

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

Joab Ulises Calderón Barrientos¹, Melissa Delgado Cardona¹, Leslie Guerrero Álvarez¹, Iván Matías Maldonado Ventura¹, Jónathan Jair Cervantes Olivares², Martha Berenice Ochoa Mariscal³

¹Hospital Regional Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado. Irapuato, Guanajuato, México.

²Hospital General de Irapuato. Secretaría de salud. Irapuato, Guanajuato, Mexico

³Hospital General de Zona 1, Instituto Mexicano del seguro social. Tepic, Nayarit, México

ABSTRACT

Background: Hospitalized patients, particularly those with reduced mobility, postoperative status, or critical illness, are at an elevated risk of developing deep vein thrombosis (DVT) and subsequent venous thromboembolism (VTE). Pharmacologic thromboprophylaxis remains a cornerstone in mitigating this risk, yet the selection of anticoagulant agents, dosing regimens, and patient-specific factors necessitate careful consideration.

Objective: This review evaluates current evidence on anticoagulation strategies for DVT prevention in hospitalized patients, including pharmacologic options (unfractionated heparin, low-molecular-weight heparin, direct oral anticoagulants, and fondaparinux), risk stratification models, and special populations (renal impairment, obesity, and thrombocytopenia).

Methods: A systematic literature search was conducted across PubMed, EMBASE, and Cochrane databases, focusing on randomized controlled trials (RCTs), meta-analyses, and clinical guidelines from major societies (ACCP, ASH, and ISTH).

Results: Low-molecular-weight heparins (LMWHs) remain the preferred choice for most hospitalized patients due to their predictable pharmacokinetics and reduced monitoring requirements. However, direct oral anticoagulants (DOACs) are emerging as viable alternatives in select populations. Risk assessment tools such as the Padua and IMPROVE scores enhance personalized prophylaxis. Bleeding risk must be carefully weighed against thrombotic benefits, particularly in patients with comorbidities.

Conclusion: Individualized anticoagulation strategies, guided by risk stratification and patient-specific factors, are essential for effective DVT prophylaxis in hospitalized patients. Future research should focus on optimizing DOAC use in acute care settings and refining protocols for high-risk subgroups.

KEYWORDS: Venous thromboembolism (VTE), Deep vein thrombosis (DVT), Pharmacologic thromboprophylaxis, Low-molecular-weight heparin (LMWH), Direct oral anticoagulants (DOACs).

ARTICLE DETAILS

Published On:
15 July 2025

Available on:
<https://ijmscrs.com>

INTRODUCTION

Hospitalized patients face a significantly increased risk of venous thromboembolism (VTE), encompassing deep vein thrombosis (DVT) and pulmonary embolism (PE), due to

immobilization, systemic inflammation, and underlying comorbidities. The incidence of hospital-associated VTE remains a major cause of preventable morbidity and

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

mortality, emphasizing the critical role of thromboprophylaxis in inpatient care.^{1,2}

Anticoagulation therapy serves as the primary preventive measure, with options including parenteral agents (unfractionated heparin [UFH], low-molecular-weight heparin [LMWH], fondaparinux) and, increasingly, direct oral anticoagulants (DOACs). The choice of agent depends on factors such as renal function, bleeding risk, and clinical context (e.g., medical vs. surgical patients). Despite established guidelines from the American College of Chest Physicians (ACCP) and the International Society on Thrombosis and Haemostasis (ISTH), real-world implementation often faces challenges, including underutilization in medically ill patients and overuse in low-risk individuals.^{2,3}

BACKGROUND

Hospitalized patients represent a high-risk population for the development of deep vein thrombosis (DVT) and its potentially life-threatening sequela, pulmonary embolism (PE), collectively referred to as venous thromboembolism (VTE). The pathophysiological mechanisms underlying this increased risk are multifactorial, involving venous stasis due to immobilization, endothelial injury from surgery or trauma, and hypercoagulability induced by acute illness, inflammation, or malignancy. This triad, originally described by Virchow, remains a fundamental framework for understanding thrombosis risk in the inpatient setting.^{3,4}

The clinical significance of hospital-acquired VTE cannot be overstated, as it contributes to substantial morbidity, prolonged hospitalization, and increased healthcare costs. Critically ill patients, post-surgical cases, and those with active cancer or severe infections are particularly vulnerable, with reported DVT rates exceeding 20% in the absence of thromboprophylaxis. Despite widespread awareness of these risks, thromboprophylaxis remains underutilized in certain populations, while in others, inappropriate dosing or agent selection may lead to either therapeutic failure or hemorrhagic complications.^{4,5}

Pharmacologic prophylaxis has been the cornerstone of inpatient VTE prevention, with low-molecular-weight heparins (LMWHs) and unfractionated heparin (UFH) historically dominating clinical practice due to their established efficacy and reversible anticoagulant effects. However, the emergence of direct oral anticoagulants (DOACs) has introduced new considerations, particularly in medically ill patients and those transitioning from hospital to outpatient care. The optimal choice of anticoagulant must account for renal function, bleeding risk, drug interactions, and patient-specific factors such as obesity or thrombocytopenia.⁵

Beyond drug selection, risk stratification plays a pivotal role in guiding prophylaxis strategies. Validated assessment tools, such as the Padua Prediction Score for medical patients and

the Caprini Risk Assessment Model for surgical patients, help identify individuals who stand to benefit most from anticoagulation while avoiding unnecessary exposure in low-risk cohorts. Nevertheless, real-world implementation of these tools remains inconsistent, and ongoing research seeks to refine risk prediction models, particularly in specialized populations such as the critically ill or those with malignancy-associated thrombosis.⁵

The evolution of anticoagulation strategies has also brought attention to the challenges of bleeding complications, drug monitoring, and adherence. While LMWHs offer predictable pharmacokinetics and reduced monitoring needs compared to UFH, their use in renal impairment requires dose adjustments. Conversely, DOACs, despite their convenience, present limitations in patients with severe kidney dysfunction or those requiring rapid reversal. Furthermore, the timing of prophylaxis initiation—especially in post-operative settings—demands careful consideration to balance thromboprophylactic benefits against surgical bleeding risks.⁶

As the understanding of thrombosis risk and anticoagulant pharmacology advances, the paradigm of inpatient thromboprophylaxis continues to shift. Emerging evidence supports extended-duration prophylaxis in high-risk medical patients, while novel anticoagulants and personalized dosing algorithms are under investigation. The integration of multidisciplinary approaches, including pharmacist-led stewardship and electronic alert systems, may further optimize prophylaxis adherence and patient outcomes.⁶

Given these complexities, a comprehensive understanding of contemporary anticoagulation strategies is essential for clinicians managing hospitalized patients. This review aims to synthesize the latest evidence, providing a nuanced perspective on risk assessment, drug selection, and practical challenges in the prevention of hospital-associated DVT. By addressing key controversies and knowledge gaps, this discussion seeks to inform evidence-based decision-making in thromboprophylaxis, ultimately improving patient safety and reducing the burden of preventable VTE.⁶

RISK ASSESSMENT MODELS

The implementation of appropriate thromboprophylaxis strategies in hospitalized patients necessitates a rigorous and systematic approach to risk stratification, as the indiscriminate administration of anticoagulant therapy may expose low-risk individuals to unnecessary bleeding complications while failing to adequately protect high-risk patients from thromboembolic events. Contemporary clinical practice has evolved to incorporate validated risk assessment models (RAMs) that provide structured, evidence-based frameworks for evaluating individual patient risk factors and guiding prophylaxis decisions. These tools integrate both patient-specific variables and hospitalization-related factors

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

to generate comprehensive risk profiles that inform therapeutic interventions.⁷

The foundation of effective risk stratification lies in the recognition that venous thromboembolism (VTE) risk is not uniformly distributed across hospitalized populations but rather represents a dynamic interplay between inherited and acquired thrombotic predispositions. Well-established RAMs such as the Padua Prediction Score for medical patients and the Caprini Risk Assessment Model for surgical patients have demonstrated clinical utility in numerous validation studies, offering quantifiable metrics that correlate with observed thromboembolic event rates. These models typically incorporate variables including but not limited to advanced age, reduced mobility, active malignancy, history of prior VTE, known thrombophilic disorders, acute infectious or inflammatory states, and specific procedural risk factors such as prolonged operative times or major orthopedic interventions.^{7,8}

The Padua Prediction Score, specifically designed for medical inpatients, assigns weighted values to clinical parameters including cancer, reduced mobility, thrombophilia, recent trauma or surgery, advanced age, cardiovascular and respiratory failure, acute myocardial infarction or ischemic stroke, ongoing hormonal treatment, and obesity. Patients exceeding a predetermined threshold score are identified as high-risk candidates warranting pharmacologic prophylaxis, while those below the threshold may be appropriately managed with mechanical methods or early ambulation alone. The predictive validity of this model has been demonstrated across diverse medical populations, though ongoing refinements continue to optimize its sensitivity and specificity in specific subpopulations.^{7,8}

Surgical patients present unique challenges in VTE risk assessment due to the additional variables introduced by procedural factors, anesthetic techniques, and postoperative recovery trajectories. The Caprini RAM addresses these complexities through a comprehensive scoring system that evaluates over 40 individual risk factors, generating cumulative risk scores that correlate with recommended prophylaxis strategies and durations. High-risk surgical populations, particularly those undergoing major oncologic procedures or orthopedic interventions, frequently achieve scores mandating extended-duration pharmacologic prophylaxis that may continue into the post-discharge period. The model's strength lies in its adaptability to diverse surgical specialties and its ability to identify the highest-risk patients who may benefit from more aggressive thromboprophylaxis regimens.^{8,9}

Critical care populations require special consideration in risk assessment due to the frequent presence of multiple concurrent risk factors including immobility, central venous catheterization, sepsis, and multiorgan dysfunction. While

general medical and surgical RAMs retain some applicability in intensive care settings, specialized tools such as the IMPROVE score have been developed to address the unique thrombotic risks encountered in critically ill patients. These models incorporate parameters such as ICU stay duration, mechanical ventilation requirements, and markers of systemic inflammation to provide more nuanced risk stratification in this vulnerable population.^{9,10}

The practical implementation of these risk assessment tools in hospital settings has been facilitated through electronic medical record integration, with automated scoring algorithms that prompt clinicians to consider appropriate prophylaxis measures. However, the effectiveness of these systems depends critically on accurate data input and clinician engagement, as overreliance on automated scoring without clinical correlation may lead to inappropriate prophylaxis decisions. Furthermore, special populations such as oncology patients, pregnant women, and those with extreme body mass indices may require supplemental risk evaluation beyond standard scoring systems, as their thrombotic risks often exceed what conventional models predict.¹¹

Ongoing research continues to refine existing risk assessment methodologies, with particular focus on improving predictive value through incorporation of biomarkers such as D-dimer levels, genetic thrombophilia markers, and inflammatory cytokines. The development of dynamic risk models that can adjust prophylaxis recommendations based on changing clinical status throughout hospitalization represents an important frontier in personalized thromboprophylaxis. As these tools evolve, they promise to enhance our ability to precisely target anticoagulation therapy to those patients who stand to derive the greatest benefit while minimizing unnecessary exposure in low-risk individuals, thereby optimizing both patient outcomes and healthcare resource utilization.¹¹

INDICATIONS AND DOSING STRATEGIES

The selection of an appropriate anticoagulant regimen for venous thromboembolism (VTE) prophylaxis in hospitalized patients requires careful consideration of individual risk factors, clinical context, and pharmacologic properties of available agents. The primary goal is to mitigate the risk of deep vein thrombosis (DVT) while minimizing bleeding complications, necessitating a tailored approach based on patient-specific variables such as renal function, body weight, and concurrent medications.¹¹

Low-molecular-weight heparins (LMWHs) remain the most widely utilized agents for thromboprophylaxis in both medical and surgical inpatients due to their predictable pharmacokinetics, subcutaneous bioavailability, and reduced need for monitoring compared to unfractionated heparin (UFH). Enoxaparin, one of the most extensively studied

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

LMWHs, is typically administered at a dose of 40 mg once daily for standard prophylaxis in medical patients and those undergoing general surgery. In high-risk orthopedic procedures, such as total hip or knee arthroplasty, an adjusted dose of 30 mg twice daily or 40 mg once daily may be employed, with variations depending on institutional protocols and patient weight. Dalteparin, another commonly used LMWH, is generally dosed at 2500 or 5000 IU once daily, with the higher dose reserved for higher-risk scenarios such as major abdominal surgery in cancer patients.¹¹

Fondaparinux, a synthetic pentasaccharide that selectively inhibits factor Xa, represents an alternative for patients with a history of heparin-induced thrombocytopenia (HIT) and is typically administered at 2.5 mg once daily, though its prolonged half-life and lack of reversibility necessitate caution in renal impairment.¹¹

Unfractionated heparin, while less frequently used for routine prophylaxis due to its variable anticoagulant effect and requirement for frequent monitoring, still plays a role in specific clinical situations. The standard prophylactic dose is 5000 IU administered subcutaneously every 8 to 12 hours, with adjustments made in obese patients or those at particularly high thrombotic risk. UFH may be preferred in patients with severe renal dysfunction, where LMWH accumulation poses a concern, or in settings where rapid discontinuation may be required due to bleeding or invasive procedures.¹¹

Direct oral anticoagulants (DOACs) have emerged as viable options for extended-duration prophylaxis in select populations, particularly following major orthopedic surgery. Rivaroxaban, an oral factor Xa inhibitor, is approved for post-operative thromboprophylaxis in hip or knee replacement patients at a dose of 10 mg once daily, typically initiated 6 to 10 hours after surgical hemostasis is achieved. Apixaban, another factor Xa inhibitor, is used at a dose of 2.5 mg twice daily for the same indication. While DOACs offer the advantage of oral administration and fixed dosing, their use in acutely ill hospitalized patients is less established, and concerns regarding drug interactions, renal clearance, and lack of rapid reversal agents limit their routine application in the inpatient setting.¹²

Special populations require individualized dosing strategies to optimize efficacy and safety. In obese patients, particularly those with a body mass index exceeding 40 kg/m², standard LMWH dosing may be insufficient, and weight-based adjustments or anti-Xa level monitoring may be warranted. Conversely, in patients with renal impairment, dose reduction or alternative agents may be necessary to prevent drug accumulation and bleeding complications. For example, enoxaparin dosing should be reduced to 30 mg once daily in severe renal insufficiency, while fondaparinux is contraindicated in patients with a creatinine clearance below 30 mL/min. Critically ill patients, particularly those in intensive care units, present additional challenges due to

fluctuating hemodynamics, altered drug metabolism, and concurrent bleeding risks, often necessitating a multidisciplinary approach to thromboprophylaxis decision-making.¹²

The timing of prophylaxis initiation is another critical consideration, particularly in surgical patients. In elective procedures, LMWH is typically started 12 hours preoperatively or resumed 12 to 24 hours postoperatively, depending on bleeding risk. In trauma or emergency surgery, where immediate postoperative bleeding is a concern, delayed initiation may be prudent. Bridging strategies may also be required for patients on long-term anticoagulation who require temporary interruption for invasive procedures.¹²

Ultimately, the choice of anticoagulant and dosing regimen must be individualized, balancing thrombotic risk against bleeding potential while accounting for patient comorbidities, drug availability, and institutional protocols. Ongoing assessment during hospitalization is essential, as changes in clinical status, renal function, or bleeding events may necessitate regimen adjustments. As evidence continues to evolve, particularly regarding the role of DOACs in acute hospitalization, clinicians must remain vigilant in applying the most current, evidence-based practices to optimize patient outcomes.¹³

CONTRAINDICATIONS

The implementation of anticoagulation therapy for venous thromboembolism (VTE) prophylaxis in hospitalized patients necessitates careful evaluation of absolute and relative contraindications, as the potential benefits of thromboprophylaxis must be judiciously weighed against the risk of hemorrhagic complications. While the prevention of deep vein thrombosis (DVT) remains a critical patient safety priority, certain clinical scenarios mandate either complete avoidance or temporary withholding of pharmacologic prophylaxis due to unacceptably high bleeding risks that could lead to catastrophic outcomes.¹³

Active bleeding or recent major hemorrhage constitutes the most definitive contraindication to initiating anticoagulant therapy, as the pharmacologic inhibition of coagulation pathways could exacerbate existing hemorrhagic diathesis or impede hemostasis at sites of vascular injury. This includes but is not limited to intracranial hemorrhage, gastrointestinal bleeding with hemodynamic compromise, retroperitoneal hematoma formation, or postoperative bleeding in surgical sites where adequate hemostasis has not been achieved. The presence of severe coagulopathy, whether inherited or acquired, similarly precludes the safe administration of prophylactic anticoagulants until the underlying disorder has been appropriately managed and coagulation parameters stabilized.¹⁴

Patients with recent or planned invasive procedures represent another high-risk population where the timing of

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

anticoagulation requires meticulous consideration. Neurosurgical interventions, particularly those involving the brain or spinal cord, carry exceptional bleeding risks that often warrant temporary suspension of thromboprophylaxis due to the potentially devastating consequences of intracranial or epidural hematoma formation. Similarly, ocular procedures such as vitreoretinal surgery or patients with recent ocular trauma may necessitate avoidance of anticoagulation given the limited space for hemorrhage expansion in orbital compartments and the threat to visual acuity.¹⁴

Severe thrombocytopenia, typically defined as platelet counts below 50,000/ μ L, presents a significant contraindication to pharmacologic prophylaxis due to the compounded impairment of both primary (platelet-mediated) and secondary (coagulation cascade) hemostasis. The risk escalates dramatically with platelet counts below 30,000/ μ L, where spontaneous bleeding may occur even without anticoagulant exposure. In such cases, platelet transfusion support may be required before considering anticoagulant administration, particularly for patients at very high thrombotic risk.¹⁴

Heparin-induced thrombocytopenia (HIT), while not an absolute contraindication to all anticoagulants, represents a specific scenario where heparin-based products (including unfractionated heparin and low-molecular-weight heparins) must be strictly avoided due to the immune-mediated pathogenesis of this prothrombotic disorder. In these patients, alternative agents such as direct thrombin inhibitors or factor Xa inhibitors must be employed for both therapeutic and prophylactic indications.¹⁵

The presence of structural lesions prone to bleeding, such as vascular malformations, cerebral aneurysms, or extensive metastatic cancer with friable tumor vasculature, may constitute relative contraindications where the risk-benefit assessment must be carefully individualized. Similarly, patients with recent ischemic stroke may require temporary withholding of prophylaxis due to the risk of hemorrhagic transformation, particularly in large territorial infarcts.¹⁵

Severe, uncontrolled hypertension (typically defined as systolic blood pressure exceeding 180 mmHg or diastolic pressure above 110 mmHg) serves as another important contraindication, as the elevated intravascular pressure combined with anticoagulant effects significantly increases the likelihood of spontaneous intracranial hemorrhage. This risk persists until adequate blood pressure control is achieved through antihypertensive management.¹⁶

Hepatic dysfunction with associated coagulopathy presents unique challenges, as the impaired synthesis of both procoagulant and anticoagulant factors creates an unpredictable hemostatic balance. In cases of acute liver failure or severe cirrhosis with elevated international normalized ratio (INR), pharmacologic prophylaxis may

need to be deferred until coagulation parameters stabilize or alternative mechanical methods are employed.¹⁶

Renal impairment, while not an absolute contraindication, necessitates careful agent selection and dose adjustment. The accumulation of renally excreted anticoagulants such as low-molecular-weight heparins or direct oral anticoagulants may lead to excessive anticoagulant effects and subsequent bleeding complications in patients with severe renal insufficiency. In such cases, unfractionated heparin with its shorter half-life and non-renal clearance may be preferred, albeit with careful monitoring.¹⁷

The decision to withhold pharmacologic prophylaxis must always be accompanied by consideration of alternative mechanical methods (such as intermittent pneumatic compression devices) in high-risk patients, along with frequent reassessment for when pharmacologic intervention might safely be initiated. This dynamic risk assessment should occur throughout the hospitalization, as clinical conditions evolve and contraindications may resolve. Ultimately, the contraindications to pharmacologic thromboprophylaxis underscore the importance of individualized patient assessment and the careful balancing of thromboembolic and hemorrhagic risks in the inpatient setting.¹⁷

CONCLUSION

The prevention of deep vein thrombosis (DVT) in hospitalized patients through appropriate anticoagulation strategies represents a critical component of inpatient medical care, balancing the imperative of thromboprophylaxis against the inherent risks of bleeding complications. The complexity of this clinical decision-making process stems from the diverse patient populations encountered in hospital settings, each presenting unique risk profiles influenced by comorbidities, acuity of illness, and procedural interventions. Pharmacologic prophylaxis, while demonstrably effective in reducing venous thromboembolism (VTE) incidence, demands meticulous patient selection guided by comprehensive risk assessment tools that evaluate both thrombotic potential and hemorrhagic predisposition.

The evolution of anticoagulant therapies, from traditional heparins to contemporary direct oral anticoagulants, has expanded therapeutic options while introducing new considerations regarding pharmacokinetics, monitoring requirements, and reversal strategies. Low-molecular-weight heparins maintain their position as first-line agents for many hospitalized patients due to their established efficacy profile and manageable safety parameters, though emerging data continues to refine the role of alternative agents in specific clinical scenarios. The integration of novel oral anticoagulants into inpatient prophylaxis protocols remains an area of active investigation, particularly regarding optimal patient selection and transition between parenteral and oral therapies during care transitions.

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

Special populations, including those with renal impairment, extreme body weights, or hematologic disorders, require tailored approaches that account for altered drug metabolism and heightened susceptibility to adverse effects. The management of anticoagulation in critical care environments presents additional challenges, where dynamic physiologic changes and concurrent organ dysfunction necessitate frequent reassessment of thromboprophylaxis strategies. Furthermore, the appropriate duration of prophylaxis must be carefully considered, particularly for patients at elevated risk for post-discharge VTE events who may benefit from extended outpatient anticoagulation.

The successful implementation of hospital-wide thromboprophylaxis protocols hinges on multidisciplinary collaboration, incorporating physician judgment, pharmacist expertise, and nursing vigilance to ensure both adherence to evidence-based guidelines and recognition of individual patient factors that may warrant protocol deviations. Electronic medical record systems and clinical decision support tools have shown promise in improving appropriate prophylaxis ordering, though their effectiveness ultimately depends on clinician engagement and accurate risk stratification.

As medical knowledge advances, ongoing research continues to refine our understanding of optimal anticoagulation strategies, particularly in challenging patient subgroups and complex clinical scenarios. Future directions include the development of more precise risk prediction models, investigation of personalized dosing algorithms, and exploration of novel anticoagulant agents with improved safety profiles. Ultimately, the prevention of hospital-associated DVT through judicious anticoagulation represents a fundamental aspect of patient safety, requiring clinicians to maintain current knowledge of evolving evidence while exercising careful clinical judgment to optimize outcomes for this pervasive and potentially preventable complication of hospitalization.

REFERENCES

- I. Ho KM, Litton E: Venous thromboembolism prophylaxis in hospitalized elderly patients: time to consider a 'MUST' strategy. *J Geriatr Cardiol.* 2011, 8:114-20. 10.3724/SP.J.1263.2011.00114
- II. Phillippe HM: Overview of venous thromboembolism. *Am J Manag Care.* 2017, 23:376-82.
- III. Stashenko GJ, Tapson VF: Prevention of venous thromboembolism in medical patients and outpatients. *Nat Rev Cardiol.* 2009, 6:356-63. 10.1038/nrcardio.2009.33
- IV. Colling ME, Tourdot BE, Kanthi Y: Inflammation, infection and venous thromboembolism. *Circ Res.* 2021, 11:2017-36. 10.1161/circresaha.121.318225
- V. Heit JA: Epidemiology of venous thromboembolism. *Nat Rev Cardiol.* 2015, 12:464-74. 10.1038/nrcardio.2015.83
- VI. Learn About Healthcare-Associated Venous Thromboembolism. (2018). Accessed: September 19, 2023: <https://www.cdc.gov/ncbddd/dvt/ha-vte.html>.
- VII. Spencer FA, Gore JM, Lessard D, Douketis JD, Emery C, Goldberg RJ: Patient outcomes after deep vein thrombosis and pulmonary embolism: the Worcester Venous Thromboembolism Study. *Arch Intern Med.* 2008, 168:425-30. 10.1001/archinternmed.2007.69
- VIII. Hunter R, Noble S, Lewis S, Bennett P: Long-term psychosocial impact of venous thromboembolism: a qualitative study in the community. *BMJ Open.* 2019, 9:e024805. 10.1136/bmjopen-2018-024805
- IX. Leizorovicz A, Cohen AT, Turpie AG, Olsson CG, Vaitkus PT, Goldhaber SZ: Randomized, placebo-controlled trial of dalteparin for the prevention of venous thromboembolism in acutely ill medical patients. *Circulation.* 2004, 110:874-9. 10.1161/01.CIR.0000138928.83266.24
- X. Samama MM, Cohen AT, Darmon JY, et al.: A comparison of enoxaparin with placebo for the prevention of venous thromboembolism in acutely ill medical patients. *N Engl J Med.* 1999, 341:793-800. 10.1056/NEJM199909093411103
- XI. Kahn SR, Lim W, Dunn AS, et al.: Prevention of VTE in nonsurgical patients. *Chest.* 2012, 141:195-226. 10.1378%2Fchest.11-2296
- XII. Crowther M, Lim W: Low molecular weight heparin and bleeding in patients with chronic renal failure. *Curr Opin Pulm Med.* 2007, 13:409-13. 10.1097/MCP.0b013e328216430d
- XIII. Schrag D, Uno H, Rosovsky R, et al.: Direct oral anticoagulants vs low-molecular-weight heparin and recurrent VTE in patients with cancer: a randomized clinical trial. *JAMA.* 2023, 329:1924-33. 10.1001/jama.2023.7843
- XIV. Longo de Oliveira AL, de Oliveira Pereira RF, Agati LB, et al.: Rivaroxaban Versus Enoxaparin for Thromboprophylaxis After major Gynecological Cancer Surgery: The VALERIA Trial : Venous thromboembolism prophylaxis after gynecological pelvic cancer surgery with Rivaroxaban versus enoxaparin (VALERIA trial). *Clin Appl Thromb Hemost.* 2022, 28:10760296221132556. 10.1177/10760296221132556
- XV. Cohen AT, Davidson BL, Gallus AS, et al.: Efficacy and safety of fondaparinux for the prevention of venous thromboembolism in older acute medical patients: randomised placebo controlled trial. *BMJ.* 2006, 332:325-9. 10.1136/bmj.38733.466748.7C

Optimal Anticoagulation Strategies for Venous Thromboembolism Prophylaxis in Hospitalized Patients: A Comprehensive Review of Evidence-Based Practices

- XVI. Pappalardo F, Scandroglio A, Maj G, Zangrillo A, D'Angelo A: Treatment of heparin-induced thrombocytopenia after cardiac surgery: preliminary experience with fondaparinux. *J Thorac Cardiovasc Surg.* 2010, 139:790-2. 10.1016/j.jtcvs.2008.11.032
- XVII. Wein L, Wein S, Haas SJ, Shaw J, Krum H: Pharmacological venous thromboembolism prophylaxis in hospitalized medical patients: a meta-analysis of randomized controlled trials. *Arch Intern Med.* 2007, 167:1476-86. 10.1001/archinte.167.14.1476