Venous Thromboembolism Prophylaxis

The following chart provides information to guide decisions regarding VTE prophylaxis in common clinical scenarios. See our chart, *LMWH Dosing in Special Populations*, for dosing in under- or overweight patients, patients with kidney impairment, and pregnant/lactating patients. Our chart, *Anticoagulants in Pregnancy*, has additional information pertinent to this population.

Clinical Scenario	VTE Prophylaxis Options
NONsurgical INPATIENT with HIGH VTE RISK. Per ACCP guidelines, medical patients at **high risk of VTE** are those with a ≥4 Padua Prediction Score (see https://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/vtguide/appendixb2.html#b12). The IMPROVE VTE and bleeding risk scores might also be used to guide decision-making (https://www.outcomes-umassmed.org/IMPROVE/). Net benefit of prophylaxis continued beyond hospitalization is unlikely (e.g., for rivaroxaban continued for 45 days post-discharge, NNT = 417 to prevent one symptomatic VTE; NNH = 175 to cause clinically important bleeding).[17]	
High VTE risk, bleeding, or at high risk of bleeding	• Graduated compression stockings, or IPC for at least 18 hrs per day, for duration of immobilization or acute admission.[1]

High VTE risk, not bleeding, and not at high risk of bleeding	• Continue one of the following **for the duration of inpatient immobilization or acute admission**[1,20] (see exception for rivaroxaban, below).
	  • **LMWH**
	  • enoxaparin 40 mg SQ once daily (30 mg SQ once daily if CrCl <30 mL/min [Canada: 20 or 30 mg])[2,3]
	  • dalteparin 5,000 units SQ once daily.[6,7] Consider dose reduction (Canada) or monitoring factor Xa levels (US) in patients with severe kidney impairment (CrCl <30 mL/min).[6,7]
	  • nadroparin (Canada): 3,800 units (if ≤70 kg) to 5,700 units (>70 kg) SQ once daily.[8] Reduce dose by 25% to 33% if CrCl <30 mL/min. Also consider dose reduction for CrCl <50 mL/min.[8]
	  • **fondaparinux** (non-critical care patients[1,20]): 2.5 mg SQ once daily (avoid if CrCl <30 mL/min [contraindicated per US labeling]).[4,5,18]
	  • **heparin** 5,000 units SQ every eight to 12 hrs or 7,500 units SQ every 12 hrs.[10] (ASH: not preferred.[20])
	• Extended thromboprophylaxis with **rivaroxaban** (*Xarelto* for 31 to 39 days) per US labeling.[21] Not proven more effective than standard-duration enoxaparin.[21] (Note: new; not included in ACCP guidelines; ASH recommends inpatient-only LMWH instead.[20]) See our chart, *Comparison of Oral Anticoagulants*, for dosing, drug interactions, and therapeutic considerations.

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Clinical Scenario	VTE Prophylaxis Options
SURGICAL patient, NON-hip/knee arthroplasty. To assess VTE risk, the Caprini score (available at: https://capriniriskscore.org/assessment/) can be used.[12] For information on VTE prophylaxis post-hip/knee arthroplasty, see our chart, *VTE Prevention After Hip or Knee Replacement*.	
For **general or abdominal/pelvic surgery** patients at **low** risk of VTE (e.g., Caprini score 1 to 2)	• Mechanical prophylaxis (preferably with IPC for at least 18 hrs per day) is suggested.[12] • Optimal duration unknown. Continue at least until discharge.[14]
For **general or abdominal/pelvic surgery** patients at **moderate** risk of VTE (e.g., Caprini score 3 to 4), major bleeding **not** a concern	**Suggested options**: • LMWH (see footnote a)[12] OR • heparin 5,000 units SQ every eight to 12 hrs[12] OR • mechanical prophylaxis, preferably with IPC for at least 18 hrs per day.[12] • Optimal duration unknown. Continue at least until discharge.[14]
For **general or abdominal/pelvic surgery** patients at **moderate** risk of VTE (e.g., Caprini score 3 to 4), major bleeding a concern	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day is suggested.[12] • Optimal duration unknown. Continue at least until discharge.[14]
For **general or abdominal/pelvic surgery** patients at **high** risk of VTE (e.g., Caprini score ≥5), major bleeding **not** a concern	**Recommended options**: • LMWH (see footnote a)*[12] OR • heparin 5,000 units SQ every eight to 12 hrs*[12] AND • It is also suggested that elastic compression stockings, or IPC for at least 18 hrs per day, be **added**.[12] *If major bleeding is **not** a concern, but the patient cannot receive LMWH or heparin (e.g., allergy), alternative may include low-dose aspirin, fondaparinux (see footnote a), or mechanical prophylaxis, preferably IPC for at least 18 hrs per day.[12] • For patients undergoing abdominal or pelvic surgery **for cancer**, it is recommended that LMWH be continued for four weeks.[12] **For others**, optimal duration unknown. Continue at least until discharge.[14]

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Clinical Scenario	VTE Prophylaxis Options
SURGICAL patient, NON-hip/knee arthroplasty, continued	
For **general or abdominal/pelvic surgery** patients at **high** risk of VTE (e.g., Caprini score ≥5), major bleeding a concern	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is recommended.[12] • Optimal duration unknown. Continue until discharge.[14]
Cardiac surgery, uncomplicated post-op course	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is recommended.[12] • Optimal duration unknown. Continue until discharge.[14]
Cardiac surgery, post-op course prolonged due to **nonhemorrhagic** surgical complication	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is recommended.[12] AND • Addition of LMWH (see footnote a) or heparin 5,000 units SQ every eight to 12 hrs is suggested.[12] • Optimal duration unknown. Continue until discharge.[14]
Thoracic surgery, **moderate** VTE risk, not at high bleeding risk	**Suggested options**: • LMWH (see footnote a)[12] OR • heparin 5,000 units SQ every eight to 12 hrs[12] OR • mechanical prophylaxis, preferably with IPC for at least 18 hrs per day.[12] • Optimal duration unknown. Continue at least until discharge.[14]
Thoracic surgery, **high** VTE risk, not at high bleeding risk	**Suggested options**: • LMWH (see footnote a)[12] OR • heparin 5,000 units SQ every eight to 12 hrs*[12] AND • It is also suggested that elastic compression stockings, or IPC for at least be 18 hrs per day, be **added**.[12] • Optimal duration unknown. Continue at least until discharge.[14]
Thoracic surgery, **moderate** VTE risk, high **bleeding risk**	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is suggested.[12] • Optimal duration unknown. Continue at least until discharge.[14]

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Clinical Scenario	VTE Prophylaxis Options
SURGICAL patient, NON-hip/knee arthroplasty, continued	
Craniotomy, not at very high VTE risk	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is suggested.[12] • Optimal duration unknown. Continue until discharge.[14]
Craniotomy, **very high** VTE risk (e.g., cancer surgery)	• It is suggested that pharmacologic prophylaxis can be added to mechanical prophylaxis once hemostasis has been achieved and risk of bleeding has decreased (e.g., at least 12 to 24 hrs post-op).[12] • Optimal duration unknown. Continue at least until discharge.[14]
Spinal surgery, not at very high VTE risk	• Mechanical prophylaxis, preferably with IPC for at least 18 hrs per day, is suggested.[12] • Optimal duration unknown. Continue until discharge.[14]
Spinal surgery, **very high** VTE risk (e.g., cancer, combined anterior-posterior approach)	• It is suggested that pharmacologic prophylaxis can be added to mechanical prophylaxis once hemostasis has been achieved and risk of bleeding has decreased.[12] • Optimal duration unknown. Continue at least until discharge.[14]
Surgical patient, HIP/KNEE ARTHROPLASTY. For information on VTE prophylaxis post-hip/knee arthroplasty, see out chart, *VTE Prevention After Hip or Knee Replacement.*	
TRAUMA INPATIENTS	
Not at high VTE risk	**Suggested options**: • LMWH (see footnote a)[12] OR • heparin 5,000 units SQ every eight to 12 hrs[12] OR • mechanical prophylaxis, preferably with IPC for at least 18 hrs per day.[12] • Optimal duration unknown. Consider continuing until discharge from rehab.[14]
With high VTE risk (e.g., acute spinal cord injury, surgery for spinal injury, traumatic brain injury).	• It is suggested that pharmacology and mechanical prophylaxis (as above) be combined, if not contraindicated by lower extremity injury.[12] • Optimal duration unknown. Continue until discharge from rehab.[14] For spinal cord injury, it is reasonable to continue prophylaxis for three months, but a shorter course may be appropriate for patients who regain purposeful lower extremity movement.[12]

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Clinical Scenario	VTE Prophylaxis Options
CANCER (outpatients)	
No additional VTE risk factors	• It is suggested that prophylaxis (i.e., LMWH, heparin) **not** be routinely used. If prophylaxis is used, warfarin use is not recommended.[1]
With solid tumor and additional risk factor (history of VTE; immobilization; or treatment with hormone therapy, angiogenesis inhibitor, thalidomide, or lenalidomide)[1]	**Suggested options** (Canada: LMWH preferred):[1,13] • enoxaparin 40 mg SQ once daily.[11] Per labeled dosing for medical patients, 30 mg SQ once daily if CrCl <30 mL/min (Canada: 20 or 30 mg).[2,3] OR • dalteparin 5,000 units SQ once daily.[13] Per labeling for medical patients, consider dose reduction (Canada) or monitoring factor Xa levels (US) in patients with severe kidney impairment (CrCl <30 mL/min).[6,7] OR • tinzaparin (Canada) 4,500 units or 75 units/kg SQ once daily.[11,13] Per labeled dosing for surgical patients, use caution and consider dose reduction if CrCl <30 mL/min.[9] OR • nadroparin (Canada): 35 to 75 units/kg SQ once daily.[11] Per labeled dosing for medical patients 3,800 units (if ≤70 kg) to 5,700 units (>70 kg) SQ once daily.[8] Reduce dose by 25% to 33% if CrCl <30 mL/min., and also consider reducing dose for CrCl <50 mL/min.[8] OR • heparin 5,000 units SQ every eight to 12 hrs or 7,500 units SQ every 12 hrs.[10]
HISTORY of VTE, long-term prophylaxis after treatment (i.e., extended duration)	
VTE **provoked** by a **transient** risk factor, no active cancer or persistent risk factor (e.g., antiphospholipid syndrome)	• In the setting of a **MAJOR transient risk factor** (e.g., surgery with general anesthesia for >30 min., confinement to hospital bed for ≥3 days, cesarean section, major trauma) within the three months prior to the VTE, offering extended prophylaxis is recommended **against**.[15] • In the setting of a **MINOR transient risk factor** (e.g., surgery with general anesthesia for <30 min., hospital admission <3 days, outpatient bed rest or leg injury with reduced mobility for ≥3 days, prolonged plane or car travel, estrogen use, pregnancy or post-partum) within the two months prior to the VTE, offering extended prophylaxis is suggested **against**.[15]
VTE (first or recurrent), **unprovoked** or **provoked** by a **persistent** risk factor (e.g., **active cancer** [also see below], antiphospholipid syndrome)	• Offering extended prophylaxis with a DOAC (e.g., rivaroxaban 10 mg once daily, apixaban 2.5 mg twice daily) is **recommended**.[15] Consider risk/benefit and patient preference.[15] o Use warfarin if a DOAC can't be used.[15] Aspirin could be used but is much less effective than anticoagulants, with similar bleeding risk.[15] • See our chart, *Comparison of Oral Anticoagulants*, for dosing, drug interactions, and more. • Assess decision to continue use at least yearly and when clinical circumstances change.[15]

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Clinical Scenario	VTE Prophylaxis Options
HISTORY of VTE, long-term prophylaxis after treatment (i.e., extended duration), continued	
VTE, **active cancer**	• See our chart, *Cancer-Associated Thrombosis FAQs*, for additional guidance.[15]
Long-Distance TRAVELERS (e.g., trip lasting >4 hrs[22])	
Long distance travelers not otherwise at increased risk of VTE	• Graduated compression stockings, aspirin, and anticoagulants are NOT routinely recommended.[1,16,20] • General preventive measures are recommended.[16] For example: o walking every two or three hrs.[22] o choosing an aisle seat (lower VTE risk than window seat).[16] o exercises (e.g., ankle rolls or raises, leg stretches).[16,22,23] o not crossing legs.[24] o hydration and avoidance of alcohol and caffeine (dehydration is a risk factor).[16,19]
High VTE risk (e.g., recent surgery or trauma, VTE history, active cancer, pregnancy, estrogen replacement, oral contraceptives use, elderly, severe obesity, thrombophilic disorder)[1,16,19]	• **ACCP**: Frequent ambulation, aisle seating, and calf exercises are suggested. Below-knee graduated compression stockings with 15 to 30 mm Hg at the ankle are also suggested.[1] Guidelines suggest **against** aspirin or anticoagulants specifically for this use.[1] • **ACOG**: During pregnancy, support stockings, exercise/ambulation, loose clothing, and hydration can be advised.[25] • **Thrombosis Canada**: For patients with previous unprovoked or travel-related VTE, active cancer, recent surgery or trauma, ≥2 risk factors, including combinations of the above with obesity, limited mobility, advanced age, known thrombophilia, pregnancy, or estrogen use: if not on anticoagulation, graduated compression stockings at a strength of 20 to 30 mm Hg are recommended. In patients at very high-risk of thrombosis not already on an anticoagulant, a short course of anticoagulation (i.e., a single dose of LMWH [e.g., enoxaparin 1 mg/kg] or DOAC [less evidence] two to four hrs pre-flight[19]) could be considered (weighing risks and benefit and considering patient values and preferences).[16,19] • **ASH**: For patients with recent surgery, VTE history, postpartum, active cancer, or ≥2 risk factors, including combinations of the above with estrogen replacement, obesity, or pregnancy: graduated compression stockings or prophylactic LMWH (e.g., enoxaparin 1 mg/kg two to four hrs pre-flight[19]) is suggested for travel >4 hrs. If neither is feasible, aspirin is suggested.[20]

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Clinical Scenario	VTE Prophylaxis Options
Other OUTPATIENT Scenarios	
Extended-duration VTE prophylaxis in non-surgical medical patients	• Inpatient-only prophylaxis recommended over extended-duration prophylaxis in non-surgical medical patients.[20] ○ Prophylaxis continued beyond hospitalization has not proven net benefit vs in-hospital prophylaxis only.[17]
Outpatients with minor VTE risk factors (e.g., immobility, minor injury, infection, illness)	• VTE prophylaxis not recommended.[20]
Chronically immobilized patient at home or in a care facility	• It is suggested that prophylaxis not be routinely used.[1,20]
Thrombophilia, no VTE history	• VTE prophylaxis not recommended.[1]

Abbreviations: ACOG = American College of Obstetrics and Gynecology; ASH = American Society of Hematology; ACCP = American College of Chest Physicians; CrCl = creatinine clearance; DOAC = direct-acting oral anticoagulant; DVT = deep vein thrombosis; hrs = hours; IPC = intermittent pneumatic compression; LMWH = low-molecular-weight heparin; SQ = subcutaneous; VTE = venous thromboembolism.

a. **LMWH** and **fondaparinux** dosing for **surgical** patients (note: ACCP guidelines recommend consulting labeling for dosing. FDA and Health Canada labeling is based on data in abdominal or general surgery).[12]
   - **enoxaparin** (abdominal surgery): 40 mg SQ once daily, started two hrs pre-op (30 mg SQ once daily if CrCl <30 mL/min [Canada: 20 or 30 mg]), usually for seven to ten days (Canada: up to four weeks).[2,3]
   - **dalteparin** (abdominal surgery [US], general surgery [Canada]): 2,500 units SQ once daily starting one to two hrs pre-op. If high-risk (e.g., cancer) 5,000 units SQ once daily starting the evening before surgery **or** 2,500 units SQ one to two hrs pre-op, then 2,500 units 12 hrs later (Canada: no sooner than four hrs post-op and at least eight hrs after the previous dose, once hemostasis achieved), then 5,000 units once daily. Usually continued for five to ten days (Canada: at least five to seven days).[6,7] Consider dose reduction (Canada) or monitoring factor Xa levels (US) in patients with severe kidney impairment (CrCl <30 mL/min).[6,7]
   - **nadroparin** (Canada; general surgery): 2,850 units SQ once daily starting two to four hrs pre-op. Continue for at least seven days.[8] Reduce dose by 25% to 33% if CrCl <30 mL/min., and also consider for CrCl <50 mL/min.[8]
   - **tinzaparin** (Canada; general surgery): 3,500 units SQ once daily for seven to ten days, starting two hrs pre-op. Use caution and consider dose reduction if CrCl <30 mL/min.[9]
   - **fondaparinux** (abdominal surgery): 2.5 mg SQ once daily, usually for five to nine days (up to ten days in clinical trials), starting no sooner than six to eight hrs post-op, once hemostasis achieved; not for patients with severe kidney impairment.[4,5,18]

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