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Opinion article

Integrating Clinical Risk and Preventive Care in Thromboembolism Management

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DESCRIPTION

Thromboembolism remains a significant clinical challenge, particularly in populations with heightened susceptibility due to physiological, pathological, or treatment-related factors. While the condition can occur in otherwise healthy individuals, certain groups-such as pregnant women, patients with cancer, and individuals undergoing major surgery-experience increased risk of clot formation and embolic complications. Understanding the pathophysiology, clinical manifestations, and preventive strategies in these populations is critical for reducing morbidity and mortality.

Pregnancy represents a unique state in which thromboembolic risk is elevated. Hemodynamic changes, including increased blood volume and reduced venous return due to uterine compression, contribute to venous stasis in the lower extremities. Hormonal fluctuations, particularly elevated estrogen levels, enhance coagulation factor activity, creating a transient hypercoagulable state. These physiological adaptations, while essential for minimizing hemorrhage during delivery, increase the likelihood of venous thromboembolism. Clinically, pregnant patients may present with unilateral leg swelling, pain, or tenderness, which may be subtle and mistaken for normal pregnancy discomfort.

Patients with malignancy also demonstrate a heightened propensity for thromboembolism due to multiple interacting mechanisms. Tumor cells can directly activate the coagulation cascade and release pro-thrombotic factors, while certain chemotherapeutic agents and indwelling central venous catheters further increase clotting risk. In cancer patients, thromboembolic events may occur even in the absence of classic risk factors, and clot formation may recur despite standard anticoagulation therapy.

Surgical patients represent another high-risk group for thromboembolic complications. Major operations, particularly orthopedic, abdominal, and pelvic procedures, often involve prolonged immobility and tissue trauma, which promote clot formation through both venous stasis and endothelial injury. Perioperative thromboprophylaxis, including pharmacologic anticoagulants and mechanical compression devices, is standard practice to mitigate risk. Early postoperative mobilization is equally important, as even brief periods of activity can significantly reduce venous pooling and thrombus development.

The pathophysiology of thromboembolism in these populations reflects the convergence of stasis, endothelial injury, and hypercoagulability. These mechanisms often act synergistically, increasing the likelihood of clot formation and subsequent embolization. Clots that originate in the deep veins of the lower extremities may migrate to the pulmonary vasculature, producing pulmonary embolism, while arterial thromboembolism can arise from cardiac sources such as atrial fibrillation or mural thrombi in patients with myocardial injury.

Diagnosis in high-risk populations requires careful clinical assessment supplemented by imaging and laboratory evaluation. Ultrasonography is frequently employed for deep vein thrombosis, while computed tomography angiography or magnetic resonance imaging is used for pulmonary embolism. Laboratory markers, including D-dimer levels, can support suspicion but must be interpreted cautiously in pregnancy, cancer, and postoperative states, as baseline elevations may occur. Prompt recognition of thromboembolism is essential to prevent progression and improve outcomes.

Management strategies in these groups emphasize both acute treatment and preventive care. Anticoagulation remains the mainstay of therapy, but dosing and choice of agent may require adjustment based on renal function, bleeding risk, and pregnancy status. In severe cases, thrombolysis or surgical thrombectomy may be necessary to restore circulation. Long-term anticoagulation is often indicated for patients with persistent risk factors or recurrent thromboembolism. Patient education is essential, focusing on recognizing warning signs, adhering to medication regimens, and avoiding prolonged immobility.

Preventive strategies extend beyond pharmacological interventions. Mechanical measures, such as graduated compression stockings and intermittent pneumatic compression devices, reduce venous stasis. Lifestyle modifications, including

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regular movement during long periods of travel or work, adequate hydration, and weight management, further decrease thromboembolic risk. In high-risk patients, clinicians must maintain vigilance for subtle signs of clot formation and implement timely interventions.

CONCLUSION

Thromboembolism in high-risk populations poses significant challenges due to the convergence of physiological, pathological, and treatment-related risk factors. Pregnancy, malignancy, and surgery exemplify situations in which clot formation can occur rapidly and lead to severe complications. Through careful assessment, preventive strategies, individualized anticoagulation, and patient education, the incidence and impact of thromboembolism in these populations can be minimized.