

# Thrombosis

## Risk factors among pediatric patients with cancer

Gina M. Newman, MSN, CPNP-AC, CPHON®

**BACKGROUND:** Thrombosis is the formation of a blood clot, or thrombus, inside of a blood vessel. Pediatric patients with cancer are at a higher risk of developing a thrombus because of their underlying disease, as well as their treatment and supportive care. Thrombosis can lead to significant morbidity, such as pulmonary embolism, in pediatric patients with cancer.

**OBJECTIVES:** The purpose of this study is to identify risk factors for developing a thrombus among pediatric patients with cancer, along with treatment and prevention protocols. This study also examines the clinical nurse's role in preventing thrombosis and caring for pediatric patients who present with thrombosis.

**METHODS:** The thrombosis literature was reviewed to identify risk factors, treatment regimens, and strategies for prevention.

**FINDINGS:** Thrombosis in pediatric patients with cancer requires management of potential complications so that cancer treatment may continue.

### KEYWORDS

pediatric; coagulation disorders;  
thrombosis; venous thromboembolism

### DIGITAL OBJECT IDENTIFIER

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**CLINICAL CARE OF PEDIATRIC PATIENTS WITH CANCER** is complex because of the potential for serious complications. Thrombosis, which entails the development of a thrombus (blood clot) inside of a blood vessel, is one of the most severe complications. Venous thromboembolism (VTE) can progress into deep vein thrombosis (DVT) and/or pulmonary embolism (PE). Pediatric patients with cancer are at increased risk for thrombosis. Although there has been extensive research on thrombosis in the adult population, a gap in the literature exists regarding prevention and treatment of thrombosis in children, particularly pediatric patients with cancer.

The incidence of symptomatic VTE in pediatric patients with cancer is between 7% and 14%, whereas the incidence of asymptomatic VTE is about 40% (Piovesan, Attard, Monagle, & Ignjatovic, 2014). Cancer registry data indicate that pediatric patients with cancer are more likely to develop thrombosis than the general pediatric population. A Canadian registry of DVT and PE among 15 pediatric hospitals reported that 25% of patients admitted were diagnosed with a malignancy (Monagle et al., 2000). Pediatric patients with cancer diagnosed with thrombosis experience frequent hospitalizations, which, ultimately, increase costs for patients and their families and the medical institution. Compared to children without a cancer diagnosis, pediatric patients with cancer have an increased risk for mortality, thrombus-related morbidity, and recurrence of VTE (Raffini, Huang, Witmer, & Feudtner, 2009). About 25%–30% of symptomatic thrombi in children are related to the presence of a central venous line (CVL) (Athale & Chan, 2003).

With survival rates increasing for pediatric patients with cancer, clinical nursing care can prevent thrombosis or support its early treatment. This article will further explore the risk factors associated with the development of thrombosis among pediatric patients with cancer, as well as preventive measures, treatment modalities, and nursing implications for pediatric hematology-oncology nurses and advanced practice nurses (APNs).

### Pathophysiology

The pathophysiology of cancer-associated thrombosis in children is multifaceted and involves interactions among the underlying cancer, prothrombotic factors inherent in patients, and the effects of therapy. Cancer is known to cause a hypercoagulable, prothrombotic state. This is in large part because of tissue factor (TF), a transmembrane protein that is secreted minimally by normal human cells. However, TF is increasingly expressed by malignant cells. TF forms a complex with factor VII to activate factor IX and factor X (both are clotting factors), which, in turn, initiates blood coagulation and the clotting cascade. This results in the generation of thrombin and fibrin