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<p>Age-related alterations in renal function, protein binding, and increased bleeding risk must be considered prior to administering anticoagulants to the increasing elderly population. Clinical use of unfractionated heparin, low-molecular-weight heparin, and fondaparinux are reviewed with respect to their role in prevention and treatment of venous thromboembolism, as well as for treatment of acute coronary syndrome. In addition, heparin-induced thrombocytopenia, a potentially life-threatening adverse effect, is discussed with respect to both diagnosis and management.</p>	
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Laurie G. Jacobs	
<p>Warfarin, a vitamin K antagonist, is currently the most extensively used oral anticoagulant world-wide. It is prescribed for a variety of indications and has undergone extensive clinical study. Still, despite wide usage and considerable accumulated data from clinical trials demonstrating efficacy for a variety of thrombotic and thromboembolic conditions, warfarin is underutilized because its management is complex for both patients and physicians. However, despite these limitations, warfarin can be managed with relative safety, even in an elderly population.</p>	
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<p>Decades of research have been devoted to developing effective, safe, and convenient anticoagulant agents. In recent years, much emphasis has been placed on the development of direct thrombin inhibitors (DTIs) that offer benefits over agents like heparin and warfarin including the inhibition of both circulating and clot-bound</p>	

thrombin; a more predictable anticoagulant response, because they do not bind to plasma proteins and are not neutralized by platelet factor 4; lack of required cofactors, such as antithrombin or heparin cofactor II; inhibiting thrombin-induced platelet aggregation; and absence of induction of immune-mediated thrombocytopenia. Various injectable DTIs are currently available and used for many indications. In addition, research is now focusing on oral DTIs that seem promising and offer various advantages, such as oral administration, predictable pharmacokinetics and pharmacodynamics, a broad therapeutic window, no routine monitoring, no significant drug interactions, and fixed-dose administration.

Antiplatelet Agents and Arterial Thrombosis

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Henny H. Billett

There is an increase in arterial thrombotic events in the elderly. Elderly patients are more likely to have associated diseases, such as diabetes, hypertension and hypercholesterolemia, and when age is confounded by these other predisposing factors, the risk of an arterial ischemic event increases disproportionately. Antithrombotic therapy for geriatric patients is underused, even when one adjusts for potential drug contraindications. This article focuses on the action of the currently available antiplatelet agents—aspirin, clopidogrel, and glycoprotein IIb/IIIa (GPIIb/IIIa) receptor antagonists, and assesses their effects in different disease states, with special attention to data that examine the geriatric population.

Pathophysiology of Venous Thrombosis and the Diagnosis of Deep Vein Thrombosis–Pulmonary Embolism in the Elderly

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Geno J. Merli

Deep vein thrombosis and pulmonary embolism are common medical problems in a variety of patient populations. It is essential that practitioners involved in the management of these patients understand not only the pathophysiology but also the diagnosis of venous thromboembolism. This foundation will provide the basis for the best care of this disease entity.

Prevention of Venous Thromboembolism in the Geriatric Patient

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Daniel J. Brotman and Amir K. Jaffer

Elderly patients immobilized because of an acute medical illness or surgery have a very high risk of developing venous thromboembolism (VTE). Aggressive pharmacologic prophylaxis is necessary and should be initiated either at admission for a medical condition or shortly after surgery. Aggressive prophylaxis may result in fewer patients developing VTE in the hospital and ultimately lead to fewer patients requiring full-dose anticoagulation for VTE. Mechanical prophylaxis can be used as an adjunct to an anticoagulant-based regimen but should only be used as primary prophylaxis when there is a contraindication, such as active bleeding. It is recommended that the clinician carefully evaluate the elderly patient's creatinine clearance and weight before prescribing anticoagulants, particularly when using fixed dosing regimens.

Anticoagulant Treatment of Deep Vein Thrombosis and Pulmonary Embolism

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Huyen Tran, Simon McRae, and Jeffrey Ginsberg

Venous thrombosis is a common disease. As the mean age of the population increases, so does the incidence of venous thromboembolism. Anticoagulant therapy is equally effective in young and older patients, and can reduce substantially the associated

morbidity and mortality. When considering long-term oral anticoagulant therapy in older patients, however, careful ongoing evaluation is imperative to ensure that the risk of bleeding does not outweigh the antithrombotic benefits.

Antithrombotic and Thrombolytic Therapy for Ischemic Stroke

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Oriana Cornett, Lenore C. Ocava, Manjeet Singh, Samit Malhotra,
and Daniel M. Rosenbaum

Thrombolytic and antithrombotic agents form the cornerstone of stroke treatment and prevention. Recombinant tissue plasminogen activation (rt-PA) improves the outcome in patients treated within 3 hours of stroke onset. The risk-benefit ratio is narrow because of an increased risk for bleeding, but studies do not support a higher risk in the geriatric population. Emerging trials are directed at extending the therapeutic window and identifying agents that could provide better safety profiles. Large randomized trials have also highlighted the effectiveness and safety of early and continuous antiplatelet therapy in reducing atherothrombotic stroke recurrence. Aspirin has become the antiplatelet treatment standard against which several other antiplatelet agents have been shown to be more effective. The prevention of cardioembolic stroke is best accomplished with oral anticoagulation, barring any contraindications.

Reducing the Risk for Stroke in Patients Who Have Atrial Fibrillation

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David A. Garcia and Elaine Hylek

Warfarin is highly effective at reducing the risk of stroke in AF. The benefit of oral anticoagulant therapy strongly outweighs the risk in most patients who have AF. More data are needed to define the overall risk-to-benefit ratio better for patients aged 80 years and older. Because a significant proportion of elderly individuals may not be optimal candidates for anticoagulant therapy, we must continue to evaluate alternative stroke prevention strategies while redoubling our efforts to understand the mechanisms underlying AF and thrombogenesis.

Chronic Antithrombotic Therapy in Post-Myocardial Infarction Patients

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Rangadham Nagarakanti, Sandeep Sodhi, Robert Lee, and Michael Ezekowitz

Because 1.1 million myocardial infarctions occur in the United States alone each year, and 450,000 of them are recurrent infarctions, which carry an inherently greater risk of death and disability than first events, the importance of secondary prevention strategies that can be implemented widely is unparalleled in health care. Antithrombotic therapies, both antiplatelet and anticoagulant, have become the mainstays of these strategies. This article covers the use of chronic antiplatelet and anticoagulation agents after myocardial infarction. It does not include the management of these patients in the acute phase.

Antithrombotic Therapy in Peripheral Arterial Disease

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Evan C. Lipsitz and Soo Kim

The management of elderly patients with peripheral arterial disease requires a multidisciplinary and individualized approach, especially for patients requiring intervention and for those on antithrombotic therapy. Communication between the patient's primary physician, consulting medical specialists, and vascular surgeon is essential because all may contribute synergistically to deliver optimal care to the patient. This article reviews the pathophysiology of peripheral arterial disease and data regarding the use of antiplatelet and anticoagulant agents.

Perioperative Management of Oral Anticoagulation

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Martin O'Donnell and Clive Kearon

Based on an individual assessment of risk factors for arterial or venous thrombosis and the risk of postoperative bleeding, this article outlines the preoperative and postoperative approach to anticoagulant management. Preceding this is a brief description of the therapies most commonly used in the perioperative period. The prevention of arterial thromboembolism is considered separately from the prevention of venous thrombosis. Perioperative management of anticoagulation can cause anxiety for patients, surgeons, anesthetists, and those who manage long-term anticoagulant therapy. Good communication between all of these parties is essential to ensure that an optimal management strategy is identified and executed.

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