Venous Thromboembolism: Mechanisms, Treatment, and Public Awareness

CDC Division of Blood Disorders
Public Health Research Activities in Venous Thromboembolism

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Venous thromboembolism (VTE) includes both deep vein thrombosis (DVT) and pulmonary embolism (PE), and is an important and growing public health issue. The precise number of people affected by VTE is unknown. However, based on prospective studies, VTE is estimated to affect 300,000 to 600,000 (1 to 2 per 1000) people in the United States annually. Not only is the high prevalence of VTE an important and growing public health issue. The precise number of people affected by VTE is unknown. However, based on prospective studies, VTE is estimated to affect 300,000 to 600,000 (1 to 2 per 1000) people in the United States annually. Not only is the high prevalence of VTE associated with substantial morbidity (one-third of people with DVT will have complications associated with post-thrombotic syndrome), but it is also the cause of substantial mortality with 30% of persons with VTE dying within 1 month of diagnosis and about 25% of those with PE presenting with sudden death. In addition, many affected (about 30%) will experience recurrence of DVT/PE within 10 years of an initial DVT/PE. Fortunately, much of the morbidity and mortality associated with VTE is preventable with early and accurate diagnosis and management. However, one of the major challenges for preventing VTE is the ability to effectively predict which individuals are at greatest risk and ensure access to appropriate care.

VTE is a multifactorial disease involving both genetic and acquired risks in all age groups; however, the interplay of these risk factors on disease expression is not fully understood. Many of the acquired risks such as obesity, advanced age, air travel, and chronic diseases are increasing in the US population, suggesting that we can expect to see increasing numbers of people affected by VTE. Awareness of VTE is crucial; because many healthcare providers and individuals at risk are unaware of the signs and symptoms of VTE, opportunities for providing primary prevention and preventive prophylaxis are often missed.

The Division of Blood Disorders (DBD) located in the National Center on Birth Defects and Developmental Disabilities at the Centers for Disease Control and Prevention (CDC) http://www.cdc.gov/ncbddd/hbd/default.htm includes in its mission the prevention of VTE and its complications. The division has 3 teams, the Epidemiology and Surveillance, Laboratory Research (molecular and clinical hemostasis), and Prevention Research, that work closely together to meet the division’s goals through research of VTE determinants, complications, and outcomes while also promoting education and outreach needed to raise awareness of VTE among the general public and healthcare providers. Activities in which the CDC is engaged for the prevention of VTE include the following:

- Conducting research to identify genetic and acquired risk factors of thrombosis
  - Many of the known genetic risk factors for VTE have been discovered in European populations, including Factor V Leiden and Prothrombin G20210A polymorphisms, but many genetic factors have yet to be elucidated among non-White populations. The Genetic Attributes of Thrombosis Epidemiology (GATE) Study, a cooperative agreement with Emory University’s Rollins School of Public Health, aims to address this gap in knowledge by evaluating genetic variations and hemostatic biomarkers in a racially diverse population. The case-control study involves over 1200 cases of VTE in both Blacks and Whites. Recently researchers demonstrated an increase risk of VTE among those persons who have sickle cell trait.

- Conducting research on the risk of adverse pregnancy outcomes for those affected by thrombosis and thrombophilia
  - Currently CDC is collaborating with researchers from Duke University, Robert Wood Johnson Medical School, and the University of Utah, to conduct a multisite case-control study to investigate the association between the presence of maternal and fetal thrombophilic biomarkers and the occurrence of intrauterine growth restriction.

Funding of a Thrombosis and Hemostasis Centers Research and Prevention Network to foster collaborative epidemiological research to identify risks (both genetic and acquired) among a US population and ultimately improve diagnosis and treatment

- The network was established in July of 2007 following the work of the Thrombosis and Hemostasis Centers Pilot Sites. The present funded centers include: Duke University, the Mayo Clinic, the University of North Carolina at Chapel Hill, Robert Wood Johnson Medical School, and the University of Colorado.

- These centers provide an opportunity for broad population-based research of VTE as the present registry includes over 4000 patients, ranging from newborn to 90 years and including all racial groups. Although about half of these

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patients have experienced a VTE, the centers provide services to patients with other thrombotic conditions including thrombophilia, arterial thrombosis, and pregnancy concerns and management. The centers are initiating protocols that will use the DBD laboratory to assess the contribution of coagulation and inflammatory genes and proteins to the risk of VTE.

Supporting education and outreach activities to provide health promotion and wellness programs for people affected by clotting disorders at both the community and national level.

- Currently CDC is analyzing national health survey data to determine public awareness about DVT (ie, does the public know the meaning of VTE/DVT, the signs and symptoms, and the factors that predispose to developing VTE/DVT). Information from this survey will be used to develop messages to increase DVT awareness that will be shared with partners.

- CDC is funding a health promotion and wellness initiative to provide the public with health information regarding the prevention of VTE and its complications. CDC is working with the National Alliance for Thrombosis and Thrombophilia (http://www.nattinfo.org/, a community-based organization whose mission is to prevent, and optimize diagnosis and treatment, of thrombosis and thrombophilia through research, education, support, and advocacy) to develop and disseminate health information for the public, and develop a training program for nonphysician health care providers.

Enhancing laboratory research capacity by providing collaborative services to investigators ranging from subject matter expertise to laboratory analysis and assay development and validation techniques

- The clinical hemostasis laboratory analyzes and develops new assays to detect proteins involved in the coagulation, anticoagulation, and fibrinolytic pathways using both high-throughput and robotic platforms.

- The molecular hemostasis laboratory conducts research in thrombogenetics (the genetics of thrombosis) and the analysis of inflammation-associated proteins. These activities include high-throughput genotyping, resequencing of candidate genes, and whole genome scans associated with thromboembolic disorders.

Although there are estimates on the prevalence of VTE, a major challenge facing public health research of VTE is quantifying the true public health burden. Thus, future activities will include population-based surveillance of VTE to develop more accurate incidence and prevalence estimates.

**Disclosures**

None.

**References**


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