Treatment of Venous Thromboembolism: American Society of Hematology/International Society on Thrombosis and Haemostasis 2024 Updated Guidelines

COG Supportive Care Endorsed Guidelines

Click **here** to see all the COG Supportive Care Endorsed Guidelines.

The "American Society of Hematology/International Society on Thrombosis and Haemostasis 2024 updated guidelines for treatment of venous thromboembolism" were endorsed by the COG Supportive Care Guidelines Working Group in May 2026. This clinical practice guideline is published (Monagle P, Azzam M, Bercovitz R, et al. American Society of Hematology/International Society on Thrombosis and Haemostasis 2024 updated guidelines for treatment of venous thromboembolism in pediatric patients. Blood advances. 2025; 9(10): 2587-636.) and is available here: https://doi.org/10.1182/bloodadvances.2024015328

The purpose of these guidelines is to provide evidence-based recommendations on the treatment of venous thromboembolism in pediatric patients. The good practice statements and recommendations of the source clinical practice guideline are presented below.

Good Practice Statements for Venous Thromboembolism Treatment

GOOD PRACTICE STATEMENTS
A pediatric hematologist or a pediatrician in consultation with a hematologist will be best suited to implement these recommendations given the complexity of the care involved in children with VTE.
For pediatric patients who are at high risk of bleeding (eg, CSVT and associated hemorrhage secondary to venous congestion, immediate after or anticipated invasive procedures), consider the use of a short half-life agent such as UFH rather than LMWH or DOACs if anticoagulation is required, to decrease the risk of worsening hemorrhage or bleeds.

VTE, venous thromboembolism; CSVT, cerebral simus venous thrombosis; UFH, unfractionated heparin; LMWH, low molecular weight heparin; DOAC, direct oral anticoagulants.

Summary of Recommendations for Venous Thromboembolism Treatment (VTE)

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
1. For pediatric patients with symptomatic deep vein thrombosis (DVT) or pulmonary embolism (PE), the ASH/ISTH guideline panel suggests using anticoagulation rather than no anticoagulation	Conditional / Very low
Remarks: Although there remains limited direct evidence in pediatric patients, there is strong indirect evidence in adults that symptomatic VTE requires treatment. However, based on recently published observational studies in pediatric patients, there may be specific clinical scenarios such as neonatal central venous catheter–associated VTE or trauma-associated VTE in which anticoagulation may result in either no significant benefit or potentially an increased risk of harm. Outside of these specific clinical scenarios, the panel agrees that in most pediatric patients with symptomatic DVT and PE, anticoagulation is warranted. Therefore, the panel made a conditional recommendation with very low certainty in the evidence.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
2. For pediatric patients with clinically unsuspected (previously termed asymptomatic) DVT or PE, the ASH/ISTH guideline panel suggests either using anticoagulation or no anticoagulation	Conditional / Very low
Remarks: The natural history of clinically unsuspected DVT or PE in pediatric patients appears to carry a lower risk (compared with symptomatic DVT or PE) of acute and long-term sequelae, especially in certain pediatric subpopulations. The recommendation is based on studies that report outcomes for pediatric patients with clinically unsuspected DVT or PE. Single institution, observational, and retrospective studies in select subpopulations of pediatric patients suggest that not using anticoagulation for clinically unsuspected DVT or PE does not lead to severe outcomes. The benefits or harms of anticoagulation or no anticoagulation vary for different populations including neonates, pediatric patients who are critically ill, patients with cardiac disease, or patients who have experienced trauma. However, if clinically unsuspected DVT or PE is detected, the decision to treat or not treat should be individualized. Research to better understand the natural history of clinically unsuspected DVT or PE, benefits, and harms of treatment in a variety of subgroups and clinical settings in pediatrics is a high priority.	
3. For select pediatric patients with provoked VTE, the ASH/ISTH guideline panel suggests 6 weeks rather than 3 months of anticoagulation. Exclusions to this recommendation include (1) PE, (2) recurrent VTE, (3) persistent occlusive thrombus at 6 weeks, (4) cancer-associated thrombosis, (5) patients with persistent antiphospholipid antibodies (APAs) or major thrombophilia, and (6) ongoing VTE risk factors	Conditional / Very low
Remarks: This recommendation is based mainly on the Kids-DOTT randomized clinical trial (RCT) that evaluated the duration of anticoagulation therapy in pediatric patients with provoked VTE. Importantly, the criteria for inclusion and randomization were stringent, and many pediatric patients with provoked VTE were excluded. The recommendation reflects the population that was studied and cannot be extrapolated to all patients with provoked VTE. For patients with provoked VTE not meeting these low-risk criteria, the panel suggests the use of anticoagulation therapy for 3 months, and for those with persistent provoking VTE risk factors, longer duration of anticoagulation may be considered.	
4. For pediatric patients with unprovoked DVT or PE, the ASH/ISTH guideline panel suggests using anticoagulation for 6 to 12 months rather than indefinite anticoagulation	Conditional / Very low
Remarks: Unprovoked VTE is rare in pediatrics. Although studies suggest that rates of recurrent VTE in children and adolescents with age of >1 year with unprovoked VTE are relatively high (21%-36% at 3.5 years follow up), there are no pediatric studies evaluating duration of therapy in this cohort. Although extrapolation of adult data might favor prolonged treatment in terms of VTE recurrence, in the absence of pediatric data, the panel felt that the impact of indefinite anticoagulation on bleeding risk and quality of life (QOL) would more negatively affect pediatric patients compared with adults. Patient values and preferences should be considered when making this decision.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
5. For pediatric patients with cerebral sinus venous thrombosis (CSVT) with and without hemorrhage secondary to venous congestion, the ASH/ISTH guideline panel suggests using anticoagulation rather than no anticoagulation	Conditional / Very low
Remarks: Observational studies suggest lower mortality and improved neurologic outcomes in patients with CSVT treated with anticoagulation. However, the panel recognized different populations of patients with CSVT (eg, neonates, and those with infection-associated CSVT, who have experienced trauma, have had surgery, and have cancer) may have different risks for bleeding and neurologic outcomes that should be considered in the decision to use anticoagulation. Evidence of venous congestion secondary to thrombus obstruction with or without hemorrhage should be managed with anticoagulation. The panel notes that when anticoagulation is prescribed, it is important that appropriate therapy for additional associated conditions (eg, surgical interventions for infection-associated CSVT) be used.	
6. For pediatric patients with CSVT, the ASH/ ISTH guideline panel suggests using anticoagulation alone rather than thrombolysis followed by anticoagulation	Conditional / Very low
Remarks: The evidence is sparse for the balance of benefits and harms of thrombolysis compared with anticoagulation in pediatric patients with CSVT. Based on the experience of the panel members, the panel suggests use of anticoagulation rather than thrombolysis for children with CSVT who have no evidence of ischemia. However, thrombolysis may be considered when there is neurologic deterioration despite anticoagulation and, in such or similar instances, reperfusion therapies may be considered depending on local resources or experiences.	
7a. For neonates and pediatric patients with right atrial thrombosis (RAT), the ASH/ISTH guideline panel suggests anticoagulation rather than no anticoagulation for patients with high-risk features and low perceived risk of bleeding	Conditional / Very low
Remarks: Insufficient data are available for formal risk stratification of RAT and bleeding from anticoagulation. Based on available literature and experience of panel members, high-risk features of RAT to consider include large size, shape (snake-shaped or pedunculated), mobility, location (eg, involvement of tricuspid valve or restricting blood flow), presence of intracardiac right-to-left shunt, presence of a central venous catheter, or associated with symptoms (arrhythmias, hemodynamic compromise, etc). The decision to start anticoagulation should be individualized based on the risk of thrombotic complications and the perceived risk of bleeding from anticoagulation.	
7b. For neonates and pediatric patients with RAT and the absence of high-risk features or with unacceptable perceived risk of bleeding, the ASH/ISTH guideline panel suggests no anticoagulation over anticoagulation	Conditional / Very low
Remarks: Studies in patients without high-risk features treated with anticoagulation do not demonstrate clinical benefits compared with patients not treated with anticoagulation. The studies are not randomized, are small, and are subject to significant bias. Study participants treated with anticoagulation had an increased risk of bleeding.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
8. For neonates and pediatric patients with RAT requiring anti-thrombotic treatment, the ASH/ISTH guideline panel suggests using anticoagulation alone over thrombolysis followed by anticoagulation	Conditional / Very low
Remarks: In most cases, anticoagulation alone is adequate. However, there are individual cases in which the hemodynamic status, size, and mobility of the thrombus might dictate more aggressive therapy. The choice to use thrombolysis will depend on feasibility or the intervention and patient and family acceptability of the anticipated risks and benefits of thrombolysis.	
9. For neonates with renal vein thrombosis (RVT), the ASH/ISTH guideline panel suggests using anticoagulation rather than no anticoagulation	Conditional / Very low
Remarks: The panel considers the intervention to have a potential beneficial effect if the long-term outcomes of avoiding hypertension, chronic kidney disease, and renal failure are considered. Anticoagulation is likely more important with bilateral renal vein involvement compared with unilateral involvement with or without extension to the inferior vena cava (IVC). Severity of disease, gestational age, presence of intraventricular hemorrhage, underlying comorbidities, and degree of thrombocytopenia may affect bleeding risk with treatment.	
10a. For neonates with non–life-threatening RVT, the ASH/ISTH guideline panel recommends anticoagulation alone vs thrombolysis followed by anticoagulation	Strong / Very low
Remarks: Available evidence is derived from observational studies in which patients treated with thrombolysis were critically ill, and because the studies did not adjust for this bias, causation is difficult to ascertain. The panel placed a high value on avoiding the potential bleeding risks of thrombolysis, especially in neonates, and therefore, made this recommendation for cases with low mortality risk (ie, unilateral RVT or unilateral RVT with IVC extension). The panel made a strong recommendation, considering high-quality evidence for harm and high costs, despite very low quality evidence for benefit.	
10b. For neonates with life-threatening RVT, the ASH/ISTH guideline panel suggests using thrombolysis followed by anticoagulation, rather than anticoagulation alone	Conditional / Very low
Remarks: When RVT is life threatening (ie, bilateral thrombosis), the panel considered that the beneficial effects of thrombolysis may outweigh the undesirable consequences of the intervention. Gestational age, presence of intraventricular hemorrhage, underlying comorbidities, and degree of thrombocytopenia may affect bleeding risk with thrombolysis.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
11a. For neonates and children with occlusive portal vein thrombosis (PVT) and for children with nonocclusive PVT, post–liver transplant PVT, or unprovoked PVT, the ASH/ISTH guideline panel suggests using anticoagulation rather than no anticoagulation	Conditional / Very low
11b. For neonates with nonocclusive PVT, and for children who have already developed portal hypertension (PHTN) secondary to PVT, the ASH/ISTH guideline panel suggests no anticoagulation rather than using anticoagulation	Conditional / Very low
Remarks: For recommendations 11a and 11b: neonates and pediatric patients who did not receive anticoagulation warrant follow-up monitoring, because extension of thrombus or organ dysfunction may require reconsideration of treatment options. Evidence from the available observational studies describes (complete or partial) PVT resolution in patients who did receive anticoagulation, as well as those who did not receive anticoagulation, and therefore, does not allow for assessment of the degree of benefit from anticoagulation. However, the panel placed value on avoiding the potential increased risk of long-term complications associated with persistent occlusive thrombus, and therefore, favored treatment in this setting. The panel also recognized the potential increased risk of bleeding in pediatric patients with PHTN and development of esophageal varices, and therefore, did not recommend anticoagulation in that setting.	
12a. For pediatric patients with superficial vein thrombosis (SVT) secondary to IV cannulation in the upper limb, the ASH/ISTH guideline panel suggests no anticoagulation rather than using anticoagulation	Conditional / Very low
12b. For pediatric patients with SVT in the upper limb, which is not cannula related, or in the lower limbs associated with cancer or varicose veins, the ASH/ISTH guideline panel suggests anticoagulation rather than no anticoagulation	Conditional / Very low
Remarks: There were no direct and only limited indirect data upon which to base this recommendation. The panel members experience suggested that, in most instances (eg, peripheral IV [PIV]– or CVAD-related events in the upper extremity), no anticoagulation may be required. However, anticoagulation could be considered in select patients with symptomatic SVT (eg, non–PIV-/PICC (peripherally inserted central catheter)-related, cancer, varicose vein, and lower limb events) or scenarios (eg, PIV/long-term PICC and/or symptom progression). The panel notes that when anticoagulation is prescribed, there is uncertainty about the optimal intensity (eg, prophylactic vs full dose) and duration of therapy.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
13. For pediatric patients with proximal DVT, the ASH/ISTH guideline panel suggests using anticoagulation alone rather than thrombolysis followed by anticoagulation	Conditional / Very low
Remarks: The panel considered characteristics such as the extent and clinical impact of VTE, as important in determining the risk to benefit ratio of thrombolysis. In most cases, the risks seem higher than the potential benefit; however, there may be individuals for whom the opposite is true. In this clinical scenario, extrapolation from adult data was difficult. There are insufficient data to address the risk to benefit ratio of local thrombolysis via interventional radiology compared with systemic thrombolysis, and the panel noted that the centers with access to pediatric interventional radiology were often stronger advocates of thrombolysis.	
14. For pediatric patients with PE and echocardiographic or biochemical evidence of right ventricular dysfunction but without hemodynamic compromise, the ASH/ISTH guideline panel suggests using anticoagulation alone rather than thrombolysis followed by anticoagulation	Conditional / Very low
Remarks: The panel considered submassive PE to represent pediatric patients with PE who do not have hemodynamic compromise (ie, systemic hypotension or other signs of shock) but who do have echocardiographic (eg, right ventricular dilation or intraventricular septal bowing into the left ventricle, etc) or biochemical (eg, elevated troponin or brain natriuretic peptide, etc) evidence of right ventricular dysfunction. There were minimal pediatric data, and recent international adult guideline panels have recommended anticoagulation alone rather than thrombolysis followed by anticoagulation in this situation (based on low certainty in the evidence of effects). These same adult guidelines, however, have suggested that thrombolysis may be reasonable to consider for younger patients with submassive PE at low risk of bleeding and those who have evidence of both echocardiographic and biochemical evidence of right ventricular dysfunction, which may be extrapolated to select pediatric patients. Patients with submassive PE should be monitored closely for the development of hemodynamic compromise. The panel concluded that the risks of thrombolysis outweighed the benefits in most cases, hence the conditional recommendation for anticoagulation alone.	
15. For pediatric patients with PE and hemodynamic compromise the ASH/ISTH guideline panel suggests using thrombolysis followed by anticoagulation rather than anticoagulation alone	Conditional / Very low
Remarks: The panel considered massive PE to represent pediatric patients with PE who do have hemodynamic compromise that may be life threatening, with limited time to respond to standard anticoagulation, and therefore, conditionally recommended thrombolysis followed by anticoagulation, based predominantly on extrapolation from recent adult guidelines and 3 small pediatric studies that suggested a trend toward decreased mortality with thrombolysis.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
16. For pediatric patients with symptomatic CVAD-related thrombosis who no longer require venous access or whose CVAD is nonfunctioning, the ASH/ISTH guideline panel suggests either immediate removal or delayed removal of the CVAD	Conditional / Low
Remarks: Recent observational studies provided data that >48 hours of anticoagulation before CVAD removal vs immediate CVAD removal are comparable in terms of potential risk of emboli leading to PE or paradoxical stroke. The panel recognized that some clinical scenarios, such as children with a large thrombotic burden or those with right-to-left cardiac shunts, may benefit from a few days of anticoagulation before CVAD removal to decrease the risk of embolism.	
17. For pediatric patients with VTE, the ASH/ISTH guideline panel suggests using DOACs (rivaroxaban/dabigatran) over standard-of-care anticoagulants (low molecular weight heparin [LMWH], unfractionated heparin [UFH], vitamin K antagonists [VKAs], and fondaparinux)	Conditional / Low
Remarks: The panel concluded that there was a small benefit of DOACs over SOC, in relation to reduced thrombus recurrence rate and increased rate of thrombus resolution. The undesirable effects of DOACs vs SOC were felt to be small, with a reduction in major bleeding albeit with an increase in clinically relevant non major bleeding (CRNMB). The panel acknowledged the limitations of these data when evaluating the outcomes of mortality, recurrence, postthrombotic syndrome (PTS), and major/CRNMB due to the small number of events reported. Given the natural history of PTS and thrombus recurrence, evaluation at 3 to 6 months was considered to be too soon to provide accurate representation of these outcomes. The monitoring of drug level and dose adjustment of dabigatran during the DIVERSITY trial raised concern about the potential effect on efficacy and safety of routine use according to current approvals, which do not require such monitoring. Although data on QOL, cost-effectiveness, and acceptability of an oral agent that does not require monitoring were lacking, the panel felt that these were important factors when making this recommendation.	
18. For pediatric patients with VTE the ASH/ISTH guideline panel suggests using rivaroxaban over SOC anticoagulants (LMWH, UFH, VKA, and fondaparinux)	Conditional / Very low
Remarks: The panel concluded that there was a small benefit of rivaroxaban over SOC, in relation to reduced thrombus recurrence and improved thrombus resolution. The undesirable effects of rivaroxaban vs SOC were felt to be small, with a reduction in major bleeding countered by an increase in CRNMB. These data were limited by the small number of important outcomes that were reported, that is mortality, recurrence, PTS, and major bleeding/ CRNMB. The panel noted that some individuals were excluded from the EINSTEIN-Junior trial, including those aged <6 months with low birth weight and those with severe liver or renal impairment. The panel also noted reports of heavier menstrual bleeding while on rivaroxaban and felt that this was an important consideration when choosing an anticoagulant.	

RECOMMENDATIONS	Strength of Recommendation / Certainty of Evidence
19. For pediatric patients with VTE, the ASH/ISTH guideline panel suggests using dabigatran over SOC anticoagulants (LMWH, UFH, VKA, and fondaparinux)	Conditional / Very low
Remarks: The panel concluded that there was a small benefit of dabigatran over SOC, in relation to reduced thrombus recurrence and improved thrombus resolution. The undesirable effects were felt to be trivial, with major bleeding reported in fewer patients treated with dabigatran and an equivalent frequency of CRNMB. The panel noted that some individuals were excluded from the DIVERSITY trial, including those aged <2 years with low body weight, and those with severe liver or renal impairment. The monitoring and dose adjustment of dabigatran during the DIVERSITY trial raised concern about the potential effect on efficacy and safety of routine use according to current approvals, which do not require such monitoring. The panel also noted reports of gastrointestinal side effects while on dabigatran and felt that this was an important consideration when choosing an anticoagulant.	
20. For pediatric patients with VTE, the ASH/ISTH guideline panel suggests using either rivaroxaban or dabigatran, although there may be individual populations or jurisdictional availability that would lead clinicians to choose 1 agent over the other	Conditional / Very low
Remarks: The panel undertook an exercise to review the evidence-to-decisions (EtDs) for rivaroxaban vs SOC and dabigatran vs SOC to examine if 1 of these agents (given the available data) would be a preferred agent to use in treatment of pediatric VTE. To accomplish this, the panel first assigned weights to the summary of judgments. Balance of effects, certainty in the evidence, and acceptability and feasibility of implementation were given the highest weighting, with resources required given moderate weighting, and cost-effectiveness and equity given the lowest weighting.	

*see Appendix 1

Appendix 1: Systems for Classifying Recommendations and Evidence used by the Source Clinical Practice Guidelines

I. GRADE

Strength of Recommendations:

Strong Recommendation	When using GRADE, panels make strong recommendations when they are confident that the desirable effects of adherence to a recommendation outweigh the undesirable effects.
Conditional Recommendation	Conditionals recommendations indicate that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects, but the panel is less confident.

Strength of Recommendations Determinants:

Factor	Comment
Balance between desirable and undesirable effects	The larger the difference between the desirable and undesirable effects, the higher the likelihood that a strong recommendation is warranted. The narrower the gradient, the higher the likelihood that a weak recommendation is warranted
Quality of evidence	The higher the quality of evidence, the higher the likelihood that a strong recommendation is warranted
Values and preferences	The more values and preferences vary, or the greater the uncertainty in values and preferences, the higher the likelihood that a conditional recommendation is warranted
Costs (resource allocation)	The higher the costs of an intervention—that is, the greater the resources consumed—the lower the likelihood that a strong recommendation is warranted

Quality of Evidence

High Quality	Further research is very unlikely to change our confidence in the estimate of effect
Moderate Quality	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate
Low Quality	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate
Very Low Quality	Any estimate of effect is very uncertain

Guyatt, G.H., et al., *GRADE: an emerging consensus on rating quality of evidence and strength of recommendations.* BMJ, 2008; 336: 924-926.
Guyatt, G.H., et al., *GRADE: going from evidence to recommendations.* BMJ, 2008; 336: 1049-1051.