

## Prevention of Venous Thromboembolism\*

### American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)

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This article discusses the prevention of venous thromboembolism (VTE) and is part of the Antithrombotic and Thrombolytic Therapy: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). Grade 1 recommendations are strong and indicate that the benefits do or do not outweigh risks, burden, and costs. Grade 2 suggestions imply that individual patient values may lead to different choices (for a full discussion of the grading, see the "Grades of Recommendation" chapter by Guyatt et al). Among the key recommendations in this chapter are the following: we recommend that every hospital develop a formal strategy that addresses the prevention of VTE (Grade 1A). We recommend against the use of aspirin alone as thromboprophylaxis for any patient group (Grade 1A), and we recommend that mechanical methods of thromboprophylaxis be used primarily for patients at high bleeding risk (Grade 1A) or possibly as an adjunct to anticoagulant thromboprophylaxis (Grade 2A).

For patients undergoing major general surgery, we recommend thromboprophylaxis with a low-molecular-weight heparin (LMWH), low-dose unfractionated heparin (LDUH), or fondaparinux (each Grade 1A). We recommend routine thromboprophylaxis for all patients undergoing major gynecologic surgery or major, open urologic procedures (Grade 1A for both groups), with LMWH, LDUH, fondaparinux, or intermittent pneumatic compression (IPC).

For patients undergoing elective hip or knee arthroplasty, we recommend one of the following three anticoagulant agents: LMWH, fondaparinux, or a vitamin K antagonist (VKA); international normalized ratio (INR) target, 2.5; range, 2.0 to 3.0 (each Grade 1A). For patients undergoing hip fracture surgery (HFS), we recommend the routine use of fondaparinux (Grade 1A), LMWH (Grade 1B), a VKA (target INR, 2.5; range, 2.0 to 3.0) [Grade 1B], or LDUH (Grade 1B). We recommend that patients undergoing hip or knee arthroplasty or HFS receive thromboprophylaxis for a minimum of 10 days (Grade 1A); for hip arthroplasty and HFS, we recommend continuing thromboprophylaxis > 10 days and up to 35 days (Grade 1A). We recommend that all major trauma and all spinal cord injury (SCI) patients receive thromboprophylaxis (Grade 1A). In patients admitted to hospital with an acute medical illness, we recommend thromboprophylaxis with LMWH, LDUH, or fondaparinux (each Grade 1A). We recommend that, on admission to the ICU, all patients be assessed for their risk of VTE, and that most receive thromboprophylaxis (Grade 1A).  
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**Key words:** aspirin; deep vein thrombosis; fondaparinux; graduated compression stockings; heparin; intermittent pneumatic compression; low-molecular-weight heparin; pulmonary embolism; thromboprophylaxis; venous foot pump; venous thromboembolism; warfarin

**Abbreviations:** CABG = coronary artery bypass graft; CI = confidence interval; CVC = central venous catheter; DUS = Doppler ultrasonography; DVT = deep vein thrombosis; FUT = fibrinogen uptake test; GCS = graduated compression stockings; HFS = hip fracture surgery; HIT = heparin-induced thrombocytopenia; INR = international normalized ratio; IPC = intermittent pneumatic compression; IVC = inferior vena cava; LDUH = low-dose unfractionated heparin; LMWH = low-molecular-weight heparin; NNH = number needed to harm; NNT = number needed to treat; NS = not significant; OR = odds ratio; PE = pulmonary embolism; RAM = risk assessment model; RRR = relative risk reduction; SC = subcutaneous; SCI = spinal cord injury; THR = total hip replacement; TKR = total knee replacement; VFP = venous foot pump; VKA = vitamin K antagonist; VTE = venous thromboembolism

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## SUMMARY OF RECOMMENDATIONS

### 1.0 General Recommendations

#### *Hospital Thromboprophylaxis Policy*

**1.2.1. For every general hospital, we recommend that a formal, active strategy that addresses the prevention of VTE be developed (Grade 1A).**

**1.2.2. We recommend that the local thromboprophylaxis strategy be in the form of a written, institution-wide thromboprophylaxis policy (Grade 1C).**

**1.2.3. We recommend the use of strategies shown to increase thromboprophylaxis adherence, including the use of computer decision support systems (Grade 1A), preprinted orders (Grade 1B), and periodic audit and feedback (Grade 1C). Passive methods such as distribution of educational materials or educational meetings are not recommended as sole strategies to increase adherence to thromboprophylaxis (Grade 1B).**

#### *Mechanical Methods of Thromboprophylaxis*

**1.4.3.1. We recommend that mechanical methods of thromboprophylaxis be used primarily in patients at high risk for bleeding (Grade 1A), or possibly as an adjunct to anticoagulant-based thromboprophylaxis (Grade 2A).**

**1.4.3.2. For patients receiving mechanical methods of thromboprophylaxis, we recommend that careful attention be directed toward ensuring the proper use of, and optimal adherence with, these methods (Grade 1A).**

#### *Aspirin as Thromboprophylaxis*

**1.4.4. We recommend against the use of aspirin alone as thromboprophylaxis against VTE for any patient group (Grade 1A).**

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#### *Anticoagulant Dosing*

**1.4.5. For each of the antithrombotic agents, we recommend that clinicians follow the manufacturer-suggested dosing guidelines (Grade 1C).**

#### *Renal Impairment and Anticoagulant Dosing*

**1.4.6. We recommend that renal function be considered when making decisions about the use and/or the dose of LMWH, fondaparinux, and other antithrombotic drugs that are cleared by the kidneys, particularly in elderly patients, patients with diabetes mellitus, and those at high risk for bleeding (Grade 1A). Depending on the circumstances, we recommend one of the following options in this situation: avoiding the use of an anticoagulant that bioaccumulates in the presence of renal impairment, using a lower dose of the agent, or monitoring the drug level or its anticoagulant effect (Grade 1B).**

#### *Antithrombotic Drugs and Neuraxial Anesthesia/Analgesia or Peripheral Nerve Blocks*

**1.5.1. For all patients undergoing neuraxial anesthesia or analgesia, we recommend appropriate patient selection and caution when using anticoagulant thromboprophylaxis (Grade 1A).**

**1.5.2. For patients receiving deep peripheral nerve blocks, we recommend that the same cautions considered for neuraxial techniques be applied when using anticoagulant thromboprophylaxis (Grade 1C).**

### 2.0 General, Vascular, Gynecologic, Urologic, Laparoscopic, Bariatric, Thoracic, and Coronary Artery Bypass Surgery

#### *2.1 General Surgery*

**2.1.1. For low-risk general surgery patients who are undergoing minor procedures and have no additional thromboembolic risk factors, we recommend against the use of specific thromboprophylaxis other than early and frequent ambulation (Grade 1A).**

**2.1.2. For moderate-risk general surgery patients who are undergoing a major procedure for benign disease, we recommend thromboprophylaxis with LMWH, LDUH, or fondaparinux (each Grade 1A).**

**2.1.3. For higher-risk general surgery patients**

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