

Risk Assessment Models for Deep Vein Thrombosis

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To assist foot and ankle surgeons in assessing their patients for the risk of deep vein thrombosis, three different tools are provided herein. The Caprini Risk Assessment Score has been employed for the longest interval of time (Table 1). Stratification of risk has been assigned based on the following total score: 0 = very low; 1-2 = low; 3-4 = moderate; ≥5 = high (1).

More recently an extensive study has been compiled by evaluating patients with a diagnosis of deep vein thrombosis/pulmonary embolism and identifying risk factors in these patients. Further statistical analysis has been provided, and the authors established an assessment protocol for patients

who will undergo use of a cast (Table 2) (2). The authors of this study offered the following guidance: “Defining a definite cutoff point is not straightforward. We cautiously suggest using a cutoff point of 9 points to classify individuals as being at high risk for VTE [venous thromboembolism] ...” (2).

Finally, the American College of Foot and Ankle Surgeons consensus panel in 2015 analyzed data available at that time regarding deep vein thrombosis prophylaxis in patients undergoing foot and ankle surgery. The panel felt that routine chemical prophylaxis was not warranted in patients undergoing surgery or those with injuries requiring

Table 1. Caprini Risk Assessment Score (modified from ref. 1)

Add 1 point for each of the following statements that apply now or within the past month:	Add 2 points for each of the following statements that apply:	
<input type="checkbox"/> Age 41-60 years _____ <input type="checkbox"/> Minor surgery (less than 45 minutes) is planned _____ <input type="checkbox"/> Past major surgery (more than 45 minutes) within the last month _____ <input type="checkbox"/> Visible varicose veins _____ <input type="checkbox"/> A history of Inflammable Bowel Disease (IBD) (for example, Crohn’s disease or ulcerative colitis) _____ <input type="checkbox"/> Swollen legs (current) _____ <input type="checkbox"/> Overweight or obese (Body Mass Index above 25) _____ <input type="checkbox"/> Heart attack _____ <input type="checkbox"/> Congestive heart failure _____ <input type="checkbox"/> Serious infection (for example, pneumonia) _____ <input type="checkbox"/> Lung disease (for example, emphysema or COPD) _____ <input type="checkbox"/> On bed rest or restricted mobility, including a removable leg brace for less than 72 hours _____ <input type="checkbox"/> Other risk factors (1 point each)*** _____ <i>***Additional risk factors not tested in validation studies but shown in the literature to be associated with thrombosis include BMI above 40, smoking, diabetes requiring insulin, chemotherapy, blood transfusions, and length of surgery over 2 hours.</i>	<input type="checkbox"/> Age 61–74 years _____ <input type="checkbox"/> Current or past malignancies (excluding skin cancer, but not melanoma) _____ <input type="checkbox"/> Planned major surgery lasting longer than 45 minutes (including laparoscopic and arthroscopic) _____ <input type="checkbox"/> Non-removable plaster cast or mold that has kept you from moving your leg within the last month _____ <input type="checkbox"/> Tube in blood vessel in neck or chest that delivers blood or medicine directly to heart within the last month (also called central venous access, PICC line or port) _____ <input type="checkbox"/> Confined to a bed for 72 hours or more _____	
	Add 3 points for each of the following statements that apply:	
	<input type="checkbox"/> Age 75 or older _____ <input type="checkbox"/> History of blood clots, either Deep Vein Thrombosis (DVT), or Pulmonary Embolism (PE) _____ <input type="checkbox"/> Family history of blood clots (thrombosis) _____ <input type="checkbox"/> Personal or family history of positive blood testing indicating an increased risk of blood clotting _____	
	Add 5 points for each of the following statements that apply:	
<th style="background-color: #e0e0e0;">Add 1 point for each of the following statements that apply:</th> <td> <input type="checkbox"/> Elective hip or knee joint replacement surgery _____ <input type="checkbox"/> Broken hip, pelvis or leg _____ <input type="checkbox"/> Serious trauma (for example, multiple broken bones due to a fall or car accident) _____ <input type="checkbox"/> Spinal cord injury resulting in paralysis _____ <input type="checkbox"/> Experienced a stroke _____ </td>	Add 1 point for each of the following statements that apply:	<input type="checkbox"/> Elective hip or knee joint replacement surgery _____ <input type="checkbox"/> Broken hip, pelvis or leg _____ <input type="checkbox"/> Serious trauma (for example, multiple broken bones due to a fall or car accident) _____ <input type="checkbox"/> Spinal cord injury resulting in paralysis _____ <input type="checkbox"/> Experienced a stroke _____
<input type="checkbox"/> Current use of birth control or Hormone Replacement Therapy (HRT) _____ <input type="checkbox"/> Pregnant or had a baby within the last month _____ <input type="checkbox"/> History of unexplained stillborn infant, recurrent spontaneous abortion (more than 3), premature birth with toxemia or growth restricted infant. _____		

Table 2. L-TriP(cast) score based on the clinical risk prediction model (modified from ref. 2)

Environmental Predictor Variable	Point Variable
Age \geq 35 and $<$ 55 y	2
Age \geq 55 y	3
Male sex	1
Current use of oral contraceptives	4
Cancer within the past 5 y	3
Pregnancy or puerperium	3
BMI \geq 25and $<$ 35kg/m ²	1
BMI \geq kg/m ²	2
Pneumonia	3
Family history of VTE (first- degree relative)	2
Comorbidity (rheumatoid arthritis, chronic kidney disease, COPD, multiple sclerosis)	1
Hospital admission within the past 3 mo	2
Bedridden within the past 3 mo	2
Surgery within the past 3 mo	2
Superficial vein thrombosis	3
Plaster cast: lower leg	4

Table 3. Risk factors for venous thromboembolism during the management of foot and ankle conditions (modified from ref. 3)

Patient Specific	Treatment Specific	Surgery/Injury Specific
Primary		
Personal history of VTED	Immobilization > 4wks	
Hypercoagulability		
Active/recent (<6 mo) cancer		
Secondary		
Advanced age (> 60)	Non-weightbearing	Achilles tendon rupture‡
Obesity (BMI > 30)	Hospitalization	Ankle fracture‡
Family history of VTED	Bed rest	Total ankle replacement
OCP or HRT use†		Hindfoot arthrodesis
Varicose veins		General anesthesia
Diabetes mellitus or > 1 comorbidity		
Severe foot/ankle injury		

† Consider also if patient is a current smoker, as this may further VTED risk.

‡ Includes operative and nonoperative management.

immobilization. However, they noted that surgeons should "... attempt to stratify patients and develop a prophylaxis plan for those at high risk of VTED [venous thromboembolism disease]" (3). A table was developed for risk factors for VTE during management of foot and ankle conditions (Table 3).

REFERENCES

1. Caprini J. Venous resource center. URL: venousdisease.com.
2. Nemeth B, Adrichem RA, Hylekama VA, Bucciarelli P, Martinelli I, Baglin T, et al. Venous thrombosis risk after cast immobilization of the lower extremity: derivation and validation of a clinical prediction score, L-TRiP (cast), in three population-based case-control studies. *PLoS Med* 2015 Nov 10:e1001899.
3. Fleischer AE, Abicht BP, Baker JR, Boffeli TJ, Jupiter DC, Schade VL. American College of Foot and Ankle Surgeons clinical consensus statement: risk, prevention, and diagnosis of venous thromboembolism disease in foot and ankle surgery and injuries requiring immobilization. *J Foot Ankle Surg* 2015;54:497-507.