



CANADIAN ASSOCIATION
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Dynamic Practice Guidelines for Emergency General Surgery

Committee on Acute Care Surgery, Canadian Association of General Surgeons

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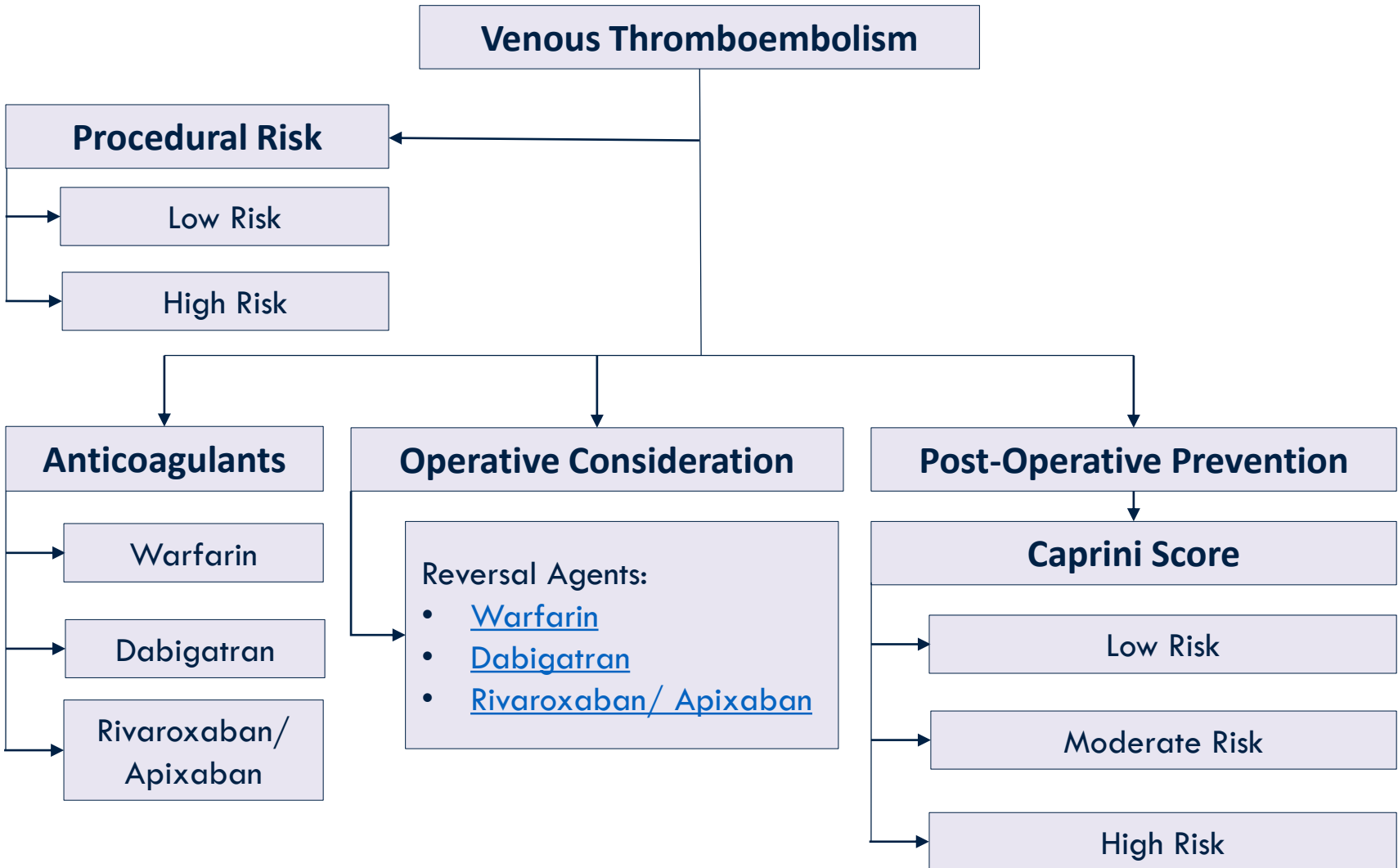
VENOUS THROMBOEMBOLISM

Dynamic Practice Guidelines for Emergency General Surgery

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Committee on Acute Care Surgery, Canadian Association of General Surgeons

VENOUS THROMBOEMBOLISM

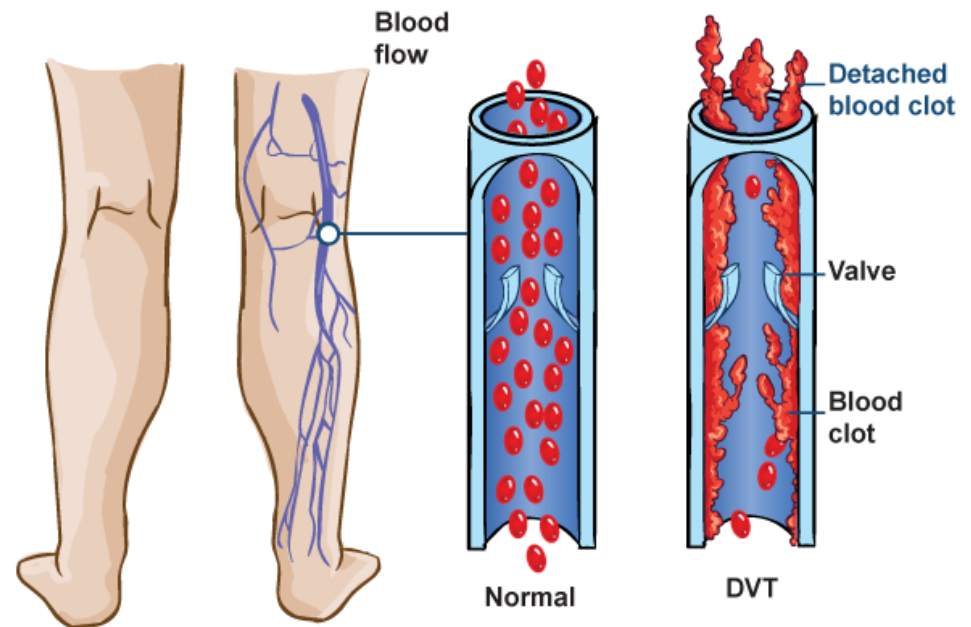


VENOUS THROMBOEMBOLISM

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Definition:

- Venous thromboembolism (VTE) is comprised of Deep Vein Thrombosis (DVT) and Pulmonary embolism (PE).
- Condition where a blood clot (thrombus) forms in a vein – commonly in the deep veins of the legs.
- The thrombus may dislodge from its site of origin and travel in the blood to other sites (embolus)



Epidemiology:

- VTE is the most common preventable cause of hospital-related deaths ¹
- In surgical inpatients > 50% of patients are moderate risk or higher for developing VTEs ¹
- Annual incidence in people of European ancestry: 104-183/ 100,000 ²
- Overall VTE incidence is higher in African-American, and lower in Asian, Asian American, and Native American populations ²
- Specifically:
 - Annual incidence of PE (with or without DVT): 29-78/ 100,000 ²
 - Annual incidence of DVT alone: 45-117/ 100,000 ²

¹ White, Zhou, Romano. 2003 [Thromb Haemost](#)

² Heit. 2015 [Nat Rev Cardiol](#)

Etiology:

1) Atrial Fibrillation

- Age, hypertension, congestive heart failure, diabetes, prior stroke, and other vascular disease affect overall risk

2) Prosthetic Heart Valve

3) Recent Thromboembolism

- Greatest in the immediate period (3-4 weeks) following the event, and declines over time
- Benefit from delay of invasive interventions
- Bridging anticoagulation may be used for emergent surgical procedures

4) Trauma

- Surgical intervention
- Spinal cord injury; Head trauma
- Lower extremity/ Pelvic fracture
- Prolonged immobilization
- High injury severity score

¹ Kearon, Hirsh 1997. [N Engl J Med](#)

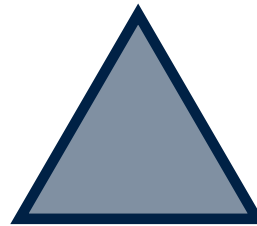
Pathophysiology = Virchow's Triad

- Major surgery/ trauma
- Malignancy
- Pregnancy/ Post-Partum
- Inherited thrombophilia
- Infection/ Sepsis
- Inflammatory bowel disease
- Autoimmune conditions
- Estrogen therapy

1. HYPERCOAGULABILITY

2. VASCULAR DAMAGE

- Thrombophlebitis
- Cellulitis
- Atherosclerosis
- Indwelling catheter/ Heart valve
- Venipuncture
- Physical trauma, stress, injury
- Microtrauma to vessel wall



3. CIRCULATORY STASIS

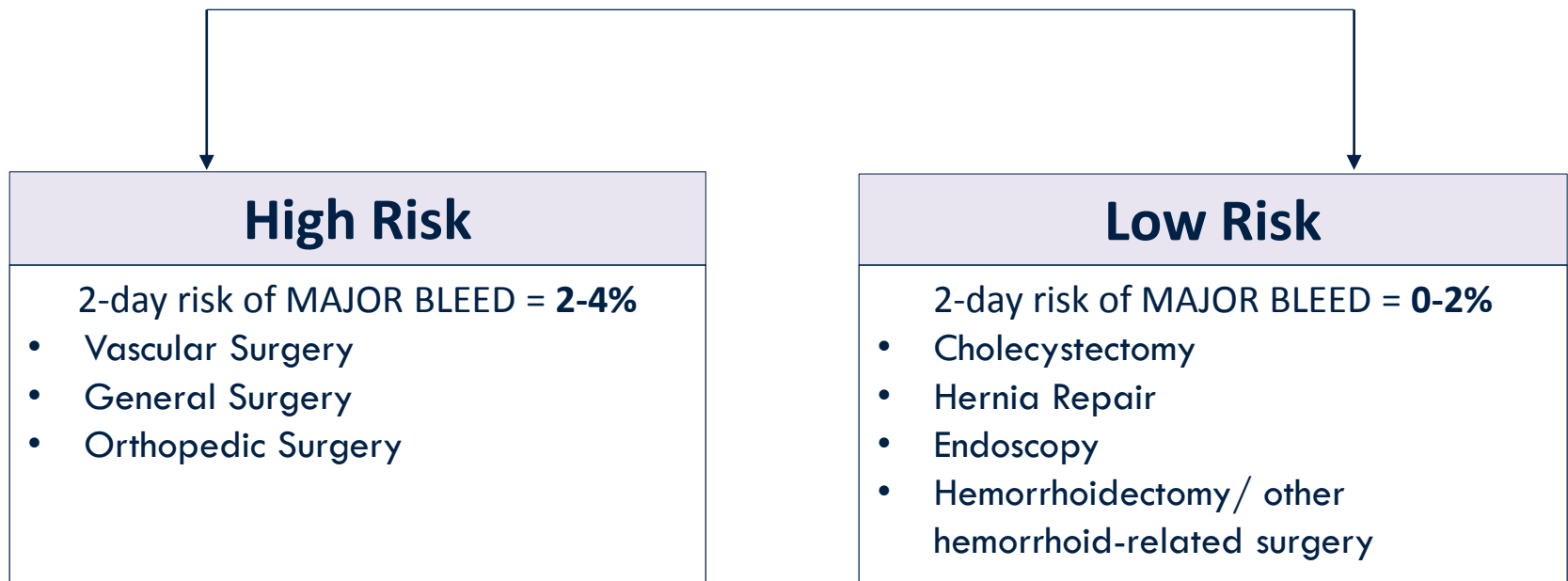
- Immobility
- Venous obstruction (e.g. obesity, tumors, pregnancy)
- Varicose veins
- Atrial fibrillation/ LV dysfunction
- Congenital venous malformations
- Bradycardia/ Hypotension

KEY Study on VTE Risk and Prophylaxis in the Acute Setting ¹

- Multinational cross-sectional study of VTE Risk and prophylaxis In hospital inpatients admitted to the surgical ward
 - 64.4% were at risk of a VTE event according to the ACCP
 - Only 58.5% received appropriate VTE prophylaxis as recommended by the ACCP guidelines
- A

¹ Cohen et al. 2008 Lancet

Procedural Bleed Risk Classification



¹ Torn, Rosendaal 2003. [Br J Haematol](#)

Treatment:

Interruption of Anticoagulation

- If high risk of VTE is transient; attempt to delay the elective surgery
- If the surgery cannot be delayed, and the patient continues to be at a high risk of VTE
 - Consider interruption requiring appropriate bridging
 - Use a short-acting anticoagulant (e.g. LMWH) during the interruption of the longer acting agent
 - Alternatively consider insertion of a vena cava filter
- Moderate VTE risk; interrupt for surgery without bridging

¹ Torn, Rosendaal 2003. [Br J Haematol](#)

Warfarin

Mechanism of Action:

- Blocks vitamin-K dependent steps in the clotting factor production by preventing the synthesis of factors II, VII, IX, and X.

Management Information:

- Measured by prothrombin time (INR)
- **Discontinue 5 days before elective surgery**
- Low dose vitamin-K (1-2 mg) to normalize INR faster
- Restart warfarin after surgery, it takes 5-10 days to attain full anticoagulant effect

¹ White, McKittrick, Hutchinson, Twitchell 1995. [Ann Intern Med](#)

² Kearon, Hirsh 1997. [N Engl J Med](#)

Warfarin: OPERATIVE CONSIDERATIONS

Urgency of Operative Management?

Semi-Urgent

1. Hold Warfarin
2. Vitamin K (IV or Oral)

Immediate

1. Activated prothrombin complex concentrates
 2. Fresh frozen plasma (FFP)
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Dabigatran

Mechanism of Action:

- Direct thrombin inhibitor (reversibly blocks the enzymatic function of thrombin in converting fibrinogen to fibrin – Factor IIa)

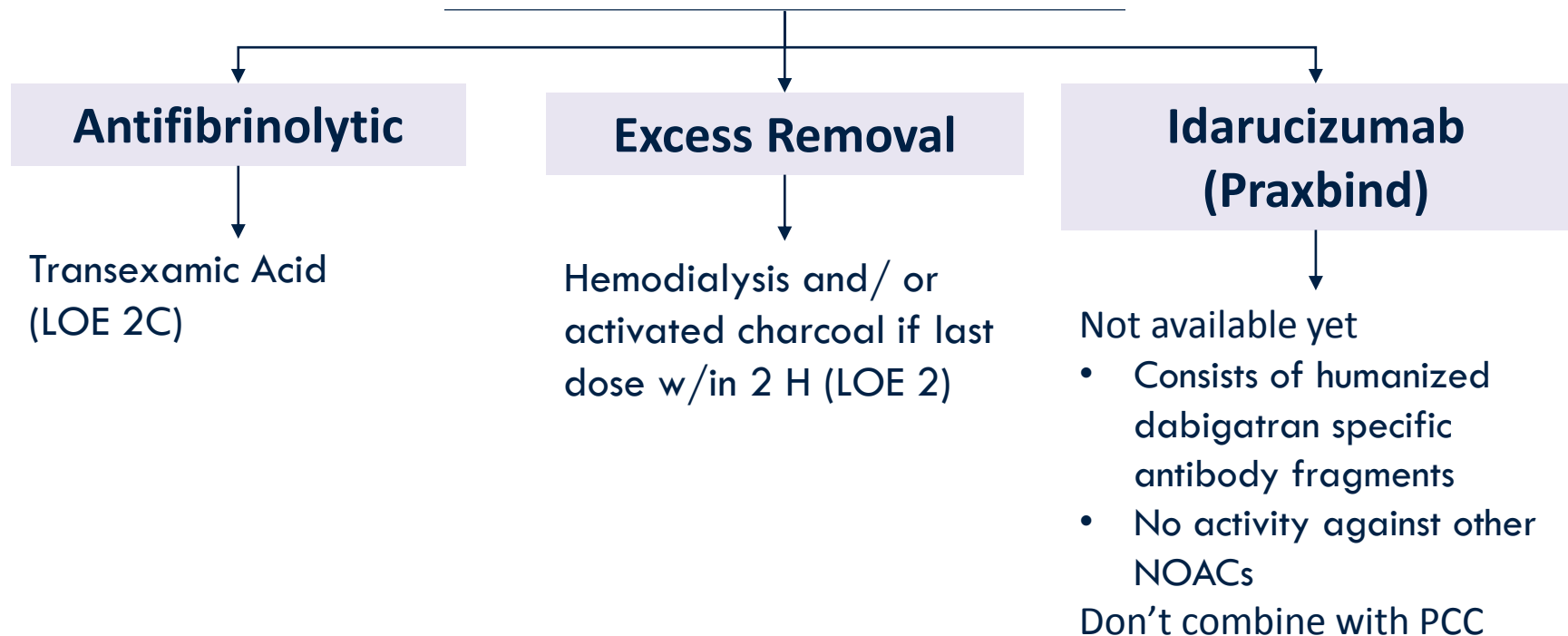
Management Information:

- Excreted renally (80-85%)
- **Discontinue 2-3 days before elective surgery for patients with normal renal function**
 - **2-4 days with renal insufficiency (CrCl 30-50 ml/min)**
- No routine coagulation test validated
- Restart when homeostasis is achieved, therapeutic within hours

¹ Stangier, Rathgen, Stahle, Mazur 2010 [Clin Pharmacokinetics](#)

Dabigatran: OPERATIVE CONSIDERATIONS

Principles of Treatment



¹ Siegal, Garcia, Crowther 2014. [Blood](#)

TSOAC – Direct Factor Xa Inhibitors (Rivaroxaban/ Apixaban)

Mechanism of Action:

- Prevent conversion of prothrombin to thrombin

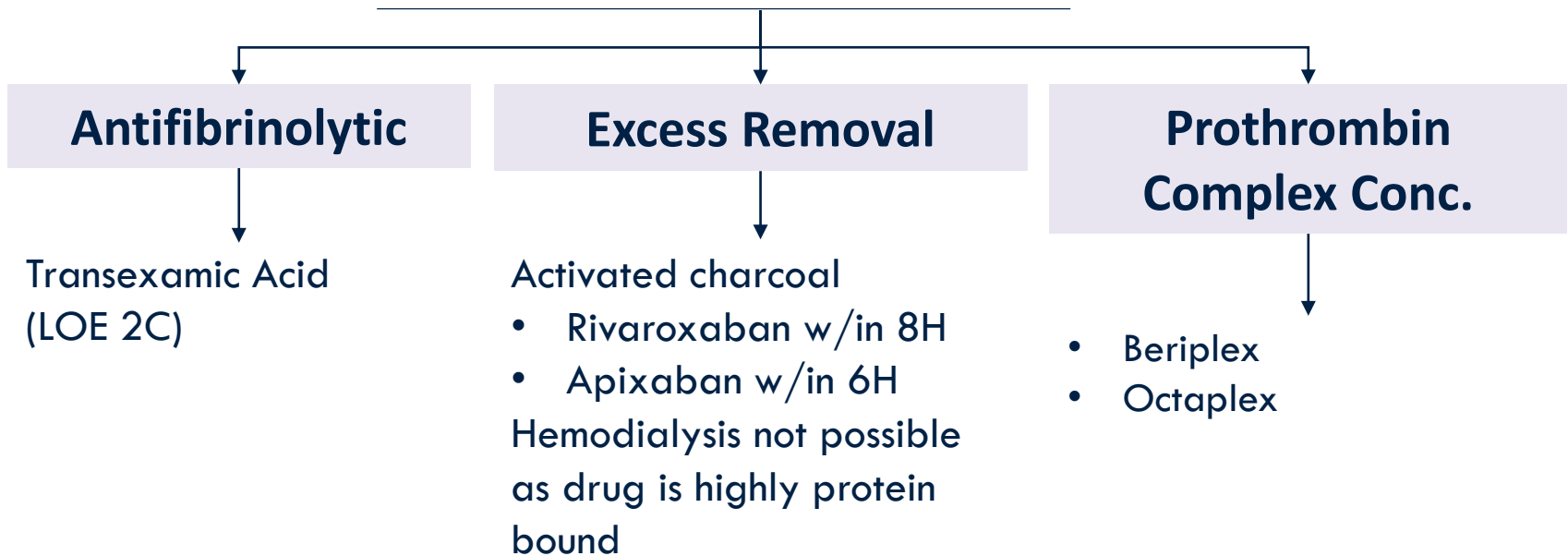
Management Information:

- Excretion is approx. 30%
- Severe hepatic impairment could result in drug bio-accumulation
- **Discontinue 2-3 days before surgery with normal renal func.**
- No routine coagulation test validated
- Restart when homeostasis is achieved, therapeutic within hours

¹ Stangier, Rathgen, Stahle, Mazur 2010 [Clin Pharmacokinetics](#)

Rivaroxaban/ Apixaban: OPERATIVE CONSIDERATIONS

Principles of Treatment



¹ Siegal, Garcia, Crowther 2014. [Blood](#)

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Post-Operative Prevention of VTE

Caprini Risk Assessment Model

1 point	2 points	3 points	5 points
<ul style="list-style-type: none"> • Age 41 – 60 Y • Minor surgery • BMI > 25 kg/m² • History of recent major surgery (< 1 Mo) • Varicose veins • Swollen legs • Acute MI • CHF (< 1 Mo) • Sepsis (< 1 Mo) • Serious lung pathology (pneumonia) < 1 Mo • COPD • Med pt. on bed rest 	<ul style="list-style-type: none"> • Age 61 – 74 Y • Arthroscopic Sx. • Major open surgery (> 45 min) • Laparoscopic surgery (> 45 min) • Malignancy (past or present) • Pt. confined to bed (> 72 H) • Immobilizing cast (< 1 Mo) • Central Venous access 	<ul style="list-style-type: none"> • Age > 75 Y • History of VTE • Family Hx. of VTE • + Factor V Leiden • + Prothrombin 20210A • Elevated serum homocysteine • + lupus anticoag. • Elevated anticardiolipin antibodies • Heparin Induced Thrombocytopenia • Congenital or acquired thrombophilia 	<ul style="list-style-type: none"> • Stroke (< 1Mo) • Elective arthroplasty • Hip, pelvis or leg # • Multiple Trauma (< 1 Mo) • Acute spinal cord injury (< 1 Mo)

Adapted from Gould, Garcia, Wren, et al. 2012. [Chest](#)

Post-Operative Prevention of VTE

