

## PEDIATRICS

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### INTRODUCTION

Venous thromboembolism (VTE) is becoming an increasingly common disease state in pediatric patients, in part, due to advances in pediatric critical care medicine as well as improvements in diagnostic modalities. Although many recommendations regarding the management of this population are adapted from adult data, differences between children with thromboembolic events and their adult counterparts should be considered and should warrant well-designed pediatric clinical trials.

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### INCIDENCE OF THROMBOSIS IN PEDIATRIC PATIENTS<sup>1-5</sup>

*Incidence of thromboembolic events is generally lower than in adults:*

- Overall incidence ranges from 0.07–0.14 per 10,000 children.
- >90% of pediatric patients with VTE have at least one risk factor.
- >60% of pediatric patients with VTE have two or more risk factors.

*Incidence related to risk factors:*

- **Age:** Highest incidence occurs in infants <1 year old and adolescents >14 years old.
- **Gender:** Teenage females have twice the rates of males.
- **Central venous catheter:** Most common risk factor in pediatrics.
  - Accounts for ~60% of VTE in children and 90% in neonates.
  - Risk is higher with external catheters than indwelling ports.
- **Disease state:**
  - Cancer
    - Acute lymphoblastic leukemia (ALL) is the most common cancer type associated with thromboembolism (TE) in children.
    - Up to 93% of children with an underlying malignancy develop a VTE at the central venous catheter site.
  - Trauma
    - 0.3% of children with severe trauma develop a VTE.
    - Severe spinal, thoracic, and abdominal injuries are associated with clinically significant VTE.

- Congenital heart disease
  - Risk of VTE is dependent on type of defect and surgical intervention performed.

*Incidence related to site of thrombosis:*

- *Thrombosis in an upper extremity*—is more common than in lower extremity.
- *Central nervous system*—is less common than upper and lower venous systems.
  - Arterial ischemic events account for ~80% of pediatric strokes.
  - Cerebral sinovenous thrombosis, the second most common site, preferentially affects neonates; also children with ALL receiving asparaginase.
- *Renal vein thrombosis (RVT)*—most commonly observed in neonates.

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## DEVELOPMENTAL AND PHARMACOKINETIC DIFFERENCES AMONG PEDIATRIC POPULATIONS

See **Tables 20-1** and **20-2** for more information on developmental and pharmacokinetic differences.

**TABLE 20-1: Definition of Age Groups**

Pediatric	Birth–18 yr
Neonate	Birth–28 days
Infant	1–12 months
Child	1–12 yr
Adolescent	12–18 yr

yr: years