



TARGET AUDIENCE: All Canadian health care professionals.

OBJECTIVE:

To summarize a practical approach to the prevention of venous thromboembolism in patients undergoing non-orthopedic surgery.

ABBREVIATIONS:

DVT	deep vein thrombosis
ECS	elastic compression stockings
IPC	intermittent pneumatic compression
IVC	inferior vena cava
LMWH	low-molecular-weight heparin
PE	pulmonary embolism
UFH	unfractionated heparin
VTE	venous thromboembolism

BACKGROUND AND RATIONALE:

Venous thromboembolism (VTE) (see DVT: Diagnosis, DVT: Treatment and PE guides) is a frequent and yet relatively preventable cause of post-operative morbidity and mortality. Although the benefits of thromboprophylaxis are broadly recognized in this context, we still face the challenge of offering a tailored, procedure-specific, patient-specific regimen across all Canadian institutions.

The use of early ambulation, elastic compression stockings (ECS), intermittent pneumatic compression (IPC), low-dose unfractionated heparin (UFH) and low-molecular-weight heparin (LMWH) have all been shown to reduce VTE in patients undergoing surgery.

The need to tailor thromboprophylaxis regimens results from varying VTE and bleeding risks. Both VTE and bleeding risks are strongly affected by patient-specific and procedure-specific factors. Prophylaxis decisions have to rely on an understanding of the balance of these risks. It should be noted that in major orthopedic surgery, procedure-specific VTE risk is so high that patient-specific considerations do not significantly alter the VTE risk. Patient-specific considerations, however, are always essential to understanding bleeding risk.

RECOMMENDATIONS:

In non-orthopedic surgical patients, suggested thromboprophylaxis is summarized in the **Table** below. Risk-stratification for VTE seeks to stratify patients in very-low (<0.5%), low (~1.5%),

moderate (~3%), and high (~6%) risk categories using a validated model such as the Caprini score, which includes measures such as: age, type/duration of surgery, obesity, history of VTE or thrombophilia, presence of a central venous catheter (see Central Venous Catheter-Related DVT guide) and malignancy (see Cancer and Thrombosis guide). Risk of bleeding, analyzed in terms of frequency and severity, depends largely on the type of surgery; patients at highest risk include those undergoing plastic surgery with free flap, cardiac surgery, craniotomy, spinal surgery, and traumatic brain and spine surgery.

Decisions regarding pharmacological thromboprophylaxis in surgical patients should be made after consideration of risk factors for both VTE and bleeding. It is suggested that every institution have a written policy for thromboprophylaxis of VTE in surgical patients. In general, patients at moderate- and high-VTE-risk with at most a moderate bleeding risk should receive pharmacologic thromboprophylaxis. When such patients have a high bleeding risk, they should receive mechanical thromboprophylaxis with IPC.

Table: Suggested Thromboprophylaxis in Non-Orthopedic Surgery Patients

Patient Group	Prophylaxis options*	Duration
General and abdominal-pelvic surgery at very low risk for VTE (< 0.5%, Caprini score: 0)	No specific pharmacologic or mechanical prophylaxis other than early ambulation	n/a
General and abdominal-pelvic surgery at very low risk for VTE (1.5%, Caprini score: 1-2)	IPC/ECS (preferably IPC)	n/a
General and abdominal-pelvic surgery at moderate risk for VTE (3%, Caprini score: 3-4) <i>and</i> not at high risk for bleeding	LMWH or UFH IPC/ECS (preferably IPC)	7-10 days or until discharge
General and abdominal-pelvic surgery at moderate risk for VTE (3%, Caprini score: 3-4) <i>and</i> high risk for bleeding	IPC/ECS (preferably IPC)	7-10 days or until discharge
General and abdominal-pelvic surgery at high risk for VTE (6%, Caprini score: > 4) <i>and</i> not at high risk for bleeding	LMWH or UFH IPC/ECS (preferably IPC) should be added to pharmacologic prophylaxis	7-10 days or until discharge
General and abdominal-pelvic surgery at high risk for VTE (6%, Caprini score: >4) <i>and</i> high risk for bleeding	IPC/ECS (preferably IPC) Initiate LMWH or UFH when bleeding risk diminishes	7-10 days or until discharge
General and abdominal-pelvic <u>cancer</u> surgery at high risk for VTE (6%, Caprini score: > 4) <i>and</i> not at high risk for bleeding	LMWH	30 days

Patient Group	Prophylaxis options*	Duration
Cardiac surgery	IPC/ECS (preferably IPC) Add LMWH or UFH if hospitalization is prolonged.	7-10 days or until discharge
Thoracic surgery at moderate risk for VTE (3%, Caprini score: 3-4) <i>and</i> not at high risk for bleeding	LMWH or UFH or IPC/ES (preferably IPC)	7-10 days or until discharge
Thoracic surgery at high risk for VTE (6%, Caprini score: > 4) <i>and</i> not at high risk for bleeding	LMWH or UFH IPC/ECS (preferably IPC) should be added to pharmacologic prophylaxis	7-10 days or until discharge
Thoracic surgery at moderate or high risk for VTE <i>and</i> high risk for bleeding	IPC/ECS (preferably IPC) Initiate LMWH or UFH when bleeding risk diminishes	7-10 days or until discharge
Craniotomy	IPC/ECS (preferably IPC)	7-10 days or until discharge
Craniotomy at very high risk for VTE (e.g. cancer resection)	IPC/ECS (preferably IPC) Initiate LMWH or UFH when bleeding risk diminishes	7-10 days or until discharge
Spinal surgery	IPC/ECS (preferably IPC)	7-10 days or until discharge
Spinal surgery at very high risk for VTE (e.g. cancer resection)	IPC/ECS (preferably IPC) Initiate LMWH or UFH when bleeding risk diminishes	7-10 days or until discharge
Trauma surgery	LMWH or UFH or IPC/ECS (preferably IPC)	7-10 days or until discharge
Trauma surgery at very high risk for VTE (e.g. spinal cord injury, traumatic brain injury)	LMWH or UFH IPC/ECS (preferably IPC) should be added to pharmacologic prophylaxis (if not contraindicated by lower extremity trauma)	7-10 days or until discharge
Trauma surgery at high risk for bleeding	IPC/ECS (preferably IPC) Initiate LMWH or UFH when bleeding risk diminishes	7-10 days or until discharge

*Recommendations assume the patient has body weight 40-100 kg and creatinine clearance ≥ 30 mL/min. Patients outside these parameters may require dosage modification or an alternative prophylaxis method.

CAPRINI SCORE CALCULATOR:

Choose All That Apply

Each Risk Factor Represents 1 Point
<input type="checkbox"/> Age 41-60 years
<input type="checkbox"/> Minor surgery planned
<input type="checkbox"/> History of prior major surgery (< 1 month)
<input type="checkbox"/> Varicose veins
<input type="checkbox"/> History of inflammatory bowel disease
<input type="checkbox"/> Swollen legs (current)
<input type="checkbox"/> Obesity (BMI > 25)
<input type="checkbox"/> Acute myocardial infarction
<input type="checkbox"/> Congestive heart failure (< 1 month)
<input type="checkbox"/> Sepsis (< 1 month)
<input type="checkbox"/> Serious lung disease incl. pneumonia (< 1 month)
<input type="checkbox"/> Abnormal pulmonary function (COPD)
<input type="checkbox"/> Medical patient currently at bed rest
<input type="checkbox"/> Other risk factors _____

Each Risk Factor Represents 2 Points
<input type="checkbox"/> Age 60-74 years
<input type="checkbox"/> Arthroscopic surgery
<input type="checkbox"/> Malignancy (present or previous)
<input type="checkbox"/> Major surgery (> 45 minutes)
<input type="checkbox"/> Laparoscopic surgery (> 45 minutes)
<input type="checkbox"/> Patient confined to bed (> 72 hours)
<input type="checkbox"/> Immobilizing plaster cast (< 1 month)
<input type="checkbox"/> Central venous access

Each Risk Factor Represents 5 Points
<input type="checkbox"/> Elective major lower extremity arthroplasty
<input type="checkbox"/> Hip, pelvis or leg fracture (< 1 month)
<input type="checkbox"/> Stroke (< 1 month)
<input type="checkbox"/> Multiple trauma (< 1 month)
<input type="checkbox"/> Acute spinal cord injury (paralysis)(< 1 month)

Each Risk Factor Represents 3 Points
<input type="checkbox"/> Age over 75 years
<input type="checkbox"/> History of DVT/PE
<input type="checkbox"/> Family history of thrombosis*
<input type="checkbox"/> Positive Factor V Leiden
<input type="checkbox"/> Positive Prothrombin 20210A
<input type="checkbox"/> Elevated serum homocysteine
<input type="checkbox"/> Positive lupus anticoagulant
<input type="checkbox"/> Elevated anticardiolipin antibodies
<input type="checkbox"/> Heparin-induced thrombocytopenia (HIT)
<input type="checkbox"/> Other congenital or acquired thrombophilia
If yes: Type _____
*most frequently missed risk factor

For Women Only (Each Represents 1 Point)
<input type="checkbox"/> Oral contraceptives or hormone replacement therapy
<input type="checkbox"/> Pregnancy or postpartum (<1 month)
<input type="checkbox"/> History of unexplained stillborn infant, recurrent spontaneous abortion (≥ 3), premature birth with toxemia or growth-restricted infant

Total Risk Factor Score

ANTICOAGULANT DOSING:

LMWH should be dosed as per the respective manufacturer’s recommendations; common dosing includes:

- Dalteparin 5,000 U daily

- Enoxaparin 40 mg daily or 30 mg twice daily (30 mg twice daily in trauma surgery patients)
- Tinzaparin 4,500 U daily (75 U/kg daily in orthopedic surgery patients)

Unfractionated heparin is usually given as 5,000 U twice daily or 7,500 U twice daily (in higher risk patients).

The assistance of a clinical pharmacist may help identify special considerations such as extremes of weight (weight < 40 kg or > 100 kg) and renal dysfunction (creatinine clearance < 30 mL/min).

ADDITIONAL SUGGESTIONS:

Start of thromboprophylaxis: For most elective non-orthopedic surgery patients in whom thromboprophylaxis is recommended, anticoagulant prophylaxis should start at least 12 hours after surgery (usually the morning after surgery).

Duration of thromboprophylaxis: Although the optimal duration of thromboprophylaxis is not known for any non-orthopedic surgery group, in patients at moderate or high risk for VTE, prophylaxis should be given, ideally for 7-10 days, or at least until discharge from hospital. Extended-duration prophylaxis (30 days) is considered in patients having abdominal-pelvic cancer surgery.

Alternatives to LMWH or UFH: If LMWH and UFH are both contraindicated or unavailable for use, fondaparinux 2.5 mg daily or acetyl salicylic acid 81 mg daily can be considered as alternative prophylaxis options (assuming no high bleeding risk).

Inferior vena cava (IVC) filters: For general abdominal-pelvic surgery or major trauma surgery, IVC filters should not be used for primary VTE prevention (see Vena Cava Filter guide).

Venous compression ultrasound: For general abdominal-pelvic surgery or major trauma surgery, periodic surveillance for DVT with venous ultrasound should not be performed.

PEDIATRICS:

Evidence for the safety and efficacy of thromboprophylaxis in neonates and children is lacking. There may be high risk cohorts where thromboprophylaxis may be considered.

REFERENCES:

Bahl V, Hu HM, Henke PK, et al. A validation study of a retrospective venous thromboembolism risk scoring method. *Ann Surg* 2010;251:344-350.

Caprini JA. Thrombosis risk assessment as a guide to quality patient care. *Dis Mon* 2005;51:70-78.

Gould MK, Garcia DA, Wren SM, et al; American College of Chest Physicians. Prevention of VTE in nonorthopedic surgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed:

Please note that the information contained herein is not to be interpreted as an alternative to medical advice from your doctor or other professional healthcare provider. If you have any specific questions about any medical matter, you should consult your doctor or other professional healthcare providers, and as such you should never delay seeking medical advice, disregard medical advice or discontinue medical treatment because of the information contained herein.