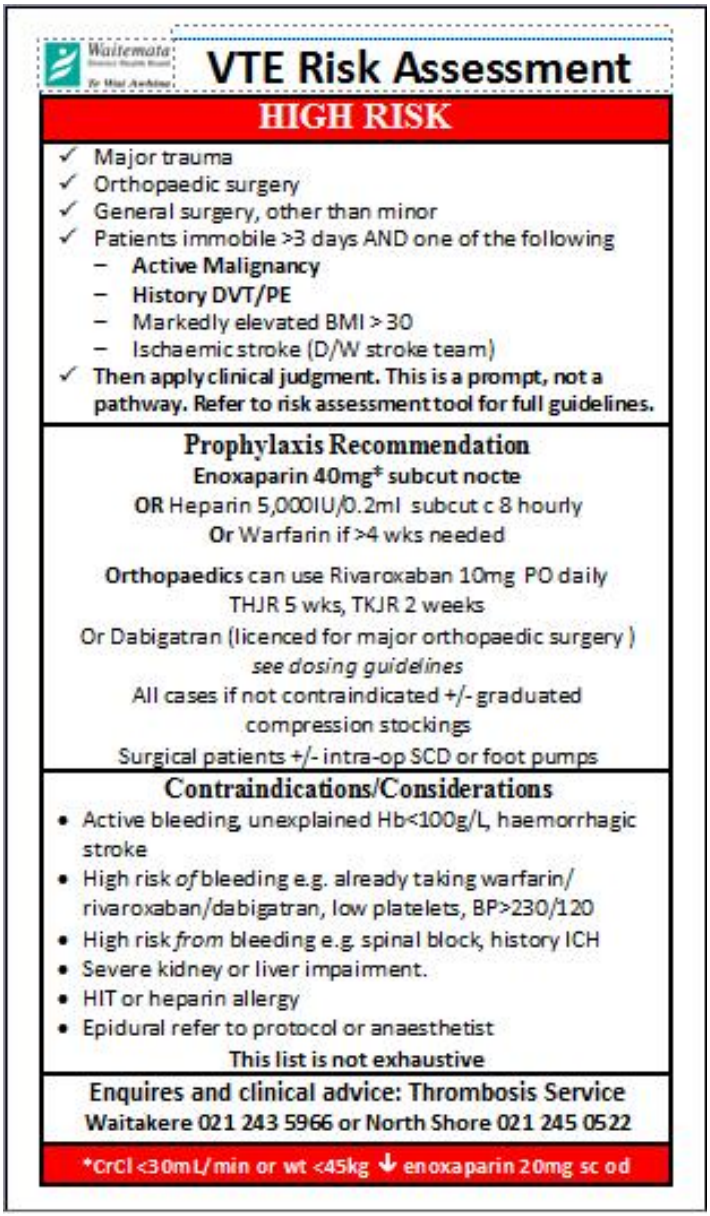
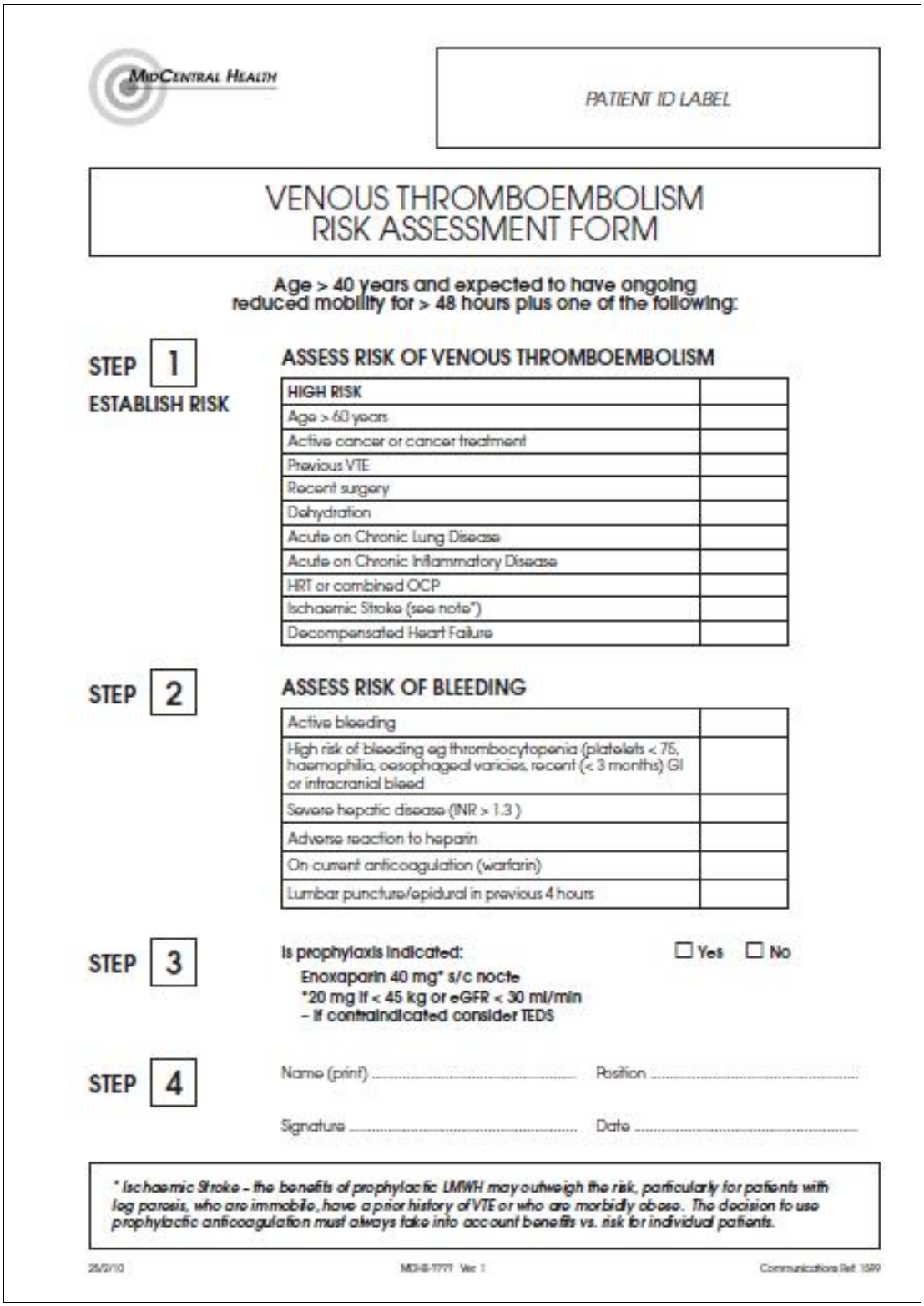



**FIGURE 10. WAITEMATA DISTRICT HEALTH BOARD VTE RISK ASSESSMENT CARD**



MidCentral Health

PATIENT ID LABEL

# VENOUS THROMBOEMBOLISM RISK ASSESSMENT FORM

**Age > 40 years and expected to have ongoing reduced mobility for > 48 hours plus one of the following:**

**STEP 1**

**ESTABLISH RISK**

**ASSESS RISK OF VENOUS THROMBOEMBOLISM**

| HIGH RISK | |
|---|---|
| Age > 60 years | |
| Active cancer or cancer treatment | |
| Previous VTE | |
| Recent surgery | |
| Dehydration | |
| Acute on Chronic Lung Disease | |
| Acute on Chronic Inflammatory Disease | |
| HRT or combined OCP | |
| Ischaemic Stroke (see note*) | |
| Decompensated Heart Failure | |

**STEP 2**

**ASSESS RISK OF BLEEDING**

| | |
|---|---|
| Active bleeding | |
| High risk of bleeding eg thrombocytopenia (platelets < 75, haemophilia, oesophageal varicies, recent (< 3 months) GI or intracranial bleed | |
| Severe hepatic disease (INR > 1.3 ) | |
| Adverse reaction to heparin | |
| On current anticoagulation (warfarin) | |
| Lumbar puncture/epidural in previous 4 hours | |

**STEP 3**

**Is prophylaxis indicated:** ☐ Yes ☐ No

**Enoxaparin 40 mg* s/c nocte**
***20 mg if < 45 kg or eGFR < 30 ml/min**
**– if contraindicated consider TEDS**

**STEP 4**

Name (print) ..... Position .....

Signature ..... Date .....

** Ischaemic Stroke – the benefits of prophylactic LMWH may outweigh the risk, particularly for patients with leg paresis, who are immobile, have a prior history of VTE or who are morbidly obese. The decision to use prophylactic anticoagulation must always take into account benefits vs. risk for individual patients.*

25/2/10 MDHB-1777 Ver 1 Communications Ref: 1589

**FIGURE 11. MIDCENTRAL HEALTH VTE RISK ASSESSMENT TOOL**

LAKES DISTRICT HEALTH BOARD

AFFIX PATIENT LABEL

# Maternity VTE Risk Assessment

**Step 1 →** Treating doctor/midwife to assess and document VTE risk category

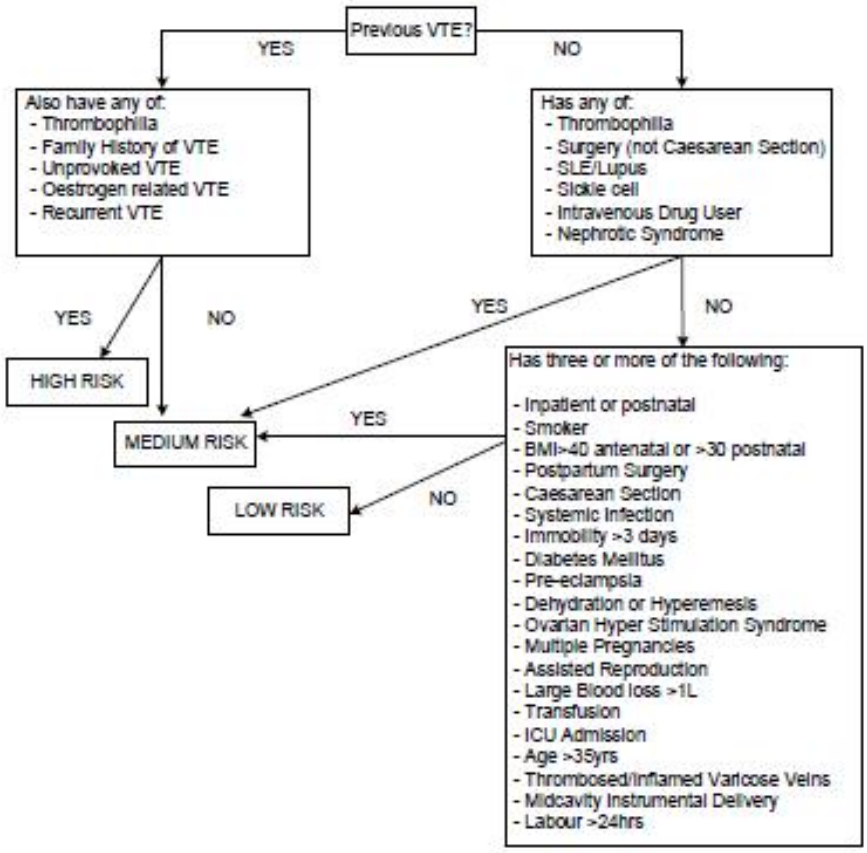
**Step 2 →** Check for contraindications for VTE prophylaxis

**Step 3 →** Record drugs and orders for TED stockings as per hospital policy

**Step 4 →** Complete summary of care at booking, admission, postnatally or if there are clinical changes

---

## STEP 1: Risk Assessment




Maternity VTE Risk Assessment

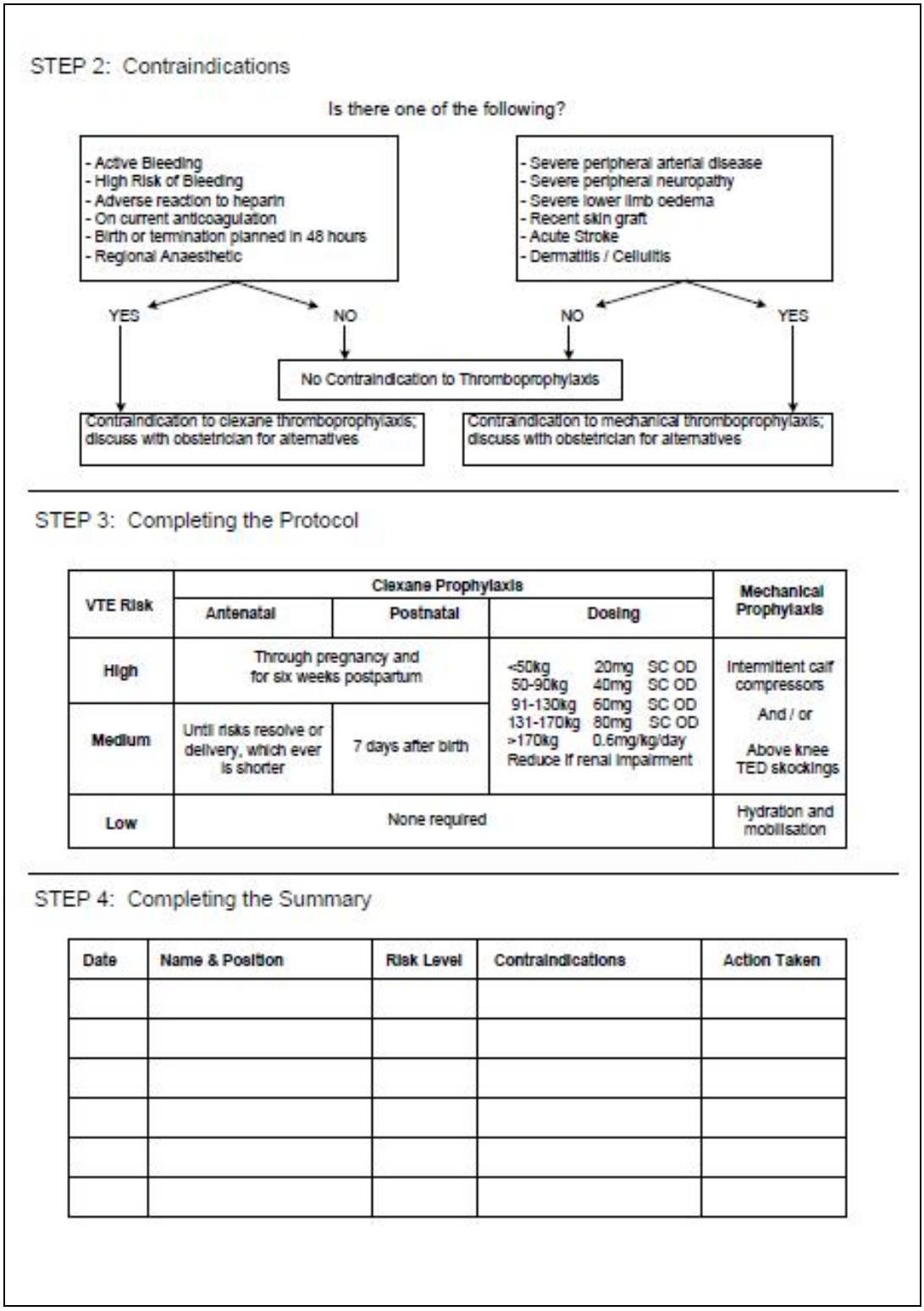
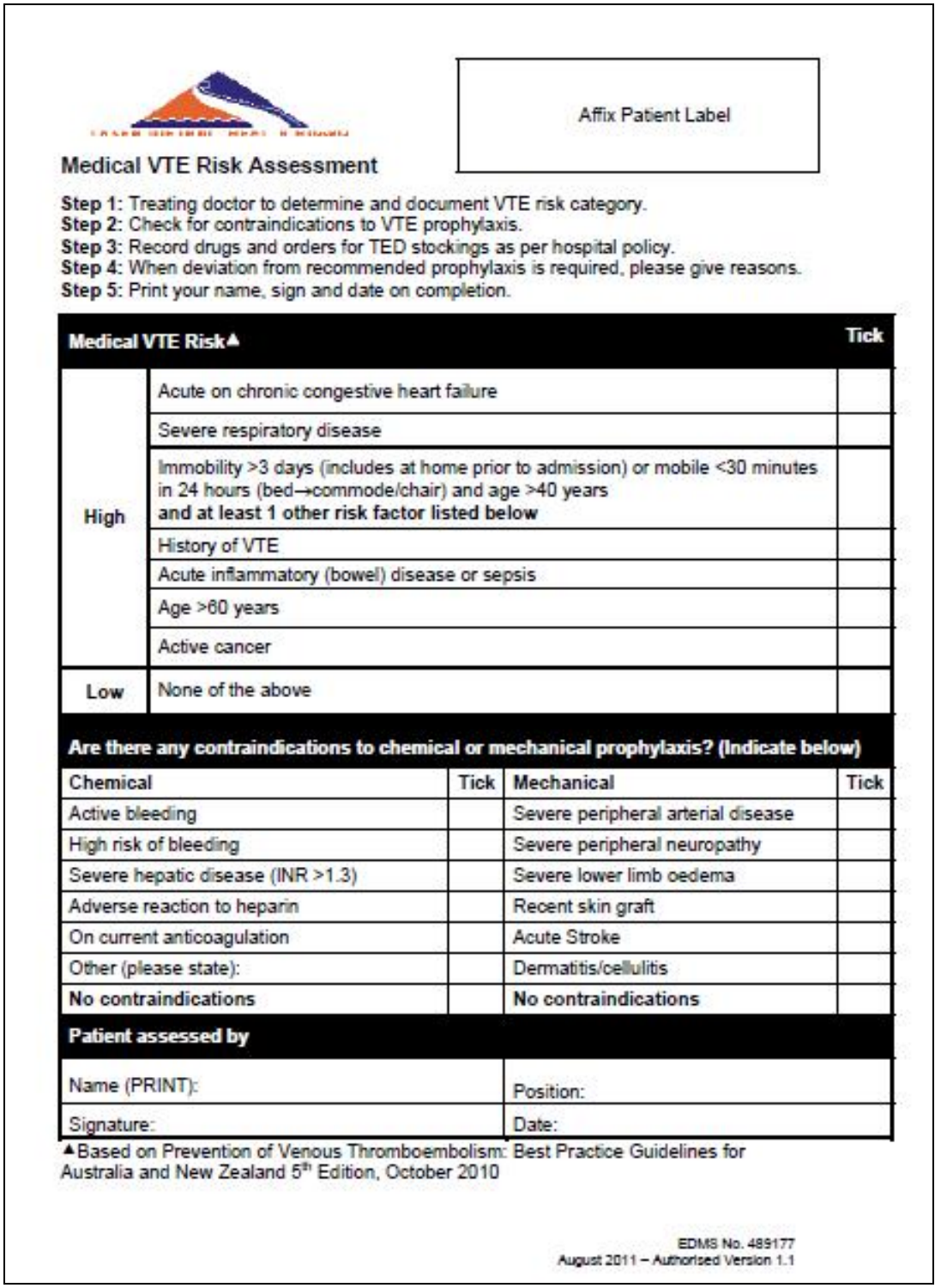



**FIGURE 12. LAKES DISTRICT HEALTH BOARD MATERNITY VTE RISK ASSESSMENT TOOL**



Affix Patient Label

## Medical VTE Risk Assessment

**Step 1:** Treating doctor to determine and document VTE risk category.
**Step 2:** Check for contraindications to VTE prophylaxis.
**Step 3:** Record drugs and orders for TED stockings as per hospital policy.
**Step 4:** When deviation from recommended prophylaxis is required, please give reasons.
**Step 5:** Print your name, sign and date on completion.

| **Medical VTE Risk▲** | | **Tick** |
|---|---|---|
| **High** | Acute on chronic congestive heart failure | |
| | Severe respiratory disease | |
| | Immobility >3 days (includes at home prior to admission) or mobile <30 minutes in 24 hours (bed→commode/chair) and age >40 years **and at least 1 other risk factor listed below** | |
| | History of VTE | |
| | Acute inflammatory (bowel) disease or sepsis | |
| | Age >60 years | |
| | Active cancer | |
| **Low** | None of the above | |

**Are there any contraindications to chemical or mechanical prophylaxis? (Indicate below)**

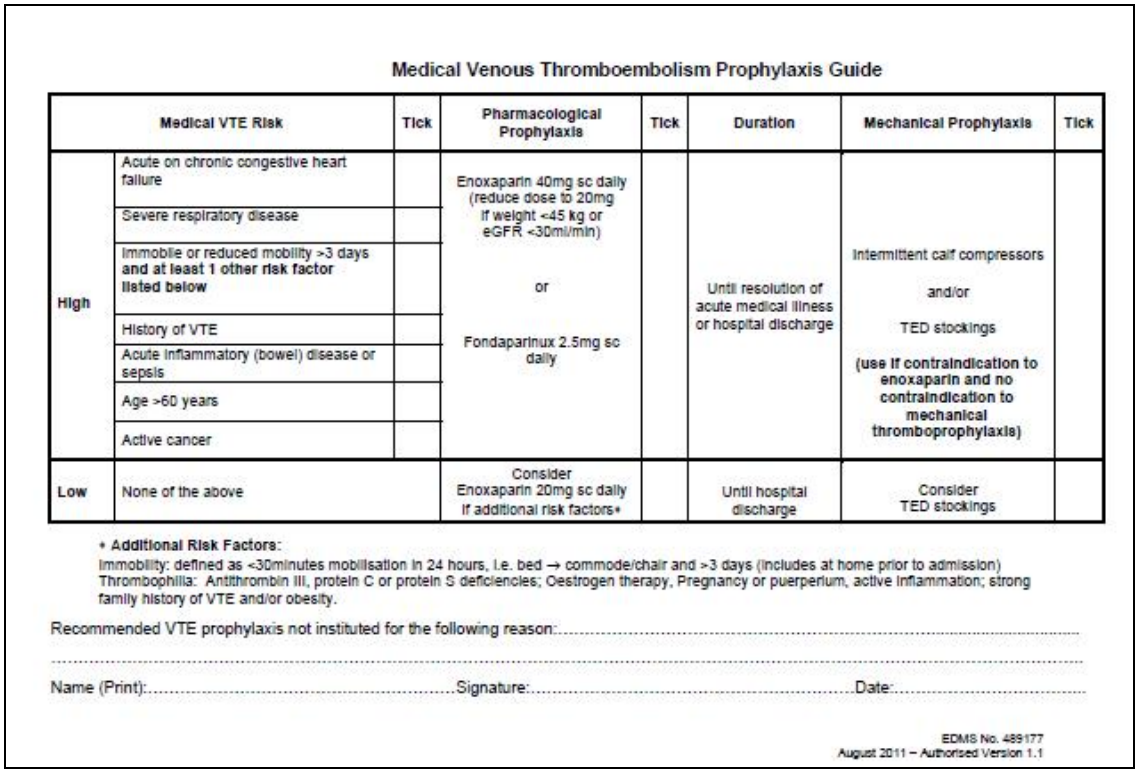
| **Chemical** | **Tick** | **Mechanical** | **Tick** |
|---|---|---|---|
| Active bleeding | | Severe peripheral arterial disease | |
| High risk of bleeding | | Severe peripheral neuropathy | |
| Severe hepatic disease (INR >1.3) | | Severe lower limb oedema | |
| Adverse reaction to heparin | | Recent skin graft | |
| On current anticoagulation | | Acute Stroke | |
| Other (please state): | | Dermatitis/cellulitis | |
| **No contraindications** | | **No contraindications** | |

| **Patient assessed by** | |
|---|---|
| Name (PRINT): | Position: |
| Signature: | Date: |

▲Based on Prevention of Venous Thromboembolism: Best Practice Guidelines for Australia and New Zealand 5th Edition, October 2010

EDMS No. 489177
August 2011 – Authorised Version 1.1

**FIGURE 13. LAKES DISTRICT HEALTH BOARD MEDICAL VTE RISK ASSESSMENT TOOL**



Medical Venous Thromboembolism Prophylaxis Guide

| Medical VTE Risk | | Tick | Pharmacological Prophylaxis | Tick | Duration | Mechanical Prophylaxis | Tick |
|---|---|---|---|---|---|---|---|
| High | Acute on chronic congestive heart failure | | Enoxaparin 40mg sc daily (reduce dose to 20mg if weight <45 kg or eGFR <30ml/min) or Fondaparinux 2.5mg sc daily | | Until resolution of acute medical illness or hospital discharge | Intermittent calf compressors and/or TED stockings **(use if contraindication to enoxaparin and no contraindication to mechanical thromboprophylaxis)** | |
| | Severe respiratory disease | | | | | | |
| | Immobile or reduced mobility >3 days **and at least 1 other risk factor listed below** | | | | | | |
| | History of VTE | | | | | | |
| | Acute inflammatory (bowel) disease or sepsis | | | | | | |
| | Age >60 years | | | | | | |
| | Active cancer | | | | | | |
| Low | None of the above | | Consider Enoxaparin 20mg sc daily if additional risk factors+ | | Until hospital discharge | Consider TED stockings | |

+ **Additional Risk Factors:**
Immobility: defined as <30minutes mobilisation in 24 hours, i.e. bed → commode/chair and >3 days (includes at home prior to admission)
Thrombophilia: Antithrombin III, protein C or protein S deficiencies; Oestrogen therapy, Pregnancy or puerperium, active inflammation; strong family history of VTE and/or obesity.

Recommended VTE prophylaxis not instituted for the following reason:.....

.....

Name (Print):.....Signature:.....Date:.....

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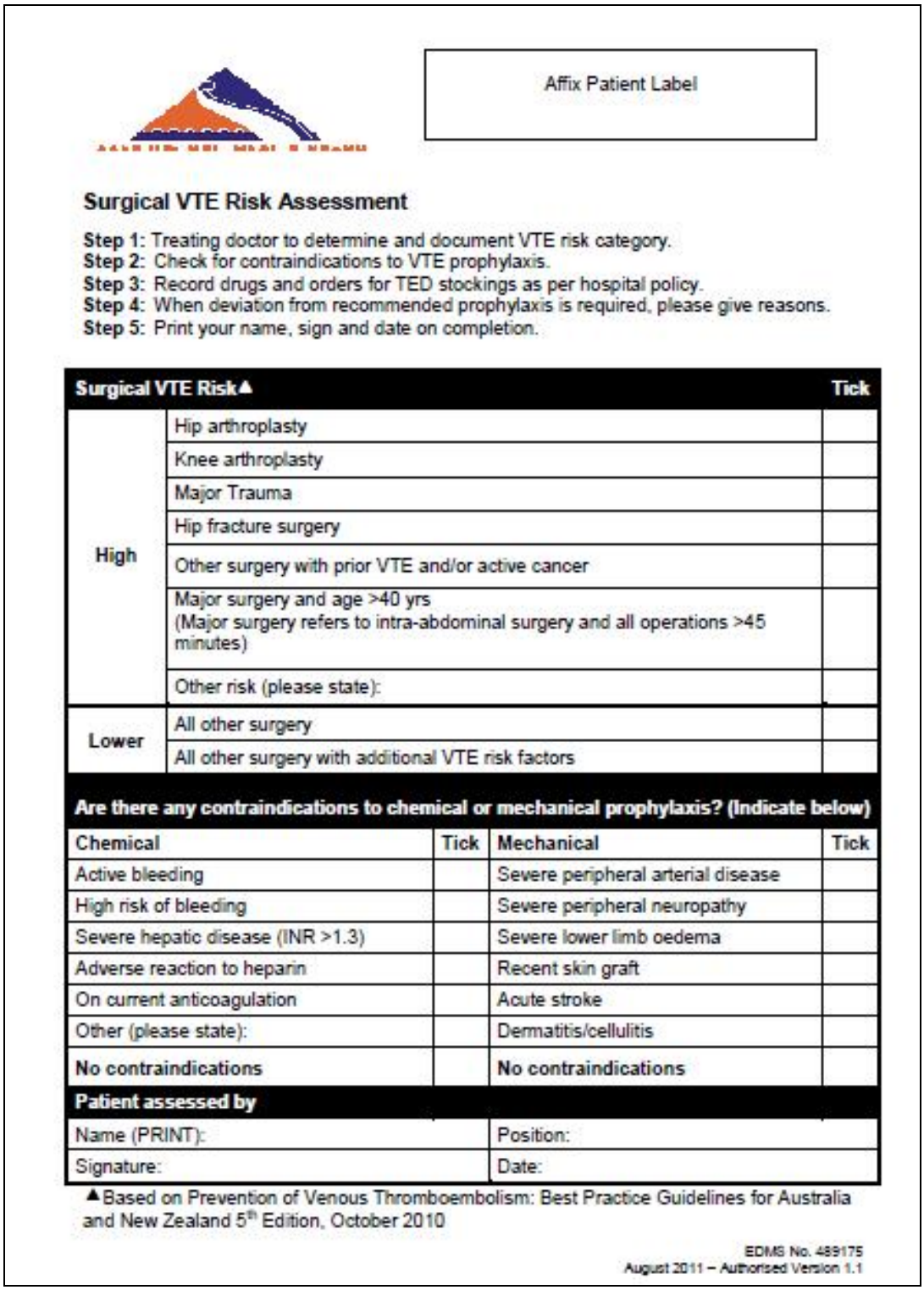
**FIGURE 14. LAKES DISTRICT HEALTH BOARD MEDICAL VTE PROPHYLAXIS GUIDE**



Affix Patient Label

## Surgical VTE Risk Assessment

**Step 1:** Treating doctor to determine and document VTE risk category.
**Step 2:** Check for contraindications to VTE prophylaxis.
**Step 3:** Record drugs and orders for TED stockings as per hospital policy.
**Step 4:** When deviation from recommended prophylaxis is required, please give reasons.
**Step 5:** Print your name, sign and date on completion.

| Surgical VTE Risk▲ | | Tick |
|---|---|---|
| High | Hip arthroplasty | |
| | Knee arthroplasty | |
| | Major Trauma | |
| | Hip fracture surgery | |
| | Other surgery with prior VTE and/or active cancer | |
| | Major surgery and age >40 yrs<br>(Major surgery refers to intra-abdominal surgery and all operations >45 minutes) | |
| | Other risk (please state): | |
| Lower | All other surgery | |
| | All other surgery with additional VTE risk factors | |

**Are there any contraindications to chemical or mechanical prophylaxis? (Indicate below)**

| Chemical | Tick | Mechanical | Tick |
|---|---|---|---|
| Active bleeding | | Severe peripheral arterial disease | |
| High risk of bleeding | | Severe peripheral neuropathy | |
| Severe hepatic disease (INR >1.3) | | Severe lower limb oedema | |
| Adverse reaction to heparin | | Recent skin graft | |
| On current anticoagulation | | Acute stroke | |
| Other (please state): | | Dermatitis/cellulitis | |
| **No contraindications** | | **No contraindications** | |

| Patient assessed by | |
|---|---|
| Name (PRINT): | Position: |
| Signature: | Date: |

▲Based on Prevention of Venous Thromboembolism: Best Practice Guidelines for Australia and New Zealand 5th Edition, October 2010

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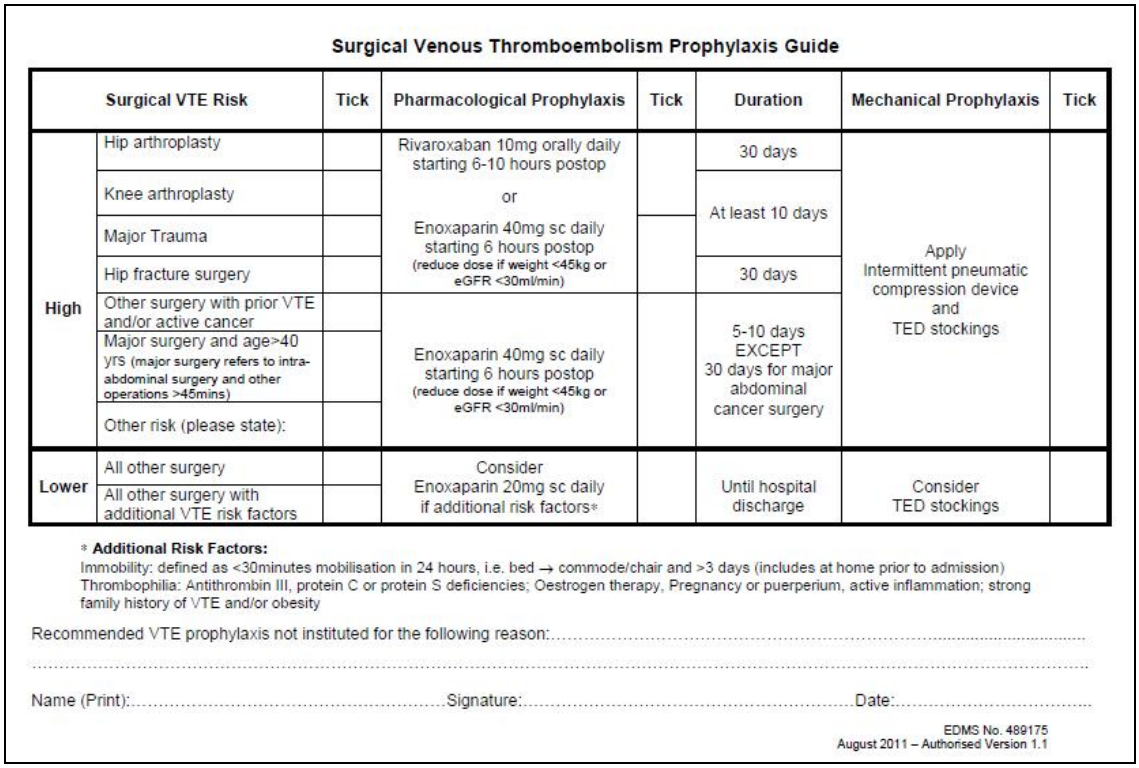
**FIGURE 15. LAKES DISTRICT HEALTH BOARD SURGICAL VTE RISK ASSESSMENT TOOL**



**Surgical Venous Thromboembolism Prophylaxis Guide**

| Surgical VTE Risk | | Tick | Pharmacological Prophylaxis | Tick | Duration | Mechanical Prophylaxis | Tick |
|---|---|---|---|---|---|---|---|
| High | Hip arthroplasty | | Rivaroxaban 10mg orally daily starting 6-10 hours postop<br>or<br>Enoxaparin 40mg sc daily starting 6 hours postop<br>(reduce dose if weight <45kg or eGFR <30ml/min) | | 30 days | Apply Intermittent pneumatic compression device and TED stockings | |
| | Knee arthroplasty | | | | At least 10 days | | |
| | Major Trauma | | | | | | |
| | Hip fracture surgery | | | | 30 days | | |
| | Other surgery with prior VTE and/or active cancer | | Enoxaparin 40mg sc daily starting 6 hours postop<br>(reduce dose if weight <45kg or eGFR <30ml/min) | | 5-10 days EXCEPT 30 days for major abdominal cancer surgery | | |
| | Major surgery and age>40 yrs (major surgery refers to intra-abdominal surgery and other operations >45mins) | | | | | | |
| | Other risk (please state): | | | | | | |
| Lower | All other surgery | | Consider Enoxaparin 20mg sc daily if additional risk factors* | | Until hospital discharge | Consider TED stockings | |
| | All other surgery with additional VTE risk factors | | | | | | |

* **Additional Risk Factors:**
Immobility: defined as <30minutes mobilisation in 24 hours, i.e. bed → commode/chair and >3 days (includes at home prior to admission)
Thrombophilia: Antithrombin III, protein C or protein S deficiencies; Oestrogen therapy, Pregnancy or puerperium, active inflammation; strong family history of VTE and/or obesity

Recommended VTE prophylaxis not instituted for the following reason:.....

.....

Name (Print):.....Signature:.....Date:.....

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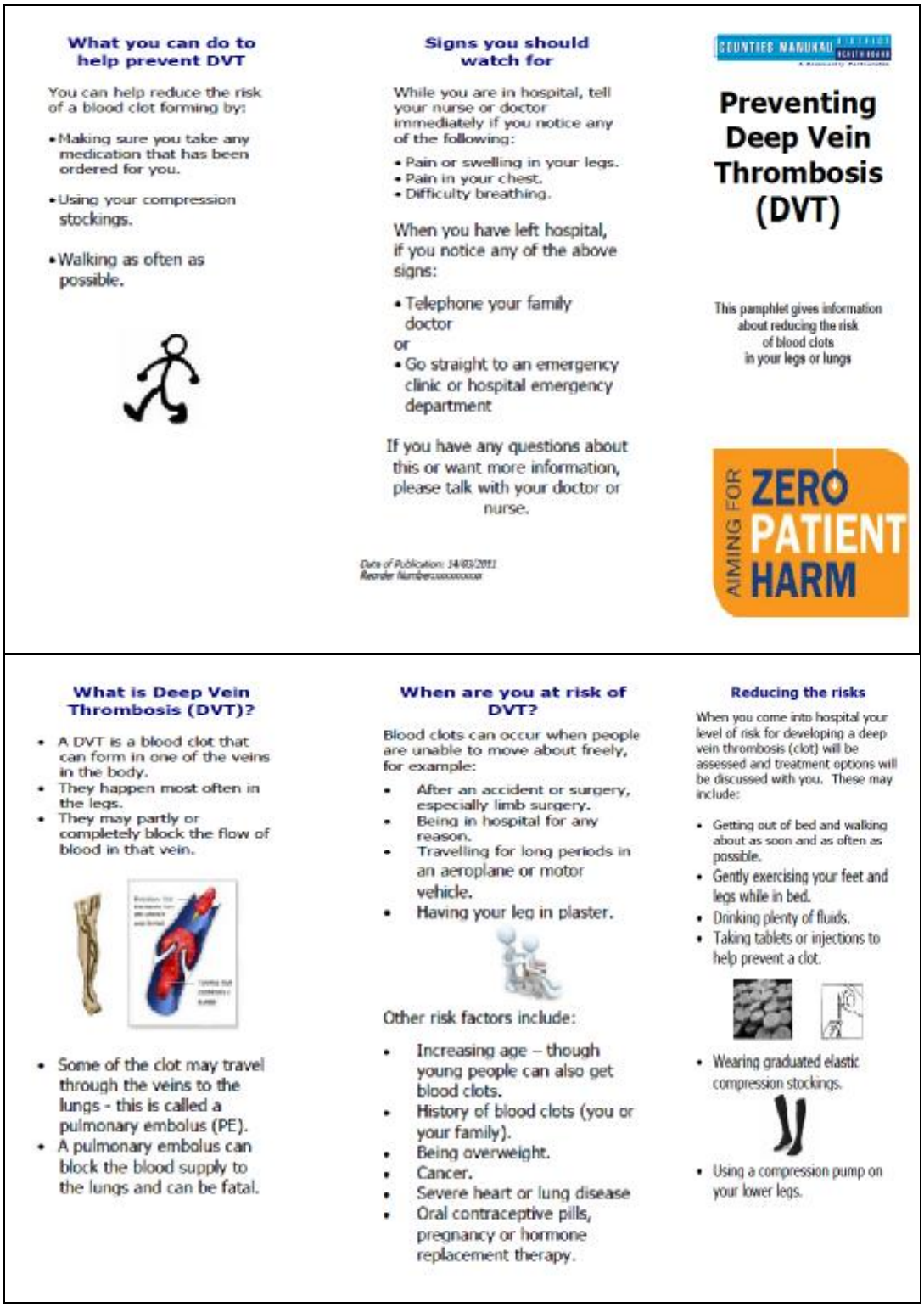
**FIGURE 16. LAKES DISTRICT HEALTH BOARD SURGICAL VTE PROPHYLAXIS GUIDE**

## APPENDIX 4. PATIENT INFORMATION / EDUCATION RESOURCES / VTE RISK SELF-ASSESSMENT TOOL



### What you can do to help prevent DVT

You can help reduce the risk of a blood clot forming by:

- Making sure you take any medication that has been ordered for you.
- Using your compression stockings.
- Walking as often as possible.

### Signs you should watch for

While you are in hospital, tell your nurse or doctor immediately if you notice any of the following:

- Pain or swelling in your legs.
- Pain in your chest.
- Difficulty breathing.

When you have left hospital, if you notice any of the above signs:

- Telephone your family doctor

or

- Go straight to an emergency clinic or hospital emergency department

If you have any questions about this or want more information, please talk with your doctor or nurse.

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*Reorder Number:xxxxxxxx*

COUNTIES MANUKAU DISTRICT HEALTH BOARD

# Preventing Deep Vein Thrombosis (DVT)

This pamphlet gives information about reducing the risk of blood clots in your legs or lungs

AIMING FOR ZERO PATIENT HARM

### What is Deep Vein Thrombosis (DVT)?

- A DVT is a blood clot that can form in one of the veins in the body.
- They happen most often in the legs.
- They may partly or completely block the flow of blood in that vein.

- Some of the clot may travel through the veins to the lungs - this is called a pulmonary embolus (PE).
- A pulmonary embolus can block the blood supply to the lungs and can be fatal.

### When are you at risk of DVT?

Blood clots can occur when people are unable to move about freely, for example:

- After an accident or surgery, especially limb surgery.
- Being in hospital for any reason.
- Travelling for long periods in an aeroplane or motor vehicle.
- Having your leg in plaster.

Other risk factors include:

- Increasing age – though young people can also get blood clots.
- History of blood clots (you or your family).
- Being overweight.
- Cancer.
- Severe heart or lung disease
- Oral contraceptive pills, pregnancy or hormone replacement therapy.

### Reducing the risks

When you come into hospital your level of risk for developing a deep vein thrombosis (clot) will be assessed and treatment options will be discussed with you. These may include:

- Getting out of bed and walking about as soon and as often as possible.
- Gently exercising your feet and legs while in bed.
- Drinking plenty of fluids.
- Taking tablets or injections to help prevent a clot.
- Wearing graduated elastic compression stockings.
- Using a compression pump on your lower legs.

**FIGURE 17. COUNTIES MANUKAU DISTRICT HEALTH BOARD VTE PREVENTION PATIENT INFORMATION LEAFLET**

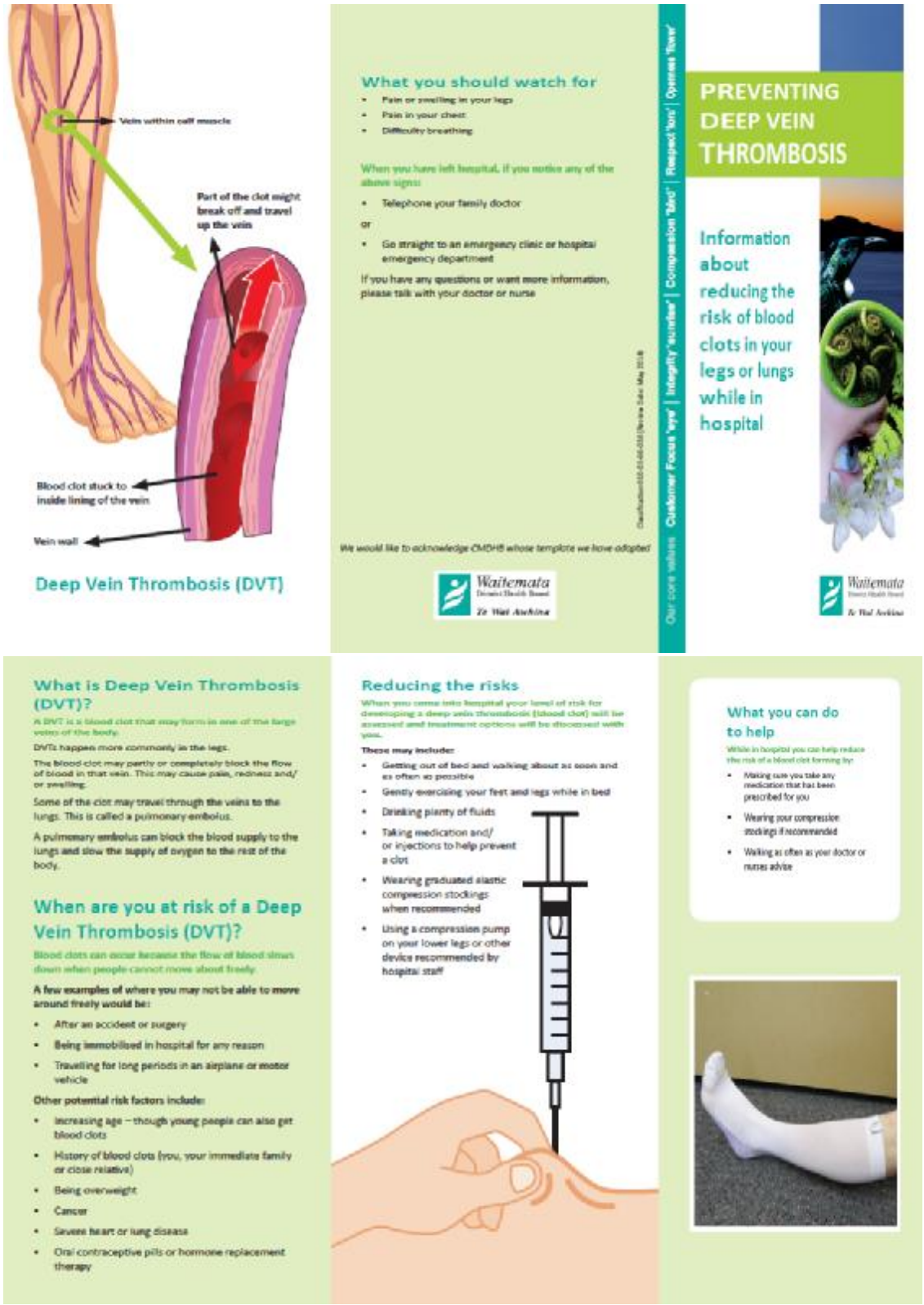



**FIGURE 18. WAITEMATA DISTRICT HEALTH BOARD VTE PREVENTION PATIENT INFORMATION LEAFLET**

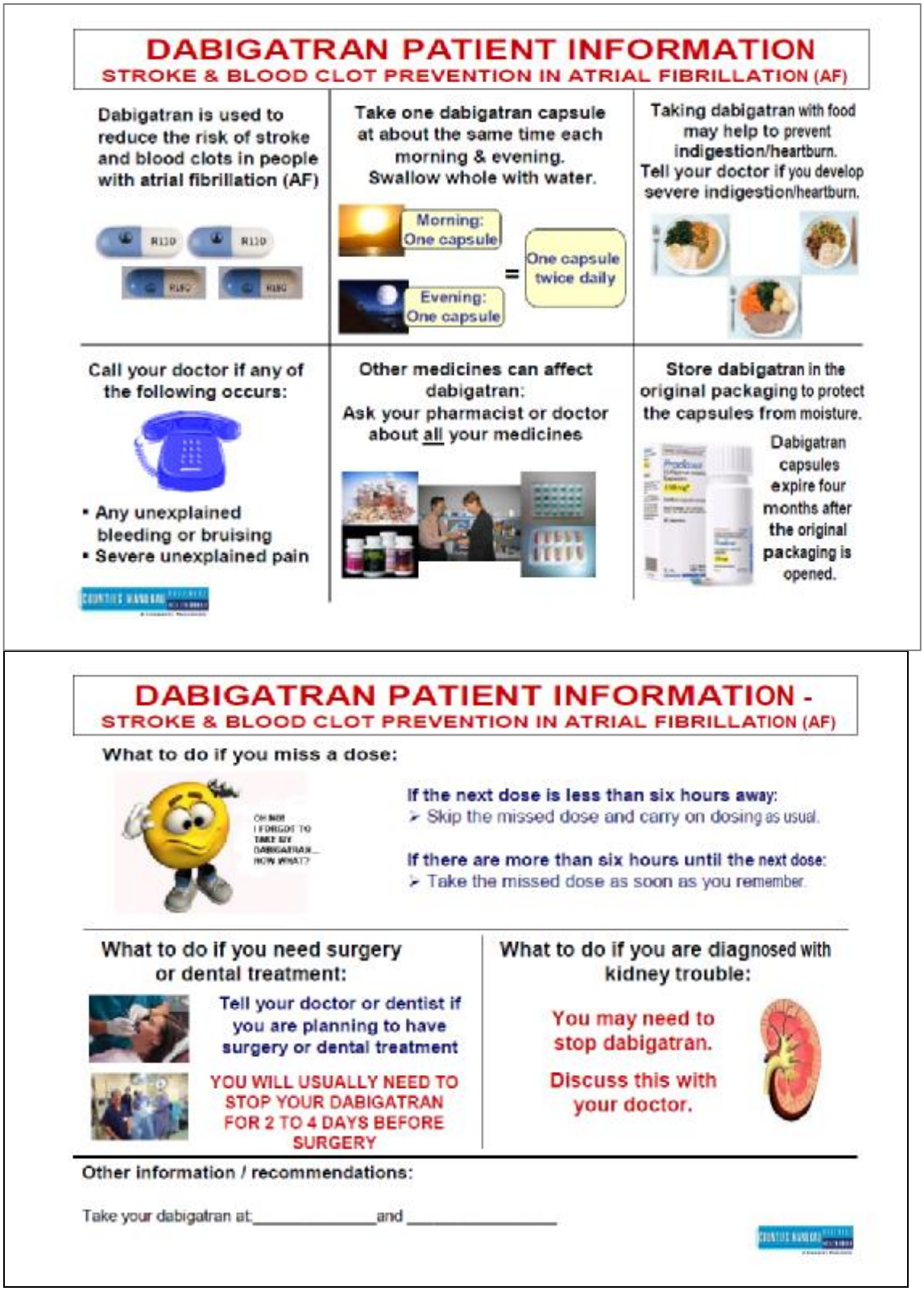



**FIGURE 19. COUNTIES MANUKAU DISTRICT HEALTH BOARD DABIGATRAN PATIENT INFORMATION CARD**

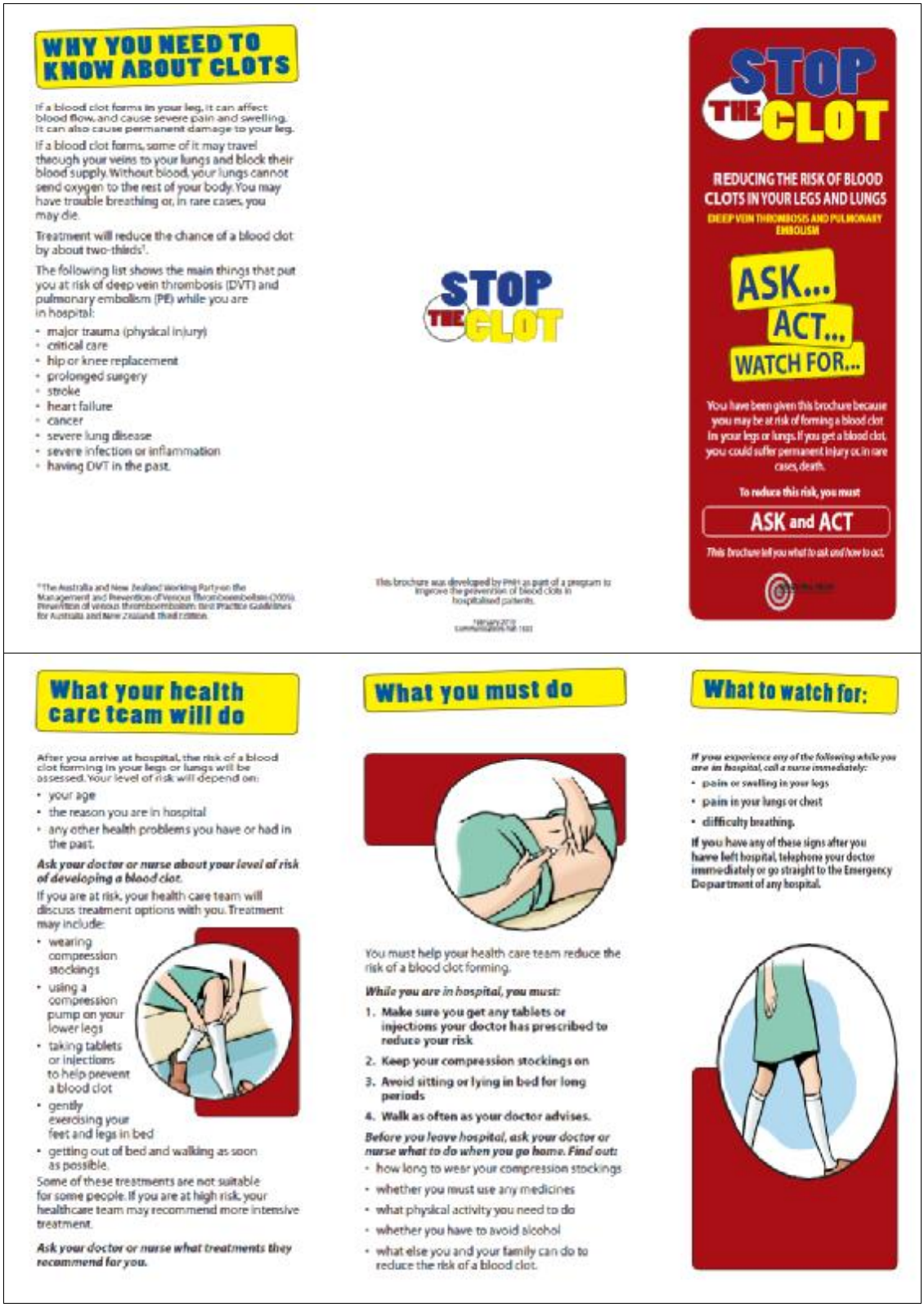
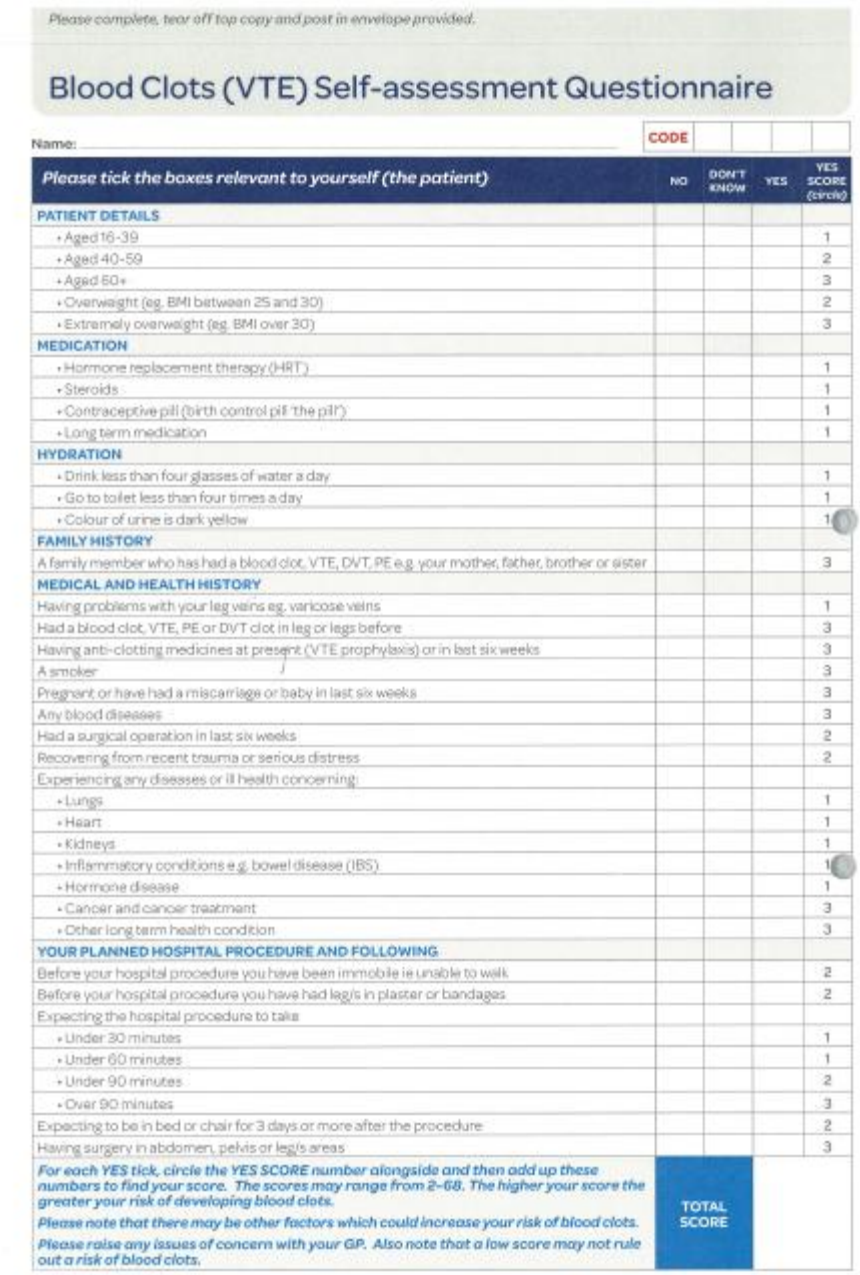



**FIGURE 20. MIDCENTRAL HEALTH PATIENT INFORMATION LEAFLET**



*Please complete, tear off top copy and post in envelope provided.*

## Blood Clots (VTE) Self-assessment Questionnaire

Name: _____ CODE

| *Please tick the boxes relevant to yourself (the patient)* | NO | DON'T KNOW | YES | YES SCORE (circle) |
|---|---|---|---|---|
| **PATIENT DETAILS** | | | | |
| • Aged 16-39 | | | | 1 |
| • Aged 40-59 | | | | 2 |
| • Aged 60+ | | | | 3 |
| • Overweight (eg. BMI between 25 and 30) | | | | 2 |
| • Extremely overweight (eg. BMI over 30) | | | | 3 |
| **MEDICATION** | | | | |
| • Hormone replacement therapy (HRT) | | | | 1 |
| • Steroids | | | | 1 |
| • Contraceptive pill (birth control pill 'the pill') | | | | 1 |
| • Long term medication | | | | 1 |
| **HYDRATION** | | | | |
| • Drink less than four glasses of water a day | | | | 1 |
| • Go to toilet less than four times a day | | | | 1 |
| • Colour of urine is dark yellow | | | | 1 |
| **FAMILY HISTORY** | | | | |
| A family member who has had a blood clot, VTE, DVT, PE e.g. your mother, father, brother or sister | | | | 3 |
| **MEDICAL AND HEALTH HISTORY** | | | | |
| Having problems with your leg veins eg. varicose veins | | | | 1 |
| Had a blood clot, VTE, PE or DVT clot in leg or legs before | | | | 3 |
| Having anti-clotting medicines at present (VTE prophylaxis) or in last six weeks | | | | 3 |
| A smoker | | | | 3 |
| Pregnant or have had a miscarriage or baby in last six weeks | | | | 3 |
| Any blood diseases | | | | 3 |
| Had a surgical operation in last six weeks | | | | 2 |
| Recovering from recent trauma or serious distress | | | | 2 |
| Experiencing any diseases or ill health concerning: | | | | |
| • Lungs | | | | 1 |
| • Heart | | | | 1 |
| • Kidneys | | | | 1 |
| • Inflammatory conditions e.g. bowel disease (IBS) | | | | 1 |
| • Hormone disease | | | | 1 |
| • Cancer and cancer treatment | | | | 3 |
| • Other long term health condition | | | | 3 |
| **YOUR PLANNED HOSPITAL PROCEDURE AND FOLLOWING** | | | | |
| Before your hospital procedure you have been immobile ie unable to walk | | | | 2 |
| Before your hospital procedure you have had leg/s in plaster or bandages | | | | 2 |
| Expecting the hospital procedure to take | | | | |
| • Under 30 minutes | | | | 1 |
| • Under 60 minutes | | | | 1 |
| • Under 90 minutes | | | | 2 |
| • Over 90 minutes | | | | 3 |
| Expecting to be in bed or chair for 3 days or more after the procedure | | | | 2 |
| Having surgery in abdomen, pelvis or leg/s areas | | | | 3 |

***For each YES tick, circle the YES SCORE number alongside and then add up these numbers to find your score. The scores may range from 2-68. The higher your score the greater your risk of developing blood clots.***

***Please note that there may be other factors which could increase your risk of blood clots.***

***Please raise any issues of concern with your GP. Also note that a low score may not rule out a risk of blood clots.***

TOTAL SCORE

**FIGURE 21. SOUTHERN CROSS HOSPITALS DRAFT PATIENT VTE RISK SELF-ASSESSMENT TOOL (CURRENTLY BEING VALIDATED)**

# APPENDIX 5. VTE PROPHYLAXIS AUDIT SHEETS

**Obstetric VTE Prophylaxis Audit (score 1 for every correct action)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient NHI | | | | | | | | | | | |
| Antenatal/ postnatal | | A / P | A / P | A / P | A/P | A / P | A / P | A / P | A / P | A / P | A / P |
| Consultant initials | | | | | | | | | | | |
| Admission diagnosis | | | | | | | | | | | |
| VTE risk factors | | | | | | | | | | | |
| Age | | | | | | | | | | | |
| VTE risk assessed within 24 hrs of admission (1) | | | | | | | | | | | |
| VTE form (front/back) completed with signature (1) | | | | | | | | | | | |
| **TED Stockings ± Foot pump/ IPC device** | Should patient have received them? | | | | | | | | | | |
| | Did patient wear them? | | | | | | | | | | |
| | Ankle/calf oedema, cellulitis | | | | | | | | | | |
| | Correct action taken or opted out with reasoning (1) | | | | | | | | | | |
| **LMWH** | Should patient have received LMWH? | | | | | | | | | | |
| | Was it prescribed? | | | | | | | | | | |
| | Was the correct dose prescribed? | | | | | | | | | | |
| | Correct action taken or opted out with reasoning (1) | | | | | | | | | | |
| Total score: /4 | | | | | | | | | | | |

**FIGURE 22. LAKES DISTRICT HEALTH BOARD OBSTETRIC VTE PROPHYLAXIS AUDIT TOOL**

**Orthopaedic VTE Prophylaxis Audit (score 1 for every correct action)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient NHI | | | | | | | | | | | |
| Age | | | | | | | | | | | |
| Consultant initials | | | | | | | | | | | |
| Admission diagnosis | | | | | | | | | | | |
| VTE Risk factors | | | | | | | | | | | |
| VTE risk assessed within 24 hrs of admission (1) | | | | | | | | | | | |
| VTE form completed with signature (1) | | | | | | | | | | | |
| **Chemical prophylaxis** | Patient on warfarin? | | | | | | | | | | |
| | Should pt receive it? | | | | | | | | | | |
| | Was it prescribed? | | | | | | | | | | |
| | Rivaroxaban (R) or Enoxaparin (E) | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E |
| | Was prescribed dose correct? | | | | | | | | | | |
| | Was time administered correct? | | | | | | | | | | |
| | Correct action or opted out with reasoning (1) | | | | | | | | | | |
| **TED Stockings** | Should pt receive them? | | | | | | | | | | |
| | Did pt receive them? | | | | | | | | | | |
| | Ankle oedema, fragile skin, cellulitis? | | | | | | | | | | |
| | Correct action or opted out with reasoning (1) | | | | | | | | | | |
| Total score: /4 | | | | | | | | | | | |

**FIGURE 23. LAKES DISTRICT HEALTH BOARD ORTHOPAEDIC VTE PROPHYLAXIS AUDIT TOOL**

**Medical VTE Prophylaxis Audit (score 1 for every correct action)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient NHI | | | | | | | | | | | |
| Age | | | | | | | | | | | |
| Consultant initials | | | | | | | | | | | |
| Admission diagnosis | | | | | | | | | | | |
| VTE Risk factors | | | | | | | | | | | |
| VTE risk assessed within 24 hrs of admission (1) | | | | | | | | | | | |
| VTE form completed with signature (1) | | | | | | | | | | | |
| **TED Stockings ± Foot pump/ IPC device** | Should patient have received them? | | | | | | | | | | |
| | Did patient receive them? | | | | | | | | | | |
| | Were they prescribed? | | | | | | | | | | |
| | Ankle/calf oedema, fragile skin, cellulitis present? | | | | | | | | | | |
| | Correct action taken (1) | | | | | | | | | | |
| **LMWH** | Patient on warfarin? | | | | | | | | | | |
| | Should patient have received LMWH? | | | | | | | | | | |
| | Was it prescribed? | | | | | | | | | | |
| | Was the correct dose prescribed? | | | | | | | | | | |
| | Correct action taken or opted out with reasoning (1) | | | | | | | | | | |
| Total score: /4 | | | | | | | | | | | |

**FIGURE 24. LAKES DISTRICT HEALTH BOARD MEDICAL VTE PROPHYLAXIS AUDIT TOOL**

**Surgical VTE Prophylaxis Audit (score 1 for every correct action)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient NHI | | | | | | | | | | | |
| Age | | | | | | | | | | | |
| Consultant initials | | | | | | | | | | | |
| Admission diagnosis | | | | | | | | | | | |
| VTE Risk factors | | | | | | | | | | | |
| VTE risk assessed within 24 hrs of admission (1) | | | | | | | | | | | |
| VTE form completed with signature (1) | | | | | | | | | | | |
| **Chemical prophylaxis** | Patient on warfarin? | | | | | | | | | | |
| | Should pt receive it? | | | | | | | | | | |
| | Was it prescribed? | | | | | | | | | | |
| | Rivaroxaban (R) or Enoxaparin (E) | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E | R / E |
| | Was prescribed dose correct? | | | | | | | | | | |
| | Was time administered correct? | | | | | | | | | | |
| | Correct action or opted out with reasoning (1) | | | | | | | | | | |
| **TED Stockings** | Should pt receive them? | | | | | | | | | | |
| | Did pt receive them? | | | | | | | | | | |
| | Ankle oedema, fragile skin, cellulitis? | | | | | | | | | | |
| | Correct action or opted out with reasoning (1) | | | | | | | | | | |
| Total score: /4 | | | | | | | | | | | |

**FIGURE 25. LAKES DISTRICT HEALTH BOARD SURGICAL VTE PROPHYLAXIS AUDIT TOOL**

## APPENDIX 6. A3 PROBLEM SOLVING SHEET

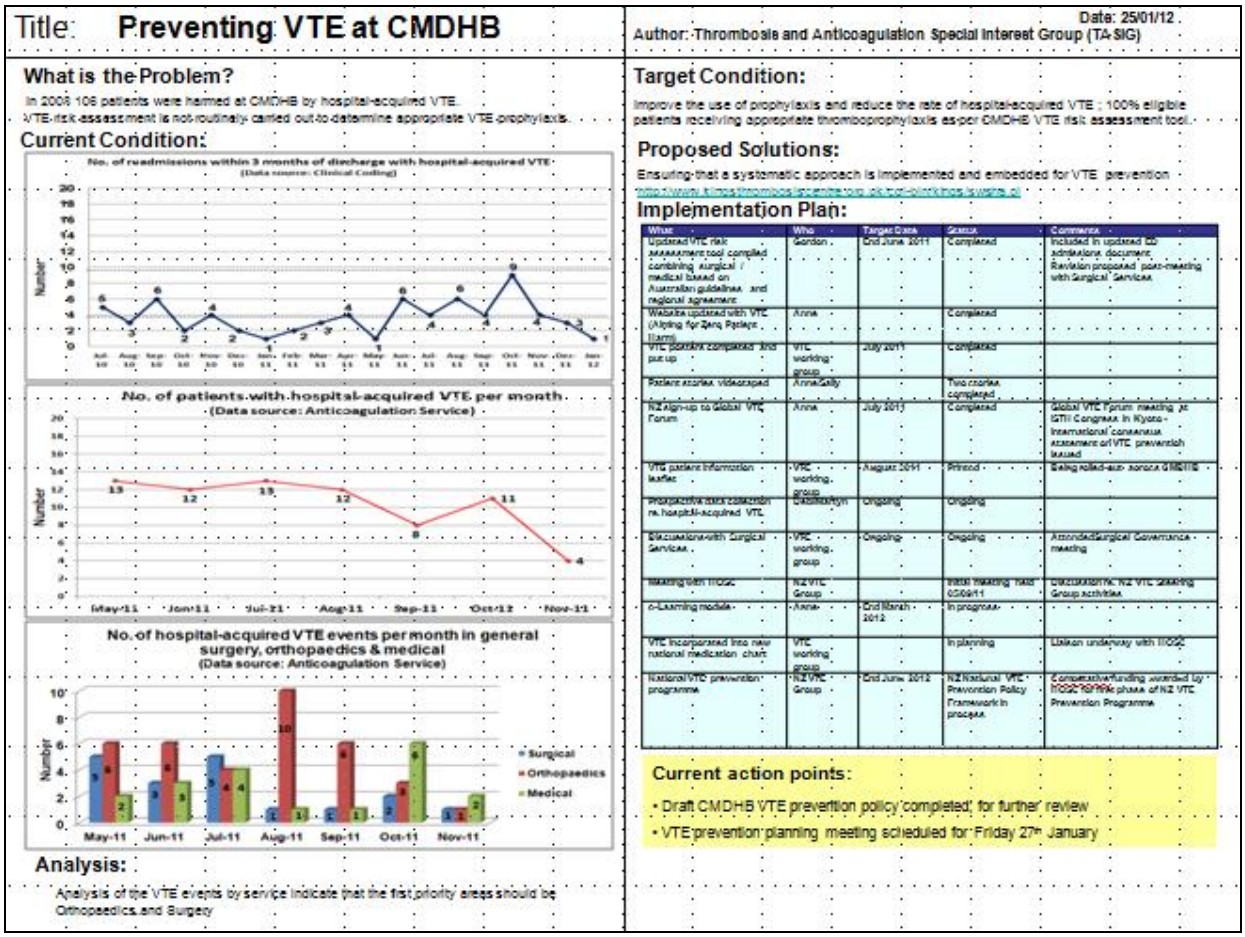



**FIGURE 24. COUNTIES MANUKAU DISTRICT HEALTH BOARD VTE PREVENTION A3 SHEET**

## APPENDIX 7: VTE PREVENTION PROMOTIONAL POSTERS

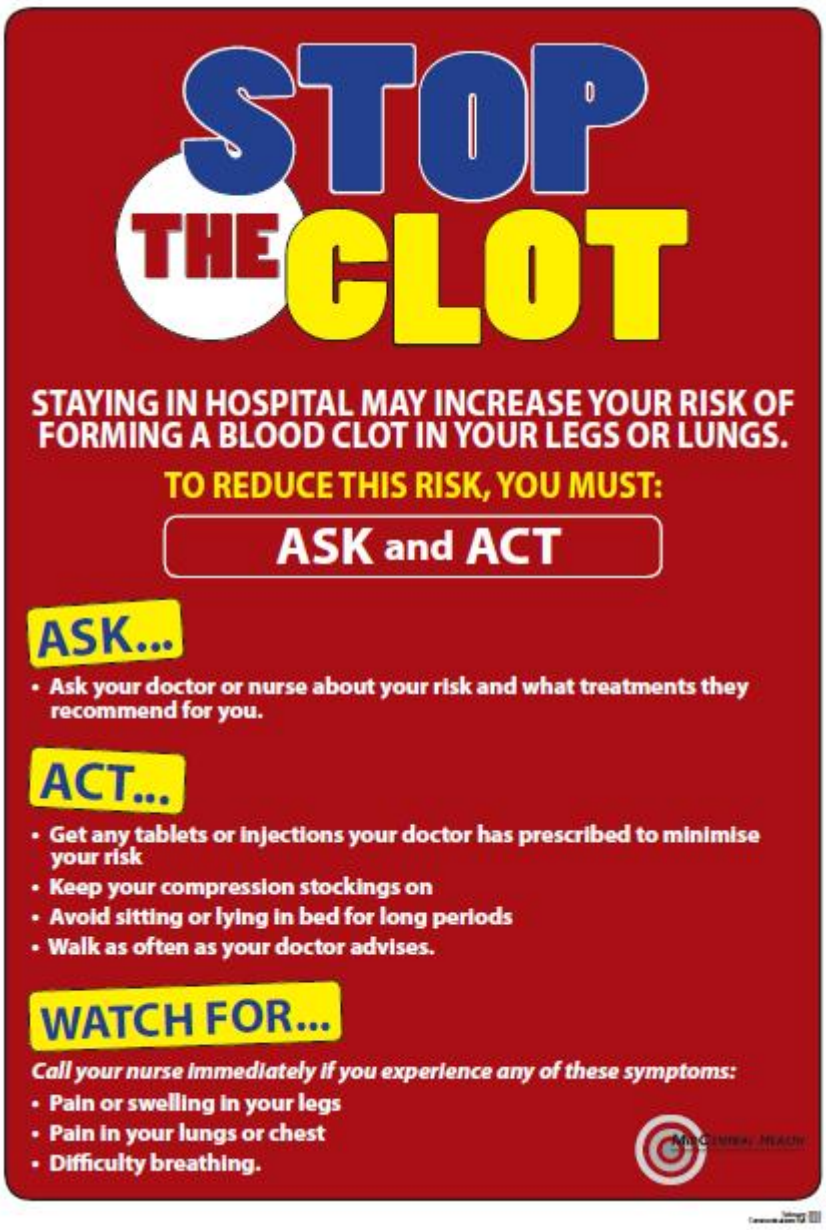



**FIGURE 25. MIDCENTRAL HEALTH STOP THE CLOT POSTER**


**FIGURE 26. COUNTIES MANUKAU DISTRICT HEALTH BOARD VTE PREVENTION POSTERS**

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