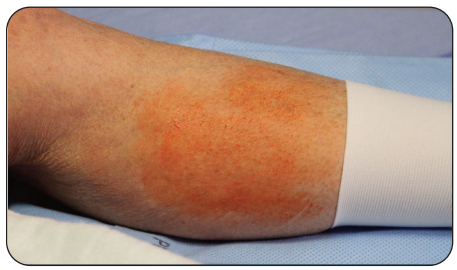
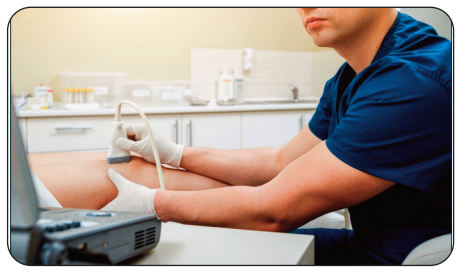
Prevention of Venous Thromboembolism

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STUDY GUIDE

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LEARNING OUTCOME

After completing this study guide and the accompanying video, the perioperative registered nurse (RN) and other perioperative team members will have increased their knowledge of risk factors for venous thromboembolism (VTE) as well as mechanical and pharmacologic interventions for prevention of VTE.

OBJECTIVES

After viewing the video and completing the study guide, the participant will be able to

- assess the patient for risk factors related to VTE,
- implement protocols for mechanical prophylaxis to prevent VTE,
- implement protocols for pharmacologic prophylaxis to prevent VTE,
- recognize the signs and symptoms of VTE, and
- provide patients with education regarding VTE and prophylactic measures to prevent it.

INTRODUCTION

Venous thromboembolism (VTE) is a serious condition that causes significant morbidity and mortality.[1] According to the Centers for Disease Control and Prevention, as many as 900,000 people experience VTE in the United States every year.[2] Venous thromboembolism is estimated to cause between 60,000 and 100,000 deaths annually,[2] and approximately 33% of patient deaths related to VTE occur after a surgical procedure.[3] It is estimated to be among the most common preventable causes of hospital-related mortality.[4]

Among people who develop VTE,

- 50% have long-term complications (eg, swelling, pain, discoloration),[2]
- 33% have a recurrence within 10 years,[2]
- 10% to 30% die within 1 month of diagnosis,[2]
- 25% with pulmonary embolism (PE) experience sudden death as the first symptom,[2] and
- 4% who survive PE develop chronic thromboembolic pulmonary hypertension.[4]

Treatment for VTE involves therapeutic anticoagulation, which is associated with complications ranging from minor bruising and hematoma to major bleeding and death. Treatment of VTE and its complications significantly add to the cost of health care.[1]

The surgical environment puts patients at particular risk for VTE. Patients are often immobilized during procedures, vessels can be injured, and retraction frequently compresses tissues. Positioning requirements during surgery can also lead to VTE. These conditions put all perioperative patients, including children, at potential risk.[1]

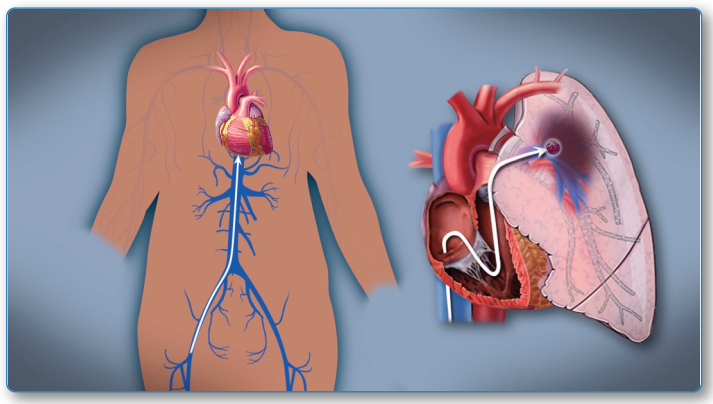
As much as 70% of hospital-associated VTE is estimated to be preventable, but less than half of hospitalized patients receive appropriate preventive measures.[5] This gap represents a major opportunity to improve the care of surgical patients.[4]

The perioperative RN plays an important role in identifying patients at risk for VTE, taking proactive steps to prevent it, consulting and collaborating with other professional colleagues regarding patient care, and advocating for the patient regarding the need for and selection of VTE prophylaxis.[1]

This study guide and accompanying video are intended to assist the perioperative team in developing and implementing a protocol for prevention of VTE. In this study guide and video, the term venous thromboembolism includes both deep venous thrombosis (DVT) and PE.

PATHOPHYSIOLOGY

A DVT occurs when a blood clot forms inside a deep vein in an extremity or the pelvis.[6] It is more likely to occur in the legs than in the arms.[1,6] Conditions that interfere with venous return, injure vessel walls, or create a hypercoagulable state increase the risk for DVT.[6]



A PE occurs when a blood clot in a vein breaks free and travels to the pulmonary system through the right heart[7] and occludes one or more of the pulmonary arteries.[8] Deep vein thrombosis is the primary cause of PE.[6] Deep vein thrombosis is present in 30% or more of patients with PE, and an untreated DVT in the lower extremity is associated with a 3% risk for fatal PE.[6] As with DVT, conditions that interfere with venous return, injure vessel walls, or create a hypercoagulable state increase the risk for PE.[8]

SIGNS AND SYMPTOMS

Signs and symptoms of DVT are variable in frequency and severity, and DVT is often asymptomatic. Symptoms are often nonspecific and can include aching pain, tenderness, swelling, and erythema. Swelling of the entire leg, a difference in calf circumference of more than 3 cm between legs, and pitting edema are more specific signs of DVT. A patient with DVT may have a low-grade fever without an obvious cause.[6]

Pulmonary embolism causes an increase of pulmonary vascular resistance leading to vasoconstriction, shunting, ventilation/perfusion mismatch, atelectasis, and hypoxemia.[7] The severity of the signs and symptoms varies with the size and severity of the clot.[7,8] Many are small and asymptomatic.[8] Signs can include rapid breathing, tachycardia, hypotension, chest pain during inspiration, dyspnea, wheezing, and cyanosis.[7]

ORGANIZATION-WIDE PROTOCOL

Each health care organization should develop and implement a protocol for prevention of VTE. A standardized protocol used throughout the organization promotes consistent and effective care. The protocol should be developed by an interdisciplinary team that includes a clinical team leader; a quality improvement facilitator; process owners, including frontline personnel from each discipline (eg, pharmacists, RNs, surgeons, anesthesia professionals); information technology and health information system experts; and patient representatives.[1]

The protocol should

- be easy to use in clinical practice,
- be evidence-based,
- provide a start time for all types of prophylaxis based on the patient's clinical condition,
- provide support for clinical decisions based on the level of risk, and
- standardize the assessment of risk for VTE and bleeding.[1]

The protocol may include specialty or procedure-specific support for prophylaxis.[1]

The health care organization should use a clinical decision support system with alerts to notify clinicians of potential lapses in prophylaxis according to the VTE protocol. Support systems can improve compliance with protocols and reduce the patient's risk for VTE. To reduce the risk of "alert fatigue," the health care organization might consider limiting notifications to critical events that indicate a lapse in care as opposed to notifying clinicians of all screening events.[1]

PREOPERATIVE ASSESSMENT

The perioperative RN should identify risk factors for VTE as part of the preoperative assessment. Some risk factors are related to the patient; others are related to the procedure. Identification of both types of risk factors is important for determining overall risk and implementing appropriate measures for prophylaxis according to the VTE prevention protocol.[1]

Many patient-related factors can increase the risk for VTE by contributing to venous stasis, vessel wall injury, and hypercoagulability. These factors include:

- Acute infectious disease, including sepsis
- Age over 40 years
- American Society of Anesthesiologists physical status classification of 3 or higher
- Asplenia
- Blood transfusion
- Cancer or treatment for cancer

- Central venous catheter
- Critical care admission
- Dehydration
- Estrogen therapy, including oral contraceptives and hormone replacement therapy
- Heart disease, including congestive heart failure and hypertension
- History of VTE or stroke
- Immobilization
- Inflammatory conditions, including inflammatory bowel disease, rheumatoid arthritis, and psoriasis
- Inherited or acquired thrombophilia
- Known non-O blood type
- Metabolic or endocrine disease
- Obesity
- Obstructive sleep apnea
- Pacemaker
- Pregnancy and the postpartum period
- Preoperative hospitalization
- Prolonged bed rest for more than 3 days
- Recent surgery within the previous 30 days
- Respiratory disease, including chronic obstructive pulmonary disease
- Smoking
- Spinal cord injury
- Steroids
- Trauma
- Varicose veins[1]

Many factors related to the procedure can also increase the risk for VTE. These include:

- Bariatric surgery
- Cardiothoracic surgery
- Cesarean delivery
- Emergency procedure
- General or urologic surgery of the abdomen or pelvis
- Immobilizing cast on a lower limb
- Intraoperative position of the patient, including hip flexion, hyperextension of the knee, and Trendelenburg position
- Major foot and ankle surgery
- Major hand, wrist, or elbow surgery
- Major orthopedic surgery
- Major plastic surgery
- Neurosurgery
- Placement of hardware
- Pneumatic tourniquet, particularly for prolonged periods
- Prolonged surgery and general anesthesia lasting more than 90 minutes, or more than 60 minutes if the procedure involves the lower limb or pelvis
- Spine surgery
- Transplant surgery
- Vascular surgery[1]

The perioperative RN should consult and collaborate with perioperative team members about the need for VTE prophylaxis and the selection of method based on the assessment and the health care organization's VTE protocol.[1]

MECHANICAL PROPHYLAXIS

Both mechanical and pharmacological measures are available for VTE prophylaxis, and they are often used in combination. The addition of intermittent pneumatic compression to pharmacologic prophylaxis has been shown to reduce the risk for VTE compared to either mechanical or pharmacological prophylaxis alone. Mechanical prophylaxis has the advantage of reducing the risk for VTE without increasing the risk for bleeding. Options for mechanical prophylaxis include intermittent pneumatic compression devices, graduated compression stockings, early ambulation, and foot and ankle exercises. Use of mechanical prophylaxis is recommended by several surgical societies. The perioperative team should implement mechanical VTE prophylaxis in a safe and effective manner as prescribed.[1]

PREOPERATIVE ASSESSMENT

While beneficial, mechanical prophylaxis does have some associated complications. Intermittent pneumatic compression

devices can cause pressure injury and hypothermia. Graduated compression stockings have the potential to cause skin injury, nerve injury, or compartment syndrome if sized or worn incorrectly.[1]

The perioperative RN should assess the patient for potential contraindications to intermittent pneumatic compression devices and graduated compression stockings, including:

- Cardiac failure or pulmonary edema from congestive heart failure
- Conditions that prevent correct fitting of the sleeves or stockings (eg, exceeding the size limit, severe leg edema, leg deformity)
- Known allergy or sensitivity to the sleeve, tubing, or stocking material
- Leg conditions (eg, dermatitis, leg ulcer, recent skin graft) that may be worsened by pneumatic compression or compression stockings
- Peripheral neuropathy or other sensory impairment
- Pre-existing DVT
- Severe arteriosclerosis or other ischemic vascular disease[1]

The perioperative RN should notify the prescriber and the anesthesia professional if any contraindications are identified.[1]

APPLICATION

When intermittent pneumatic compression devices or graduated compression stockings are ordered, the perioperative RN should apply them and make sure they are functioning properly before regional or general anesthesia is initiated. Regional and general anesthesia cause loss of muscle tone, which leads to dilation of the leg veins. Minimizing this dilation and the venous stasis that comes with it is helpful for preventing VTE.[1]

The perioperative RN should follow the manufacturer's instructions when applying the sleeves for compression devices. If a stockinet, graduated compression stocking, or other material is required under the sleeve, the RN should make sure it is free of wrinkles. Wrinkles could potentially lead to skin injuries. The tubing on the sleeve should face away from the patient's skin and be positioned away from areas that could cause pressure injuries.[1]

Whenever a patient is transferred to the OR bed or repositioned, the perioperative RN should confirm that the compression devices are still properly applied and connected and that the tubing has not moved into a position that might create an injury.[1]

The perioperative RN may be required to assist with procedures involving magnetic resonance imaging (MRI) either in the radiology suite or in a hybrid OR. The RN should ensure that pneumatic compression devices and their components are MRI safe whenever a procedure involves intraoperative MRI. Devices that are not MRI safe can become potentially lethal projectiles when the magnet is turned on. Team members might need to move the control unit for the compression device into the MRI control room and use manufacturer-approved extended tubing.[1]

Graduated compression stockings are often used in combination with other methods of prophylaxis, including intermittent pneumatic compression devices. They come in thigh-high and knee-high lengths. Current evidence is unclear about which length is optimal, although The American College of Chest Physicians recommends thigh-length stockings. The perioperative RN should assess the patient's ability to wear thigh-length compression stockings according to the manufacturer's instructions. If the patient is unable or unwilling to wear thigh-high stockings, the RN should consult with the surgeon to determine whether knee-length stockings are acceptable.[1]

The perioperative RN should ensure that graduated compression stockings are properly fitted for each patient. The wrong size of stocking can injure a patient or reduce the

effectiveness of VTE prophylaxis. Compression syndrome because of incorrect stocking size has been reported. The RN should measure the patient's legs according to manufacturer's instructions to ensure a proper fit. It is important to measure both legs separately because the legs might be different enough in size to require different sizes of stocking. The health care organization should stock a wide range of sizes to help ensure that each patient will receive a proper fit.[1]

The perioperative RN should apply the compression stockings according to the manufacturer's instructions. After the stockings are on, the RN should verify that the

- stockings are not rolled up the foot or down the leg,
- stockings are smooth when fitted,
- toe holes lie underneath the toes,
- heel patches are in the correct position, and
- thigh gussets are positioned on the patient's inner thighs.[1]

After transferring the patient to the OR bed or repositioning of the patient, the perioperative RN should verify that the compression stockings have not rolled up the foot or down the leg.[1]

Postoperative leg edema may change the fit of graduated compression stockings and reduce their effectiveness. If the patient develops postoperative leg edema, the RN should remove the stockings, remeasure the legs, and refit the stockings.[1]

Elastic bandages should not be used as a substitute for graduated compression stockings. Elastic bandages may not provide a protective effect for VTE because pressure can be variable and bandaging technique can be inconsistent.[1]

Graduated compression stockings and intermittent pneumatic compression devices may be used on patients in the lithotomy position.[1]

ASSESSMENT FOR ADVERSE EFFECTS

Skin injury, nerve injury, compartment syndrome, and vascular compromise are potential complications related to use of mechanical VTE prophylaxis. The perioperative RN should assess the patient for adverse effects, including:

- Hypothermia
- Ischemia
- Numbness, tingling, discomfort, or pain
- Proximal indentation at the knee from knee-length graduated compression stockings
- Skin injury[1]

The VTE protocol at each health care facility should specify when mechanical VTE prophylaxis should be removed for patient assessment and patient care activities. If the perioperative RN finds evidence of complications related to mechanical VTE prophylaxis, he or she should remove the stockings or compression device, notify the surgeon and anesthesia professional, and document any actions taken.[1]

If a patient is injured or equipment fails during the use of an intermittent pneumatic compression device, the RN should remove the device from service; retain all sleeve and tubing accessories; and report the details of the event, including identification of the device, according to policies and procedures established by the health care organization.[1]

AMBULATION

Contraction of the leg muscles during ambulation decreases venous stasis.[1] The perioperative RN should encourage the patient to ambulate as soon as possible after surgery.[1,7] Benefits of early postoperative ambulation include reduced VTE complications, reduced pulmonary complications, reduced muscle atrophy, and reduced hospital length of stay.[1] Early ambulation is recommended in many surgical guidelines and protocols.[1] The perioperative RN should assess the patient's risk for falls and implement measures to prevent them during postoperative ambulation.[1]

Barriers to early postoperative ambulation can include inadequate pain control, pain management techniques that reduce patient mobility (eg, regional anesthesia), IV fluid infusion, an indwelling urinary catheter, lack of patient motivation, and pre-existing comorbidities. The perioperative RN should collaborate with the perioperative team to minimize these barriers.[1]

FOOT AND ANKLE EXERCISES

The perioperative RN should instruct the patient to perform postoperative foot and ankle exercises. Foot and ankle exercises decrease venous stasis by creating natural compression of the venous system through muscle contraction. Blood flow to the lower extremities is improved.[1]

PHARMACOLOGIC PROPHYLAXIS

Unless a patient is at low risk for VTE or is at high risk for bleeding complications, mechanical prophylaxis alone is not recommended for effective VTE prevention. Pharmacologic prophylaxis consists of administering anticoagulant medications that inhibit blood clotting. The pharmacologic regimen may include medications such as low molecular weight heparin, low-dose unfractionated heparin, warfarin, factor Xa inhibitors, dabigatran, vitamin K antagonists, or aspirin. The perioperative RN should implement pharmacologic VTE prophylaxis in a safe and effective manner as prescribed.[1]

As part of the preoperative assessment, the perioperative RN should assess the patient for potential contraindications to pharmacologic VTE prophylaxis, including:

- Active bleeding
- Acute stroke
- Allergy to medication
- Bacterial endocarditis
- Concomitant use of anticoagulants, antiplatelet therapy, or thrombolytic drugs
- Known untreated bleeding disorder
- Lumbar puncture, epidural anesthesia, or spinal anesthesia within the previous 4 hours or planned within the next 12 hours
- Ophthalmic surgery
- Pregnancy
- Previous major bleeding
- Procedures (eg, craniotomy, spinal surgery, spinal trauma, reconstructive procedures involving a free flap) in which bleeding complications have especially severe consequences
- Prosthetic heart valve
- Severe renal or hepatic failure
- Thrombocytopenia
- Uncontrolled systemic hypertension[1]

If any contraindications are identified, the RN should notify the licensed practitioner who prescribed the VTE prophylaxis.[1]

The perioperative RN should assess patients receiving pharmacologic VTE prophylaxis for adverse effects, including:

- Bleeding
- Hematoma formation
- Irritation, pain, bruising, bleeding, or itching at the injection site
- Skin necrosis
- Thrombocytopenia[1]

If any signs of adverse effects are observed, the perioperative RN should notify the prescriber and the anesthesia professional.[1]

DIAGNOSTIC TESTING

Several diagnostic tests are available for cases of suspected VTE.

D-dimer is a by-product of fibrinolysis.[6,8] An elevated level of D-dimer is suggestive of the presence and lysis of thrombi.[6,8] It is a potentially sensitive test, but not specific for VTE.[6,8] A normal level of D-dimer is helpful for ruling out VTE, but an elevated level requires further investigation.[6,7,8]

For diagnosis of DVT, ultrasonography is used to visualize thrombi directly. Impaired venous flow can be detected when ultrasonography is used with Doppler flow studies. Ultrasonography is most sensitive and specific for thrombi in the femoral and popliteal veins. It is less accurate for detecting thrombi in calf or iliac veins.[6]

Computed tomography (CT) pulmonary angiography can be used for diagnosis of PE.[7,8] It is a sensitive and specific test for PE and can provide information about additional lung pathology.[8]

Ventilation/perfusion (V/Q) scans can be used to diagnose PE by identifying areas of the lungs that are ventilated but not perfused.[7,8] Ventilation/perfusion scans are less specific than CT angiography, but can be useful when radiologic contrast is contraindicated (eg, renal failure) or when a patient is too unstable for CT.[8]

TREATMENT

The primary treatment for VTE is anticoagulation.[6,7,8] There are many possible anticoagulation regimens. Low molecular weight heparin (LMWH) is often begun to rapidly establish a therapeutic level of anticoagulation.[6,7] Warfarin, a vitamin K antagonist, is also initiated, but requires more time to establish a therapeutic level.[7] Low molecular weight heparin can be discontinued when warfarin has achieved the desired level of therapeutic effect.[6,7]

Duration of therapy depends on the drug used and the patient's risk factors.[8] Warfarin therapy is maintained for 3 to 6 months in patients with transient risk factors.[6,7] Patients with unmodifiable risk factors may require prolonged therapy, possibly for life.[6]

Unfractionated heparin is not cleared by the kidneys, so it can be used instead of LMWH for patients with renal failure or insufficiency.[6]

Fondaparinux is a selective factor Xa inhibitor.[6] It is sometimes used for acute DVT instead of LMWH.[8]

Direct oral anticoagulants (DOACs) (eg, rivaroxaban, apixaban, edoxaban, dabigatran) are another option for anticoagulation. Direct oral anticoagulants can achieve therapeutic levels within a few hours (compared with up to 5 days for warfarin). They are more expensive than warfarin, and reversal agents are currently available only for edoxaban and dabigatran.[6]

To treat a patient diagnosed with a large or severe VTE, thrombolytic drugs or a thrombectomy may be required.[6]

PATIENT EDUCATION

The perioperative RN should provide the patient and the patient's caregivers with instructions about prevention of VTE and the prophylactic measures that have been prescribed. Venous thromboembolism frequently develops or becomes evident after the patient is discharged. Education teaches the patient about the signs and symptoms of VTE, provides an awareness of VTE prevention measures, helps the patient understand when to seek medical help, and may help to improve compliance.[1]

The perioperative RN should provide verbal and written instructions on the prevention of VTE. These instructions should include:

- Avoiding clothing that constricts the lower extremities
- Avoiding sitting or standing for long periods of time
- Avoiding sitting with knees bent or legs crossed for long periods of time
- Common signs and symptoms of DVT or PE (eg, leg pain, swelling, unexplained shortness of breath, wheezing, chest pain, palpitations, anxiety, sweating, coughing up blood)
- Elevating the legs
- Importance of complying with the prescribed regimen of VTE prophylaxis, including continuing the prophylaxis for the specified duration
- Importance of mobilization, including ambulation and foot and ankle exercises

- Importance of seeking medical help and who to contact if the patient suspects he or she is experiencing VTE
- Maintaining adequate hydration
- Preventive measures to use when traveling long distances after surgery, including frequent ambulation; calf muscle exercise; and wearing fitted, knee-length graduated compression stockings
- Who to contact if the patient has any problems using the prescribed VTE prophylaxis[1]

If mechanical prophylaxis is prescribed for the patient, the perioperative RN should provide preoperative and postoperative instructions, including:

- Benefits of mechanical prophylaxis
- Instructions for removal and reapplication of the intermittent compression device immediately after ambulation
- Instructions for removal, laundering, and reapplication of graduated compression stockings
- Potential complications of mechanical prophylaxis, including skin injury, ischemia, numbness, tingling, discomfort, or pain
- Importance of compliance
- Importance of postoperative ambulation
- Importance of wearing compression stockings in accordance with the manufacturer's instructions
- Who to contact if the patient has any problems using the prescribed mechanical prophylaxis[1]

The perioperative RN should assess the patient's ability to remove and replace mechanical prophylactic devices or the availability of someone to help the patient. [1]

The perioperative RN should provide instructions for patients receiving pharmacologic VTE prophylaxis, including:

- Avoiding certain activities (eg, contact sports)
- Avoiding eating large amounts of food high in vitamin K (eg, green, leafy vegetables)
- Carrying or wearing medical identification to let health care providers know that the patient takes anticoagulation therapy
- Importance of continuing medication as prescribed after discharge
- Importance of following through with medication-related laboratory tests
- Importance of not stopping any medications and not starting any new medications, including over-the-counter medications, without consulting the physician
- Informing health care workers about pharmacologic prophylaxis before undergoing any procedures (eg, dental work, laboratory tests)
- Informing the physician if the patient is breastfeeding
- Potential adverse effects and when to seek medical attention
- Potential interactions with herbal and other over-the-counter preparations
- Reporting signs of bleeding, including:
  - Coughing up blood
  - Cuts that do not stop bleeding
  - Pain, swelling, or discomfort in a joint
  - Pink or brown urine
  - Recurring nose bleeds
  - Red or black tarry stools
  - Unusual bleeding from gums
  - Unusual bruising
  - Vomiting blood or vomit that looks like coffee grounds
- Reporting signs of potential epidural hematoma if the patient underwent any spine procedures, including back pain, tingling or numbness, muscle weakness, or incontinence
- Using a soft toothbrush and waxed dental floss gently
- Using an electric razor when shaving
- Who to contact if the patient has any problems self-administering the prescribed pharmacologic prophylaxis[1]

DOCUMENTATION

It is important for the perioperative RN to document activities related to the prevention of VTE. Documentation in the patient's medical record provides a description of the perioperative care administered, the status of the patient upon transfer, and information to support continuity of care.[1]

Documentation should be recorded in a manner consistent with the health care organization's policies and procedures and should include:

- Adverse effects from mechanical or pharmacologic prophylaxis and actions taken
- Application and removal times for all mechanical prophylactic measures

- Contraindications to mechanical or pharmacologic prophylaxis and actions taken
- Intermittent pneumatic compression device identification (eg, serial or biomedical number) and settings
- Patient education provided
- Pharmacologic prophylaxis administration, including medication, dose, time, and route
- Presence of VTE risk factors
- Reasons for any variances from the VTE protocol
- Results of a fall risk assessment and measures taken to prevent patient falls during postoperative ambulation
- Results of a patient skin assessment
- Type and size of the intermittent pneumatic compression sleeve and graduated compression stockings applied[1]

EDUCATION AND COMPETENCY VARIFICATION

Perioperative team members should receive initial and ongoing education and complete competency verification activities related to prevention of VTE. Education facilitates the development of knowledge, skills, and attitudes that affect safe patient care.[1]

Education and competency verification should include:

- Assessment of VTE risk factors, including both patient- and procedure-specific factors
- Contraindications and adverse effects of mechanical and pharmacologic prophylaxis
- Importance of compliance with mechanical prophylaxis
- Importance of patient education
- Manufacturer's instructions for use and sizing for graduated compression stockings and intermittent pneumatic compression devices
- Pathophysiology of VTE formation
- VTE protocol and updates[1]

QUALITY MANAGEMENT

The health care organization's quality management program should evaluate the outcomes of VTE prophylaxis and protocol compliance. Quality assurance and performance improvement programs can help to identify problem areas and assist team members in formulating plans for corrective action and evaluating and improving the quality of patient care. These programs provide data that may be used to determine whether an individual organization is within benchmark goals, and if not, to identify areas that may require corrective action.[1]

Quality assurance for venous thromboembolism (VTE) prevention should include:

- Monitoring the rate of perioperative VTE, including deep vein thrombosis and pulmonary embolism
- Assessing compliance with prophylaxis according to the health care organization's protocol
- Addressing barriers to compliance with prophylaxis
- Identifying common failure models in VTE prevention processes
- Providing ongoing evaluation and feedback to perioperative team members and refinement of the VTE protocol as needed[1]

SUMMARY

Venous thromboembolism is a potentially devastating complication with serious consequences for patient morbidity and mortality. The surgical environment puts perioperative patients, including children, at particular risk. Many cases of hospital-associated VTE are preventable, and the perioperative RN has a responsibility to identify risk factors and advocate for the patient regarding the need for VTE prophylaxis. By implementing an evidence-based, organization-wide protocol for VTE prophylaxis and providing education to patients, the perioperative team can minimize the risk for VTE, enhance patient safety, and improve outcomes.[1]

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ADDITIONAL RESOURCES

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POST-TEST

PREVENTION OF VENOUS THROMBOEMBOLISM

Multiple choice. Please choose the word or phrase that best completes the following statements.

1. Approximately what proportion of patient deaths related to VTE occur after a surgical procedure?
   a. One-fourth
   b. One-third
   c. One-half
   d. Two-thirds

2. What percentage of hospital-associated VTE is estimated to be preventable?
   a. 25%
   b. 40%
   c. 55%
   d. 70%

3. Which of the following is the primary cause of PE?
   a. Amniotic fluid embolism
   b. Deep venous thrombosis
   c. Fat embolism from broken bones
   d. Tumor cells

4. Which of the following signs and symptoms is most specific for DVT?
   a. Aching pain
   b. Erythema
   c. Swelling of an entire leg
   d. Tenderness

5. An organization-wide protocol for prevention of VTE should have which of the following characteristics?
   a. Developed by a multidisciplinary team
   b. Easy to use in clinical practice
   c. Evidence-based
   d. Standardization of risk assessment for venous thromboembolism and bleeding
   e. All of the above

6. Which of the following is a patient-related risk factor for VTE?
   a. Age over 30 years
   b. American Society of Anesthesiologists physical status classification of 2 or higher
   c. Obstructive sleep apnea
   d. O blood type
   e. All of the above

7. Which of the following is a contraindication to intermittent pneumatic compression device or graduated compression stocking use for mechanical VTE prophylaxis?
   a. Cardiac failure
   b. Peripheral neuropathy
   c. Recent skin graft
   d. Severe arteriosclerosis
   e. All of the above

8. When should intermittent compression devices or graduated compression stockings used for VTE prophylaxis be applied?
   a. After final positioning of the patient
   b. After the patient is numb from regional anesthesia or unconscious from general anesthesia
   c. After the procedure has been confirmed during the time out
   d. Before regional or general anesthesia is initiated

9. Which of the patient's legs should be measured when fitting graduated compression stockings?
   a. Both legs should be measured separately
   b. Right leg for right-handed patients and left leg for left-handed patients
   c. Whichever leg is larger
   d. Whichever leg is smaller

10. How soon after surgery should the perioperative RN encourage a patient to ambulate?
    a. After the patient is cleared by physical therapy
    b. After the surgeon conducts postoperative rounds
    c. As soon as possible
    d. When the patient's reported pain score is 3 or less

11. Lumbar puncture, epidural anesthesia, or spinal anesthesia within the previous _____ or planned within the next _____ is a potential contraindication for pharmacologic VTE prophylaxis.
    a. 4 hours; 4 hours
    b. 4 hours; 12 hours
    c. 12 hours; 12 hours
    d. 12 hours; 24 hours

12. Which of the following best describes the sensitivity and specificity of levels of D-dimer for diagnosing venous thromboembolism?
    a. Neither sensitive nor specific
    b. Sensitive and specific
    c. Sensitive, but not specific
    d. Specific, but not sensitive

13. Which of the following is the primary treatment for VTE?
    a. Anticoagulation
    b. Heat and compression
    c. Thrombectomy
    d. Thrombolytic therapy

14. Which of the following statements regarding patient education about prevention and prophylaxis for VTE is most accurate?
    a. Venous thromboembolism rarely develops after the patient has been discharged.
    b. Education has been shown to have no effect on patient compliance.
    c. Education helps the patient understand when to seek medical help.
    d. Involving the patient's caregivers in education is a violation of HIPAA regulations.

POST-TEST ANSWERS
PREVENTION OF VENOUS THROMBOEMBOLISM

1. b
2. d
3. b
4. c
5. e
6. c
7. e
8. d
9. a
10. c
11. b
12. c
13. a
14. c