

Surgeon General's Perspectives

PREVENTION OF DEEP VEIN THROMBOSIS AND PULMONARY EMBOLISM

In May 2006, former U.S. Surgeon General Richard H. Carmona, in conjunction with the National Heart Lung and Blood Institute, hosted the Surgeon General's Workshop on Deep Vein Thrombosis (DVT). The goal of this meeting was to raise awareness about DVT and Pulmonary Embolism (PE) and identify new areas of research related to venous biology, DVT, PE, their complications, and clinical interventions. At the end of the workshop, Dr. Carmona charged the participants with developing a Surgeon General's Call to Action on DVT and PE, with the goal of reaching out not only to all health professionals (including physicians, nurses, paramedics, emergency medical teams, and others involved in treating this multifactorial disease), but also to the public at large to create greater awareness of and demand for appropriate prevention and treatment of DVT.

DVT and PE result in many preventable deaths each year. Estimates suggest that at least 100,000 deaths may be directly or indirectly related to DVT and PE each year, with some 350,000, and perhaps as many as 600,000, Americans falling victim to DVT and PE annually.¹⁻³ These statistics are alarming as there are currently preventive measures available to decrease these numbers. Many people do not know about the harmful effects of DVT and PE, and it is vital that word about this public health concern is spread throughout our nation.

DVT is the formation of a blood clot, or thrombus, in a deep vein—most commonly the lower leg. The blood clot restricts blood circulation through the blocked area, leading to symptoms that can include pain, swelling, redness of the leg, and dilation of the surface veins. One-third of DVT patients develop a PE that can be a life-threatening event. A PE happens when a part of the blood clot breaks off and travels through the circulation to the heart and into the lungs, completely or partially blocking a pulmonary artery. Symptoms of a PE can include pain in the chest while breathing, circulatory instability, and difficulty breathing.

Many factors increase the probability that an individual will experience a DVT, including recent surgery and hospitalization. Other risk factors for DVT include,



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but are not limited to, age, obesity, infection, immobilization, hormone therapy, tobacco use, pregnancy, and air travel.

DVT and PE disproportionately affect the elderly; the incidence of DVT and PE is much lower for children than for adults. The number of people younger than 50 years of age affected by DVT and PE is about one per 100,000 people a year. Once people reach the age of 50, the incidence rapidly increases—to about 1,000 cases per 100,000 people a year by age 85.² After age 50, men are at greater risk than women for DVT.² African American men and women have a 30% higher chance of getting a DVT than Caucasians for reasons that are not understood.⁴

Along with age and sex, genetics play a role in the likelihood of suffering a DVT or PE. Thrombophilia, the tendency to develop blood clots, is a genetic condition often found in people who have recurring episodes of DVT. Thirty-five percent of DVT patients have one of five genetic factors related to DVT. These factors include deficiencies in anticoagulation factor genes protein C, protein S, antithrombin, prothrombin, and factor V. *Factor V Leiden* is a genetic mutation that is found in 15% to 20% of all DVT cases. The *Factor*

V Leiden mutation leads to factor V that is not easily inactivated by protein C, resulting in hypercoagulability and increased incidence of blood clots.

Women who take hormone therapy, especially estrogen, are at an increased risk of developing blood clots. Specifically, oral contraceptives that contain both estrogen and progestin increase the risk of a blood clot by two to eight times. Therefore, it is important that women who use these oral contraceptives are aware of the increased risks. Also, in some cases, it may be favorable for women to undergo testing for genetic mutations related to thrombophilia before they begin hormone therapy.

Those undergoing surgery should be monitored carefully for the development of a DVT; the associated lack of ambulatory movement raises the risk for DVT and PE. Patients need to be evaluated for the use of appropriate preventive measures. One prevention method that can be used for surgical patients is to administer Low Molecular Weight Heparin (LMWH). LMWH is an anticoagulant that inactivates thrombin—one of the key enzymes in the coagulation cascade—leading to the disruption of blood clot formation.

Another prophylactic measure is increasing the amount of ambulatory movement for postoperative patients. Walking increases the amount of blood flow in patients, leading to a decreased probability of blood clot formation. Additionally, intermittent pneumatic compression (IPC) can be used for patients who are wheelchair- or bed-bound. IPC machines use an air bladder wrapped around the thigh or calf that inflates and deflates, squeezing the muscle to increase blood flow. For some patients, taking up to 150 mg of aspirin a day is a good preventive measure because it acts as a blood thinner, allowing for fluid movement of blood throughout the body.

Due to a relative lack of mobility and dehydration, DVT and PE may occur among people traveling on long airplane flights. Individuals who will be taking long trips on planes, trains, and automobiles should exercise their lower extremities by standing up and walking around at regular intervals to increase the blood flow through their legs.

Another important aspect of prevention is encouraging patients to share their family health history with their health-care providers. Family health history may help identify those individuals at high risk for DVT so that prevention measures can be identified and put into place. Because there are many genetic predispositions that can increase the chances for DVT, knowing a patient's family health history, including any genetic mutations, allows clinicians to better assess an individual's risk for developing a DVT.

The long-term sequelae and economic effects of DVT are other considerations related to this public health issue. Those who survive a DVT or PE may live with chronic disorders that often lead to repeat episodes, additional hospitalizations, and complex treatment plans. For example, about 30% of those who are initially affected by a DVT are likely to have another event within eight years.⁵ Many DVT patients also suffer from post-thrombotic syndrome, which occurs when a blood clot destroys one or more of the venous valves located in the deep veins of the leg, within 10 to 20 years of the initial episode. Valve damage leads to leg pain, skin breakdown, ulcers, brownish skin pigmentation changes, and chronic burning.

The economic toll is more far-reaching than the direct medical costs incurred as a result of suffering a DVT or PE. Those affected can have trouble remaining productive members of the workforce, creating financial hardship in the face of mounting medical bills and lapsed wages from missed workdays. Overall, there may be long-term effects that arise from a person's initial occurrence of a DVT. Therefore, it is imperative that clinicians and patients are aware of DVT and PE and what they can do to prevent them.

I encourage you to become aware of the risk factors for and the serious consequences of DVT and PE. Early prevention, diagnosis, and treatment of DVT and PE are vital to decreasing the number of people who are affected or who die each year from these conditions.



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