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THROMBOPROPHYLAXIS IN SURGICAL PATIENTS

Learning Objectives

At the end of this educational content, the reader will gain an insight into:

1. Burden of venous thromboembolism (VTE) in surgical patients
2. Various risk factors associated with VTE in surgical patients
3. VTE-Risk Assessment Models (RAMs) for identification and stratification of high-risk patients who need thromboprophylaxis

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Time Course and Clinical Presentation of VTE in Surgical Patients

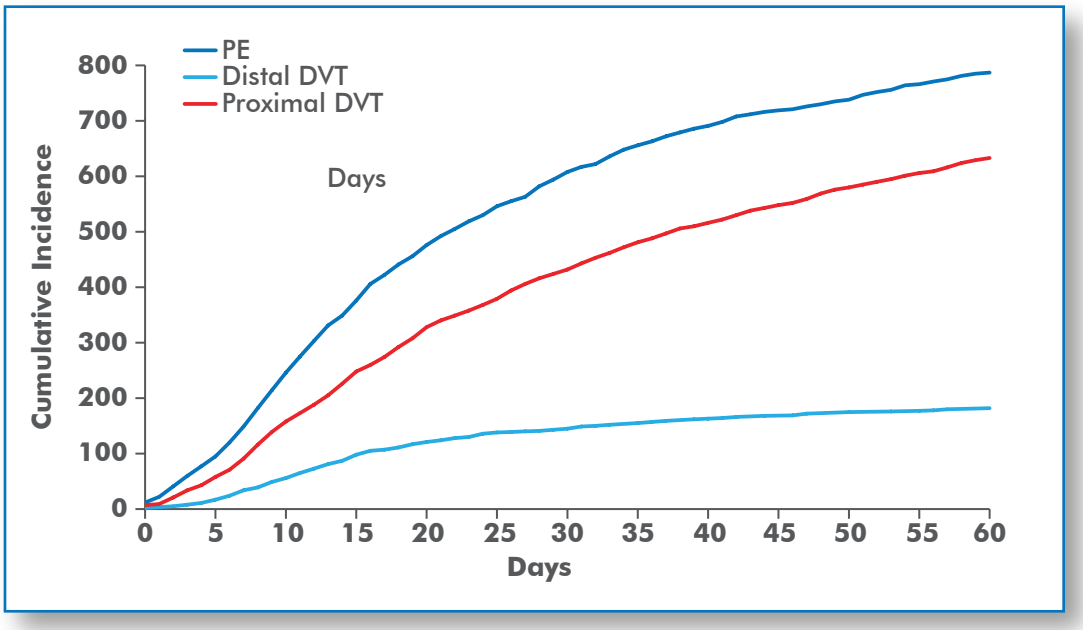
VTE in surgical patients is a common complication and the most common preventable cause of death.[1,2]

The RIETE initiative is an ongoing, international, multicenter, prospective registry of consecutive patients presenting with symptomatic acute VTE confirmed by objective tests.

Results from the RIETE registry showed that[1]:

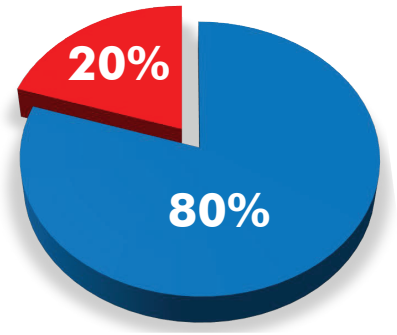
- 1,602 patients with postoperative VTE were included: 393 (25%) after major orthopaedic surgery, 207 (13%) after cancer surgery, and 1,002 (63%) after other procedures. The percentage of patients presenting with clinically overt pulmonary embolism (PE) was (48%, 48%, and 50% respectively); the average time elapsed from surgery to VTE was (22 ± 16, 24 ± 16, and 21 ± 15 days, respectively); and 3-month incidence of fatal PE was (1.3%, 1.4%, and 0.8%, respectively)
- Clinically overt PE appeared earlier than proximal deep vein thrombosis (Figure 1).
- No differences were reported in the number of patients with clinically overt PE or in the severity of PE.
- 55% of symptomatic postoperative VTE cases extended beyond the first 15 days after surgery irrespective of the type of surgery.
- 53% of patients under prophylaxis were diagnosed with VTE after withdrawal.

Figure 1: Cumulative number of patients with VTE after surgery according to their clinical presentation



	24 hours	48 hours	7 days	15 days	30 days	60 days
Clinically overt PE	22 (2.8%)	41 (5.2%)	149 (19%)	376 (48%)	608 (77%)	787
Distal DVT	2 (1.1%)	5 (2.7%)	34 (19%)	98 (54%)	145 (80%)	182
Proximal DVT	9 (1.4%)	21 (3.3)%	91 (14%)	248 (39%)	432 (68%)	633

Epidemiology



In a recent review - Prevention of VTE in 2020 and Beyond, Nicholson et al. state that about **20% of all new VTE** cases occur **due to recent surgery**.[3]

A population-based cohort study using linked hospital and primary care data found that **50% of all deaths due to VTE in postoperative patients occur after hospital discharge**.[4]

A study in the United States found that **one-third of 150,000–200,000 VTE-related deaths** occur **annually following surgery**.[5]

A prospective cohort study was followed up for 6 years. Compared with patients who did not have surgery, **patients with surgery had 70 times more chances of readmission with VTE** in the first 6 weeks after inpatient operation.[6]

A prospective cohort study found that **patients had 10 times more chances of readmission with VTE after a day case surgery** compared with patients who did not have surgery.[6]

According to a study conducted by Agnelli G, the incidence rates of VTE in various surgical procedures are listed in Table 1[7]:

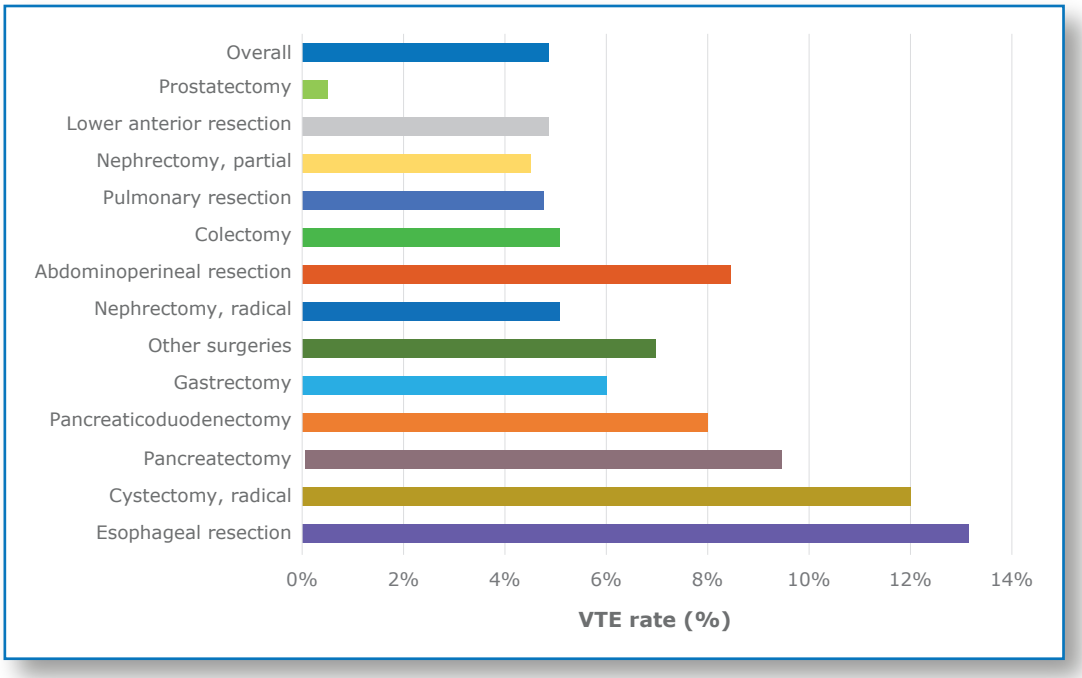
Table 1: Rates of VTE incidence in various surgical procedure

Surgical procedure	VTE incidence rate
General surgery	DVT (15%–30%), PE (0.2%–0.9%)
Gynecologic surgery	Comparable to general surgery
Urologic surgery	1%–5%
Vascular surgery	2.5%–2.9%
Orthopedic surgery	3%
Elective hip replacement surgery	DVT (40%–60%), clinically overt VTE (2%–5%)
Elective total knee replacement surgery	DVT (60%)
Hip fracture surgery	Total DVT (50%) and proximal DVT (27%)
Elective spine surgery	DVT (3.7%), PE (2.2%)
Neurosurgery	23%

DVT, deep vein thrombosis

A retrospective analysis of administrative healthcare data for the VTE rates in patients with cancer undergoing surgery showed that **esophageal resection patients had the highest rate of VTE (13.2%)** [Figure 2].[8]

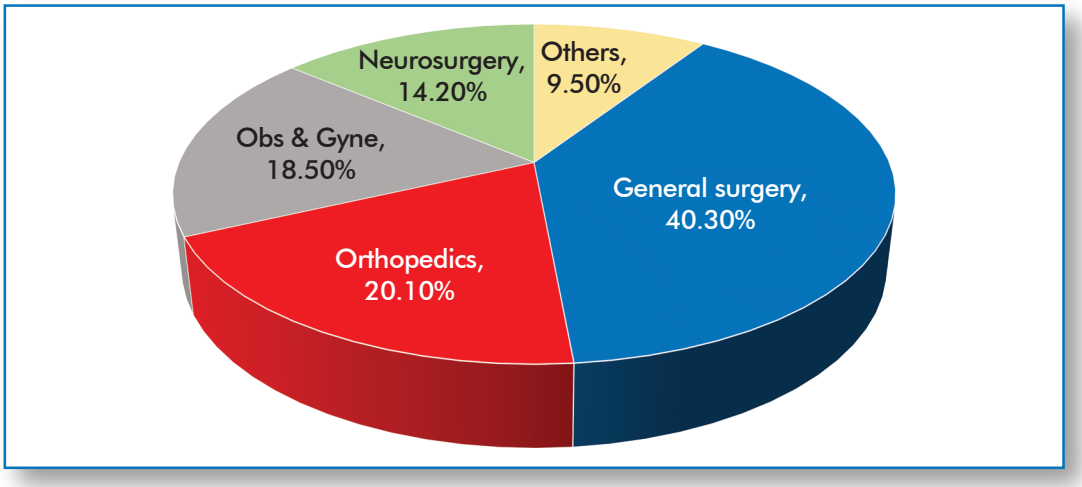
Figure 2: VTE rate by surgical procedure in patients with cancer



The findings of a retrospective study in India by Lee *et al.* are as follows[9]:

- The incidence of **VTE following surgery: 5 per 10,000 operations**
- General surgical operations: The most common cause of postoperative DVT
- The **highest incidence of DVT: General surgery patients** (Figure 3)

Figure 3: Distribution of DVT according to speciality



Risk factors for VTE

The **risk of VTE** is significantly **increased after surgery for at least 12 weeks**.[3] Risk factors for VTE in surgical patients can be patient-related and procedure-related. These factors include[10, 11]:

Patient-related risk factors

- Age >60 years
- Previous history of VTE
- Immobility
- Underlying malignancies
- Pregnancy
- Estrogen replacement therapy
- Obesity
- Underlying hereditary thrombophilic state
- Underlying inflammatory bowel disease
- HIV/AIDS
- Autoimmune diseases, including antiphospholipid syndrome

Procedure-related risk factors

- Duration of procedure
- Degree of tissue damage (orthopedic/trauma surgery: greatest risk)
- Degree of immobility following surgery
- Type of surgery (lower limb orthopedic surgery, neurosurgery, etc.)

The risk factors of VTE in surgical patients can also be divided as[11]:

Low VTE risk

- Surgery lasting <30 minutes
- Injuries without or with only minor soft-tissue trauma
- No or only minor additional predisposing risk factors

Moderate VTE risk

- Surgical procedures of longer duration
- Immobilization of lower limb with a plaster cast
- Lower limb arthroscopic procedures
- No or only minor additional predisposing risk factors

High VTE risk

- Major surgical procedures for malignancy
- Multiple trauma or severe trauma of the spine, vertebra, or lower limbs
- Major orthopedic surgery, e.g., hip or knee replacement
- Major surgical procedure of cardiothoracic and pelvic region

Risk Assessment Models (RAMs) for VTE

- The **most widely used RAM** for individualized **VTE prophylaxis after surgery** is the **Caprini score** (Table 2).[3, 12]
- The **Caprini score** has been **validated across multiple surgical subtypes**, including critically ill patients.[3]
- The **Caprini score stratifies the risk of postoperative VTEs in surgery**.[3]
- The **Caprini score** provides **guidance to clinicians** on recognizing **patients who are at the highest risk** and may **benefit from prophylaxis after surgery**.[3]

Table 2: CAPRINI score for VTE prophylaxis[12]

Choose all that apply

Each risk factor represents 1 point
Age 41–60 years
Minor surgery planned
History of prior major surgery (<1 month)
Varicose veins
History of inflammatory bowel disease
Swollen legs (current)
Obesity (BMI >25)
Acute myocardial infarction
Congestive cardiac failure (<1 month)
Sepsis (<1 month)
Serious lung disease including pneumonia (<1 month)
Abnormal pulmonary function (COPD)
Medical patient currently at bed rest
Other risk factors _____

Each risk factor represents 2 points
Age 60–74 years
Major surgery (>60 minutes)
Arthroscopic surgery (>60 minutes)
Laparoscopic surgery (>60 minutes)
Previous malignancy
Central venous access
Morbid obesity (BMI >40)

Each risk factor represents 3 points
Age over 75 years
History of DVT/PE
Family history of thrombosis
Positive Factor V Leiden
Positive Prothrombin 20210A
Elevated serum homocysteine
Positive lupus anticoagulant
Elevated anticardiolipin antibodies
Heparin-induced thrombocytopenia
Other thrombophilia
Type _____

Each risk factor represents 5 points
Elective major lower extremity arthroplasty
Hip, pelvis, or leg fracture (<1 month)
Stroke (<1 month)
Multiple trauma (<1 month)
Acute spinal cord injury (paralysis) (<1 month)

For women only (each represents 1)
Oral contraceptives or hormonal replacement therapy
Pregnancy or postpartum (<1 month)
History of unexplained stillborn infant, recurrent spontaneous abortion (≥3), premature birth with toxemia or growth-restricted infant

BMI, body mass index; COPD, chronic obstructive pulmonary disease

Total risk factor score

0–1: Low risk (incidence of DVT <10%)

2: Moderate risk (incidence of DVT 10%–20%)

3–4: High risk (incidence of DVT 20%–40%)

≥5: Highest risk (incidence of DVT 40%–80%)

Case Study - 01

A 62-year-old man came to the hospital with the complaints of intermittent abdominal pain, nausea, and weight loss for 4 months. A diagnostic colonoscopy revealed a large non-circumferential mass. Biopsy of the mass confirmed adenocarcinoma of colon, and the patient was admitted to the hospital for colectomy.

What is the estimated VTE risk in this patient?

A. High risk

B. Moderate risk

C. Low risk

D. Highest risk

Answer: **A**

Explanation: The total score in this patient is 4, which indicates a high risk of VTE.

Each risk factor represents 2 points
Age 60–74 years
Major surgery (>60 minutes)
Arthroscopic surgery (>60 minutes)
Laparoscopic surgery (>60 minutes)
Previous malignancy
Central venous access
Morbid obesity (BMI >40)

0–1: Low risk (incidence of DVT <10%)
2: Moderate risk (incidence of DVT 10%–20%)
3–4: High risk (incidence of DVT 20%–40%)
≥5: Highest risk (incidence of DVT 40%–80%)

Case Study - 02

A 47-year-old married woman with BMI of 31 kg/m^2 was diagnosed with stage IIA cervical cancer and was admitted to the hospital. She had a medical history of inflammatory bowel disease. Her treatment plan included laparoscopic radical hysterectomy along with ovarian transposition and pelvic and para-aortic lymph node dissection.

What is the VTE risk in this woman?

A. Low risk

B. Moderate risk

C. High risk

D. Highest risk

Answer: **D**

Explanation: The patient is at the highest risk of VTE, as the total score is 5.

Each risk factor represents 1 point
Age 41–60 years
Minor surgery planned
History of prior major surgery (<1 month)
Varicose veins
History of inflammatory bowel disease
Swollen legs (current)
Obesity (BMI >25)
Acute myocardial infarction
Congestive cardiac failure (<1 month)
Sepsis (<1 month)
Serious lung disease including pneumonia (<1 month)
Abnormal pulmonary function (COPD)
Medical patient currently at bed rest
Other risk factors _____

Each risk factor represents 2 points
Age 60–74 years
Major surgery (>60 minutes)
Arthroscopic surgery (>60 minutes)
Laparoscopic surgery (>60 minutes)
Previous malignancy
Central venous access
Morbid obesity (BMI >40)

0–1: Low risk (incidence of DVT <10%)
2: Moderate risk (incidence of DVT 10%–20%)
3–4: High risk (incidence of DVT 20%–40%)
≥5: Highest risk (incidence of DVT 40%–80%)

Take Home Points

- VTE in surgical patients is a common complication and the most common preventable cause of death.[7]
- The risk of VTE is significantly increased after surgery for at least 12 weeks.[3]
- The Caprini score guides clinicians on recognizing patients who are at the highest risk of VTE and may benefit from prophylaxis after surgery.[3]

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