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Venous ThromboEmbolic Disease

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Course Description:

Venous thromboembolic (VTE) disease is a high acuity, low occurring process that when recognized can be managed. The course will help by giving understanding of the disease and its management. VTE is a detrimental disease process that is life threatening for the women it effects. The VTE course will provide knowledge for treatment of the pregnant woman while keeping the fetus safe.

Approximate Time to Complete: 70 minutes

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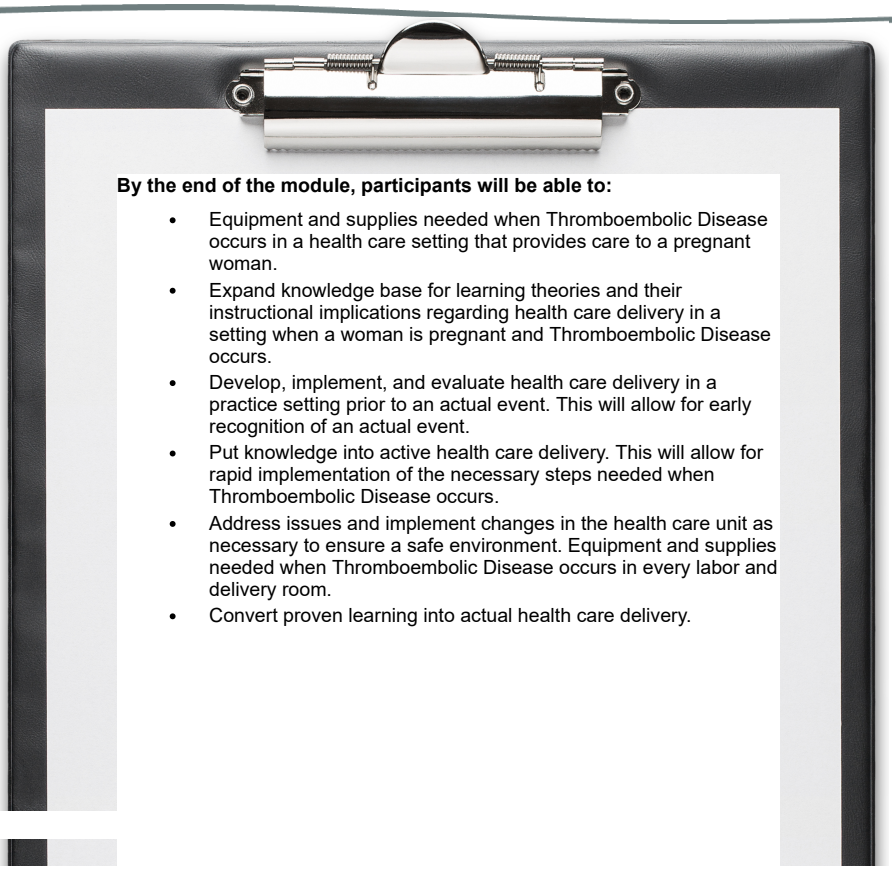


By the end of the module, participants will be able to:

- Equipment and supplies needed when Thromboembolic Disease occurs in a health care setting that provides care to a pregnant woman.
- Expand knowledge base for learning theories and their instructional implications regarding health care delivery in a setting when a woman is pregnant and Thromboembolic Disease occurs.
- Develop, implement, and evaluate health care delivery in a practice setting prior to an actual event. This will allow for early recognition of an actual event.
- Put knowledge into active health care delivery. This will allow for rapid implementation of the necessary steps needed when Thromboembolic Disease occurs.
- Address issues and implement changes in the health care unit as necessary to ensure a safe environment. Equipment and supplies needed when Thromboembolic Disease occurs in every labor and delivery room.
- Convert proven learning into actual health care delivery.

Venous ThromboEmbolic Disease

Collectively deep venous thrombosis (DVT) and pulmonary embolism (PE) are referred to as venous thromboembolic disease (VTE).

Well established risk factors for VTE, DVT and PE are pregnancy and the puerperium.

- Fortunately, the prevalence of VTE in pregnancy is low.
- The diagnosis of VTE occurs 1 in 500 - 2000 pregnancies within the United States [1-7].
- The incidence of VTE was 85 per 100,000 pregnancies in a retrospective case-control study of 395,335 pregnant women at 24 weeks of gestation [14].
- An overall incidence of VTE was 200 per 100,000 women-years in a population-based inception cohort study over a 30 year period [5].
- Compared to PE, DVT was three times more common [5].

Occurrence

PE accounts for nine percent of maternal deaths and is the seventh leading cause of maternal mortality [9-11].

- In comparison, black women have a three to four times higher pregnancy related mortality ration than white women.
- The largest racial disparity occurs with pregnancy related mortality in the maternal and child health indicators [11].
- Deaths from VTE are higher in black women and the reasons for this can not be directly attributed to increased rates of VTE [8].

Carefully consider the risk assessment protocols available and adopt them in a systematic way to reduce the incidence of VTE in pregnancy and postpartum.

Click here to learn more about occurrence of VTE.

- When comparing to non-pregnant women there is an incidence 4 to 50 times higher in pregnancy to develop a VTE [1-6, 93].
- A personal history of thrombosis is the most important risk factor for VTE in pregnancy, increasing her risk 3-4 fold [36].
- VTE has the highest risk in the postpartum period with higher than usual prevalence in the left lower extremity and pelvis.
- Further risk occurs in women with inherited thrombophilias.

The list below includes factors that increase the risk of VTE antepartum, but are less well described:

- Multiple Gestation [20]
- Varicose veins [21]
- Inflammatory bowel disease [20]
- Urinary tract infection [20]
- Diabetes [20] & Sickle Cell Anemia [67]

- Hospitalization for non-delivery reasons (particularily those >3 days) [21]
- Body mass index (BMI) ≥30 kg/m2 [21]
- Increased maternal age ≥35 years [21]

- The risk of VTE is 2-5 times more common postpartum compared to the antepartum period [22-24].
- For the first six weeks postpartum the risk is highest and slowly declines to rates approximate to that of the general population by 13-18 weeks [22].

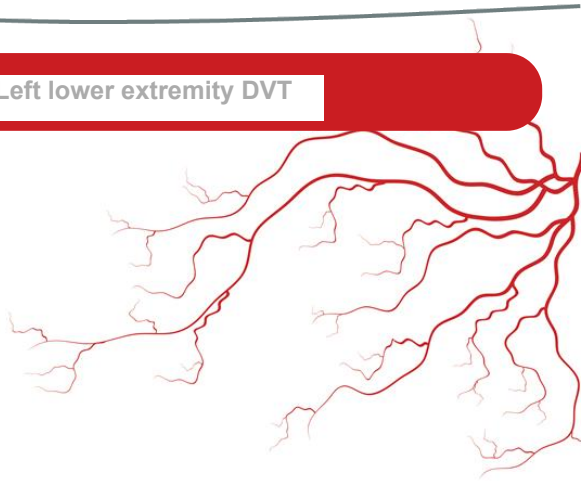
- Commonly cited factors that increase the risk of VTE postpartum include the following [14,17,19, 20,22-24]:
  - Cesarean delivery (a fourfold increase risk compared to vaginal birth[93])
  - Medical comorbidities (e.g. varicose veins, cardiac disease, inflammatory bowel disease)
  - Body mass index (BMI) ≥25 kg/m2
  - Young gestational age (preterm delivery <36 weeks)
  - Obstetric hemorrhage
  - Stillbirth
  - Increased maternal age ≥35 years
  - Hypertension
  - Smoking
  - Eclampsia or preeclampsia
  - Postpartum infection

The absolute risk of VTE postpartum appears to be quite low after six weeks, but is certainly highest the first six weeks postpartum [20,21,23].

The majority of thrombotic events are from VTE (68 percent) followed by stroke (28 percent) and myocardial infarction (4 percent) [20,21,23].

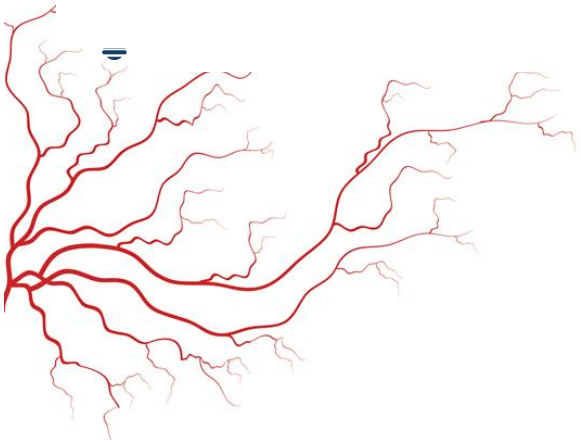
Those with thrombotic events were more likely to be older (35 years or older), have risk factors for thrombosis (i.e. eclampsia, hypercoagulable state, smoking, cesarean section) and be white or black rather than Hispanic or Asian [20, 21, 23].

Left lower extremity DVT



Interestingly, the majority of lower extremity DVT's occur on the left side during pregnancy and most commonly in the proximal veins (i.e. femoral). In addition, pelvic vein thrombosis is significantly higher during pregnacy and the puerperium.

There is not research describing an increased incidence of upper extremity DVT during pregnancy nor the puerperium.



The VTE risks is higher in pregnant women who have inherited thrombophilias [4,29-35] which is beyond the scope of this program.

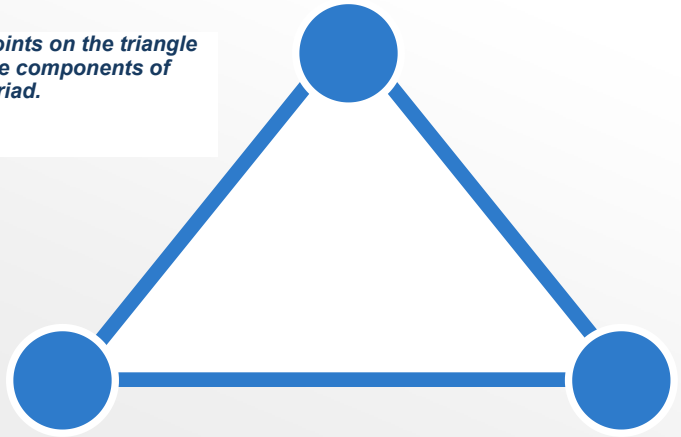
The table below reviews high versus low risk thrombophilias [36].

Low Risk Thrombophilia	High Risk Thrombophilia
Factor V Leiden Heterozygous	Antithrombin deficiency
G20210A Heterozygous	Double heterozygous Prothrombin G20210A & Factor V Leiden
Protein C deficiency	Factor V Leiden Homozygeous
Protein S deficiency	Prothrombin G20210A Mutation Homozygeous
	Antiphospholipid Syndrome

Briefly, the most common inherited thrombophilias are illustrated with the following studies with variable range in risk of VTE in pregnant patients.

All three components of Virchow's triad are known to occur in pregnancy and postpartum [2]:

Click the points on the triangle to reveal the components of Virchow's triad.



Two factors lead to venous stasis of the lower extremities during pregnancy:

- Pregnancy-associated changes in venous capacitance
- Compression of large veins by the gravid uterus.

The increased venous stasis during pregnancy appears to occur even before the uterus has enlarged substantially.

The venous pooling and valvular incompetence are due to hormonally induced dilation of capacitance veins decreasing the linear flow velocity in the lower extremities although blood volume and total venous return are supra-normal in pregnancy [38].

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left iliac vein by the

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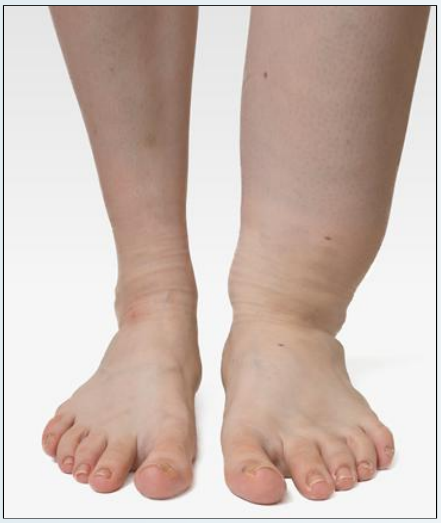


Clinical features

- Normal pregnancy and the puerperium features overlap with clinical features of DVT in pregnancy.
- Thus, it can be difficult to distinguish the clinical features associated with the hemodynamic changes of pregnancy from clinically important DVT.
- The clinical presentation of DVT in pregnancy is identical to a non-pregnant woman, other than the higher propensity to develop left-sided DVT and iliac vein thrombosis.
- When the proximal vein has a thrombus, the signs and symptoms to suggest this diagnosis are diffuse pain and swelling that may or may not be associated with erythema, warmth and tenderness of the lower extremity.
- Iliac vein thrombosis have symptoms including swelling of the entire leg with or without flank, lower abdomen, buttock or back pain [45].

Laboratory Considerations

- Compared to the general population, D -dimer has limited diagnostic value in pregnant women suspicious of having a DVT.
- Arterial blood gases are not routinely indicated to diagnose DVT.
- There has been extensive studies for the use of serum D-dimer, a breakdown product of cross-linked fibrin, for serum assays (enzyme linked, turbidimetric, hemaggluination).
- The negative predictive value of D-dimer in ruling out DVT is high in non-pregnant patients, particularly when combined with clinical probability models or with a negative compressive ultrasound.
- D-dimer increases during pregnancy making this test not useful during pregnancy, although the negative predictive value remain high.
- D-dimer has limited utility in pregnancy largely due to the natural rise in D-dimer with each trimester and slow decline postpartum.
- There are not established normal reference ranges during pregnancy, thus the altered levels of D-dimer throughout pregnancy and the puerperium are subject to misinterpretation.
    - False negative D-Dimer's have been reported in pregnant women with DVT or PE [36].

- The majority of research to support the imaging for diagnosing DVT in pregnancy is extrapolated from large studies in the non-pregnant population with smaller studies suggesting similar efficacy in pregnancy.
- DVT in pregnancy is most often diagnosed by demonstrating poor compressibility of the proximal veins on compression ultrasound (CUS).
- Rarely is the diagnosis of DVT made by noting a filling defect on CT or MRI.
- In both pregnant and non-pregnant patients the proximal vein CUS is highly sensitive and specific diagnostic study for the diagnosis of DVT.
- However, compression ultrasound (CUS) is less sensitive for pelvic vein thrombosis (more common in pregnant women) and for calf vein thrombosis (less common) [28].
- When CUS is negative, poor doppler flow in the iliac vein has reasonable accuracy for the diagnosis of suspected pelvic vein DVT; obtaining serial compression ultrasound is sensitive strategy utilized to follow suspected calf vein DVT in the rare circumstances it propagates normally.

Compression Ultrasonography

- For diagnosing symptomatic proximal vein thrombosis, in pregnant patients, poor compressibility of a thigh vein with ultrasound probe is highly sensitive (95%) and specific (>95%) [50].
- To assist in diagnosing isolated iliac vein thrombosis during pregnancy, patient positioning in the left lateral decubitus and the addition of doppler analysis for flow variation with respiration helps [46].
- When positive, the diagnosis of DVT by CUS in a pregnant patient should prompt immediate anticoagulation.
- As discussed before, CUS is less sensitive for pelvic vein thrombosis and for calf vein thrombosis [28].
- When CUS is negative, pelvic vein thrombosis may be suspected when the visualized vein is compressible, but the absence of normal changes of flow during respiration or with valsalva occur.
- Utilizing serial CUS can detect suspected calf vein thrombosis that propagates proximal as progression of pregnancy occurs.

Slide 1 of 4

Click the left and right arrows to see more.

Diagnosing VTE

- To diagnose VTE successfully in pregnancy and the puerperium, it requires clinicians to have a high index of clinical suspicion and a low threshold to order objective confirmatory tests.
- To diagnose DVT in pregnancy, the approach is consistent with evidence-based guidelines published by the American College of Chest Physicians (ACCP) in 2012 and the American College of Obstetricians and Gynecologists in 2018 [67, 36].
- The ACCP and ACOG guidelines are resources for the clinician regarding testing and implementation of anticoagulation based on individual assessment of a pregnant woman suspected of having a DVT.

Pretest Probability | Wells Score | D-Dimer

Click the terms to see more information.

- All pregnant patients suspected of having a DVT should undergo evaluation with an initial test of compression ultrasound (CUS) (**Algorithm**).
- As priorly discussed, the first-line test for the diagnosis of suspected DVT in pregnancy is proximal CUS. Venography and magnetic resonance imaging are not [59].
  - In advanced pregnancy, CUS should be performed with the patient in the left lateral decubitus position.
- The CUS results and clinical suspicion help to determine if further testing needs to occur such as doppler ultrasound of the iliac vein, magnetic resonance or contrast venography (**Algorithm**).

Click the positive and negative symbols to learn more about CUS.

Diagnosis

- With concerning signs and symptoms (i.e. suspected iliac vein thrombosis with swelling of the entire leg and buttock), it may be warranted to obtain further evaluation with doppler ultrasound directed at the iliac vein followed by magnetic resonance and then contrast venography, as needed.

- DVT in pregnancy is diagnosed by demonstrating lack of compressing the proximal veins on CUS (femoral vein thrombosis) or poor flow on doppler imaging of the femoral-iliac vein (iliac vein thrombosis).
- It is rare to utilize magnetic resonance imaging or venography in the diagnosis of DVT.
- D-dimer levels and clinical exam cannot be used alone to diagnose DVT.

The differential diagnosis of DVT in pregnancy is similar to that in non pregnant patients.

- The differential includes other entities that present with erythema, warmth, edema and tenderness of the lower extremity with or without flank, lower abdomen, buttock or back.
- Many of the physiologic changes of normal pregnancy (i.e. lower extremity swelling and cramping), can mask the clinical signs and symptoms of DVT in pregnancy.
- The clinical suspicion for DVT should be high in the setting of pregnancy.
- Features highly suggestive for the diagnosis include unilateral sign and symptoms and the classic symptoms of iliac vein thrombosis, however, these are not always present.
- Such symptoms should prompt immediate investigation for DVT with compressive or Doppler ultrasound.
- It is important to note that DVT can co-exist with other conditions.
- An alternative diagnosis (i.e. cellulitis) will lower the clinical suspicion for DVT and may negate the need for diagnostic imaging.

Prevention

- Consider discussing prophylaxis if prior DVT or thromboembolic disease (i.e. Factor V Leiden)
- Prophylaxis in pregnancy when indicated (i.e. compression stockings preop for cesarean)

Management

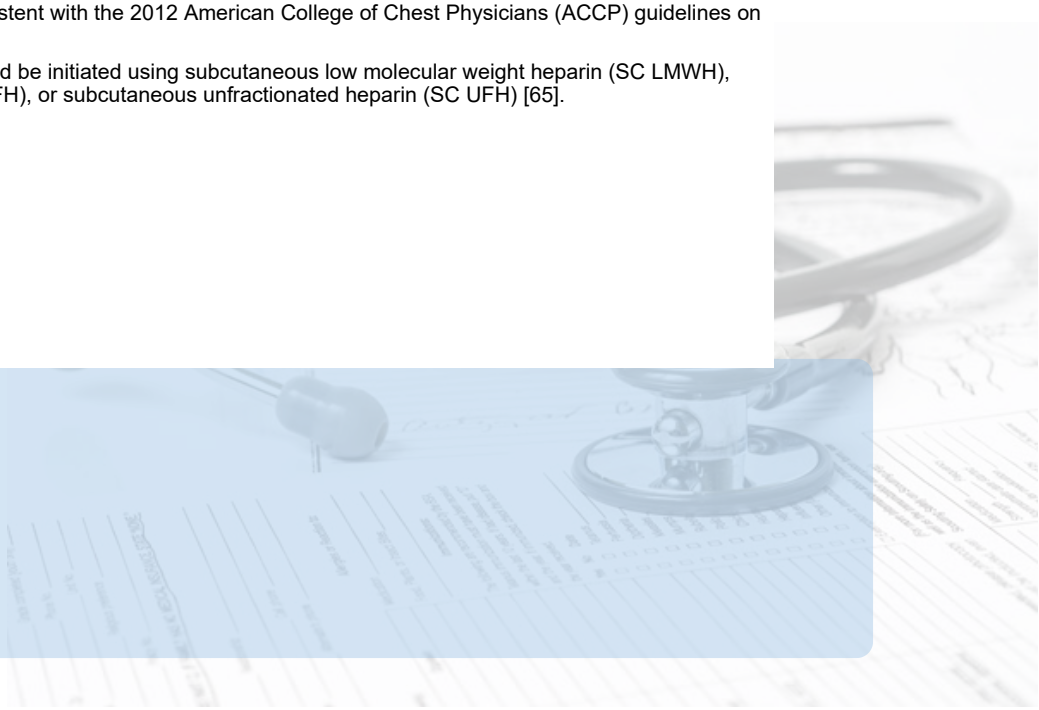
- The first line management of suspected VTE is dependent on the degree of clinical suspicion for acute PE, if contraindications for anticoagulation is present and if PE, DVT or both are suspected.
- Empiric anticoagulation is indicated prior to diagnostic testing when there is a high suspicion for acute PE.
- Anticoagulant therapy is discontinued if VTE is excluded.
- If there is low or moderate clinical suspicion, empiric anticoagulant therapy prior to diagnostic evaluation should be determined case-by-case.
- When PE is suspected, but anticoagulant therapy is contraindicated, diagnostic evaluation should be expedited.
  - Anticoagulation-independent therapy (e.g. inferior vena cava filter) is indicated if VTE is confirmed.
  - Anticoagulant therapy is generally withheld when there is suspicion for DVT alone, without evidence of acute PE, until VTE is confirmed, assuming the diagnostic evaluation can be performed very timely.
- The following table reviews clinical scenarios for antepartum and postpartum management.

Clinical scenarios for antepartum and postpartum management table

The following approach is generally consistent with the 2012 American College of Chest Physicians (ACCP) guidelines on VTE and pregnancy [1].

Once anticoagulation is indicated, it should be initiated using subcutaneous low molecular weight heparin (SC LMWH), intravenous unfractionated heparin (IV UFH), or subcutaneous unfractionated heparin (SC UFH) [65].

- **Warfarin**
- **Synthethic Heparin**
- **Subcutaneous LMWH**
- **IV UFH**



Mouse-over the blue terms to learn more.

Little information exists about the appropriate dosing of anticoagulants during pregnancy [67,68].

- Due to the limited data, it seems prudent to have additional caution when dosing these medications with more vigilant monitoring of anticoagulant activity and utilizing the weight adjusted dosing.

The following regimens are reasonable for the initial treatment of VTE during pregnancy or the puerperium.

- Regardless of the regimen, anticoagulant therapy should continue through the pregnancy.
- **LMWH**
- **IV UHF**
- **SC UHF**

Antifactor Xa levels are not required when LMWH is utilized for prophylactic anticoagulation because the optimal level has not been determined.

Treatment

- Initiating LMWH is appropriate with low risk patients in an outpatient setting. Hospitalization may be warranted with the use of IV UFH when there is a large clot, maternal co-morbidities, or hemodynamic instability. A transition to LMWH may be started as the patient becomes hemodynamically stable. [43]
  - Typically the transition is done after the patient has received IV UFH for 5-10 days [69].
  - Six hours after the first SC UFH dose the first aPTT can be checked and then six hours after every dose adjustment until a stable dose produces the desirable therapeutic level.
  - Once there is stable dosing of the SC UFH, the aPTT may be checked once or twice daily for 3-4 days and then every few weeks.
- The last ten weeks of pregnancy requires more frequent monitoring.

LABOR AND DELIVERY

Every unit should have a protocol for when pregnant women and postpartum women should have anticoagulant medications held and when women who are receiving thromboprophylaxis may undergo neuraxial anesthesia

When delivery is predicted (i.e. induction, scheduled cesarean), treating with SC LMHW should be discontinued 24 hrs prior.

- The effects of heparin then resolve.
- This is particularly important for patients who desire neuraxial anesthesia and avoiding spinal hematoma upon insertion or removal of the neuraxial anesthesia catheter.

When the pregnant patient has a high risk for recurrent VTE (i.e. those with acute PE or proximal DVT developed in the past month), it may not be desirable to stop the anticoagulation therapy for 24-36 hours.

- These patients may benefit from having their SC LMWH or SC UFH switched to IV UFH.
- The IV UFH can be discontinued 4-6 hours prior to delivery [67].

Once the aPTT is in the normal range, the neuraxial catheter may be placed [71].

Click here to learn more.

Immediately Post Partum

- The regimen, SC LMWH, IV UFH or SC UFH, should be started twelve hours after cesarean delivery or six hours after a vaginal delivery, when significant bleeding has not occurred.
- Long term anticoaguation therapy options include SC LMWH, SC UFH or an oral vitamin K antagonist (i.e. warfarin).
- When warfarin therapy is the chosen option, the patient should receive both warfarin and heparin for at least five days.
- Once the international normalized ratio (INR) has been in the therapeutic range (typically two or three) for two consecutive days, then the heparin may be stopped.
- During lactation, warfarin is considered safe because if does not accumulate in breast milk to a substantial degree [75].

Length of Therapy

The determination of length of anticoagulation should be individualized because the optimal duration is unknown.

Anticoagulation should occur for 3-6 months in women whose only risk for VTE were transient such as pregnancy and cesarean delivery [67, 76-78].

Generally, anticoagulation therapy continues for at least six weeks postpartum [67,79]. Patients with persistent risk factors for VTE may require longer therapy and should be individualized.

Inferior Vena Cava Filters

Inferior vena cava (IVC) filters have been used during pregnancy with indications being the same in pregnant women as non-pregnant patients [79,80].

- During active bleeding, following recent surgery or following a hemorrhagic stroke conventional anticoagulation is contraindicated.
- In women who develop new VTE despite being anticoagulated, conventional anticoagulation has proven ineffective.
- When a complication occurs from anticoagulation, such as significant bleeding, halting of anticoagulation therapy would be prudent.
- With a massive PE the pulmonary vascular bed is already significantly compromised and unlikely to tolerate another insult.
- A temporary IVC filter may be placed into the IVC in women who develop VTE during pregnancy or the puerperium, since the patient population tends to be quite young and have temporary risk factors for VTE such as pregnancy [81,82].
- It has been reported on the inability to retrieve a filter placed during the third trimester of pregnancy due to the filter tilting [83].

Thrombolysis and Thrombectomy

- Teratogenicity due to thrombolytic agents has not been reported, but the risk of maternal hemorrhage is high.
- As a result, thrombolytic therapy should be reserved for pregnant patients with life-threatening acute PE (i.e. persistent and severe hypotension due to the PE) [102].
- Observational studies provide the only data about the efficacy and safety of thrombolytic therapy and/or thrombectomy during pregnancy (i.e. there are no controlled trials) [86-93].
- A review of case reports and case series (172 pregnant women undergoing treatment with thrombolytic agents), the maternal mortality was one percent; the incidence of fetal loss was six percent and the incidence of maternal hemorrhagic complications was eight percent [85].
- Only a few cases have been described, but the risk of postpartum hemorrhage appears to be greatest among women treated within eight hours of delivery [87-92].
- Case studies of thrombectomy report the successful use as a life saving measure when other measures have failed [92,93].

Heparin has several side effects, including bleeding, thrombocytopenia, skin necrosis, and osteoporosis. These adverse effects can occur even at prophylactic doses but are more likely with long term use.

- Bleeding
- Skin Necrosis
- Osteoporosis
- Thrombocytopenia

Click the side effects above to learn more.

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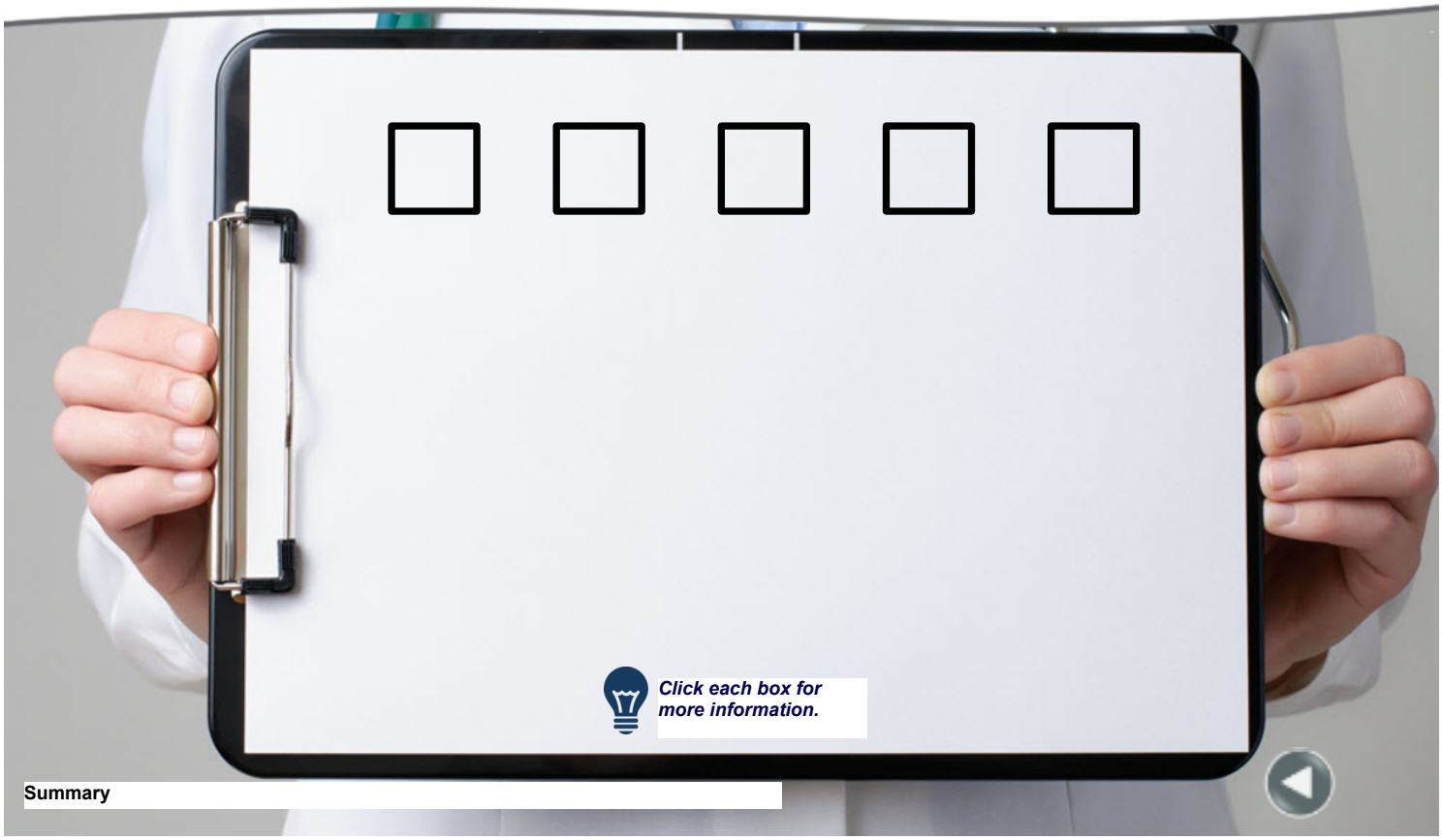


Congratulations!

You have successfully completed this module.

Click on the above 'X' to take the post-test for this course.
If you do not attain a passing score after two attempts at the post-test the entire program must be repurchased.

References

1. Marik PE, Plante LA. Venous thromboembolic disease and pregnancy. N Engl J Med 2008; 359:2025.

2. Greer IA. Thrombosis in pregnancy: maternal and fetal issues. Lancet 1999; 353:1258.

3. Prevention of venous thrombosis and pulmonary embolism. NIH Consensus Development. JAMA 1986; 256:744.

4. Kujovich JL. Hormones and pregnancy: thromboembolic risks for women. Br J Haematol 2004; 126:443.

5. Heit JA, Kobbervig CE, James AH, et al. Trends in the incidence of venous thromboembolism during pregnancy or postpartum: a 30-year population-based study. Ann Intern Med 2005; 143:697.

6. Morris JM, Algert CS, Roberts CL. Incidence and risk factors for pulmonary embolism in the postpartum period. J Thromb Haemost 2010; 8:998.

7. Lee RV, McComb LE, Mezzadri FC. Pregnant patients, painful legs: the obstetrician's dilemma. Obstet Gynecol Surv 1990; 45:290.

8. Chang J, Elam-Evans LD, Berg CJ, et al. Pregnancy-related mortality surveillance--United States, 1991--1999. MMWR Surveill Summ 2003; 52:1.

9. Sachs BP, Brown DA, Driscoll SG, et al. Maternal mortality in Massachusetts. Trends and prevention. N Engl J Med 1987; 316:667.

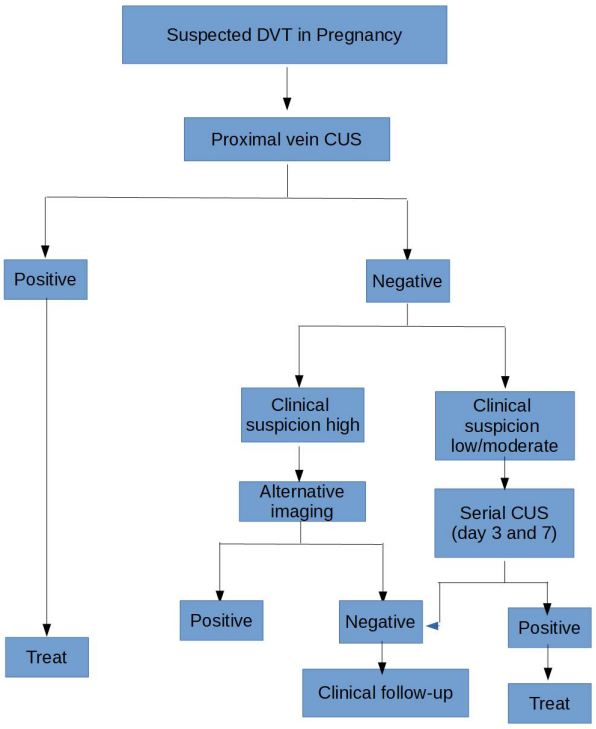
10. MacKAy AP, Berg CJ, Liu X, et al. Changes in pregnancy mortality ascertainment: United States, 1999-2005. Obstet Gynecol 2011; 118:104.

11. http://www.cdc.gov/ncbddd/dvt/data.html

12. Treffers PE, Huidekoper BL, Weenink GH, Kloosterman GJ. Epidemiological observations of thrombo-embolic disease during pregnancy and in the puerperium, in 56,022 women. Int J Gynaecol Obstet 1983; 21:327.

13. Ghaji N, Boulet SL, Tepper N, Hooper WC. Trends in venous thromboembolism among pregnancy-related hospitalizations, United States, 1994-2009. Am J Obstet Gynecol 2013; 209:433.e1.

14. Simpson EL, Lawrenson RA, Nightingale AL, Farmer RD. Venous thromboembolism in pregnancy and the puerperium: incidence and additional risk factors from a London perinatal database. BJOG 2001; 108:56.



Diagnosis algorithm for suspected deep venous thrombosis in pregnancy

Clinical Scenario	Antepartum Management	Postpartum Management
No history of VTE, no thrombophilia	Surveillance* without anticoagulation therapy	Surveillance without anticoagulation therapy or postpartum prophylaxis anticoagulation therapy if the patient has multiple risk factors VT†
VTE diagnosed during pregnancy	Adjusted-dose LMWH/UFH	Adjusted-dose LMWH/UFH for a minimum of 6 weeks postpartum. Longer duration of therapy may be indicated depending on the timing of VTE during pregnancy, prior VTE history, or presence of thrombophilia. Oral anticoagulants may be considered postpartum based upon planned duration of therapy, lactation, and patient preference.
Single provoked VTE (precipitated by a single event such as surgery, trauma, or immobility) unrelated to estrogen or pregnancy due to a transient (resloved risk factor, non thrombophilia	Surveillance* without anticoagulation therapy	Surveillance without anticoagulation therapy or postpartum prophylactic anticoagulation therapy if the patient has additional risk factors †
History of single unprovoked VTE (no identified precipitating factor present; includes prior VTE in pregnancy or associated with hormonal contraception), not on long-term anticoagulation	Prophylactic, intermediate-dose, or adjusted-dose LMWH/UFH	Prophylactic, intermediate-dose, or adjusted-dose LMWH/UFH regimen for 6 weeks postpartum
Low risk thrombophilia‡ without previous VTE	Surveillance* without anticoagulation therapy	Surveillance without anticoagulation therapy or postpartum prophylactic anticoagulation therapy if the patient has additional risk factors‡
Low risk thrombophilia‡ with a family history (first-degree relative) of VTE	Surveillance* without anticoagulation therapy or prophylactic LMWH/UFH	Postpartum prophylactic anticoagulation therapy or intermediate-dose LMWH/UFH
Low risk thrombophilia‡ with a single previous episode of VTE--Not receiving long-term anticoagulation therapy	Prophylactic or intermediate-dose LMWH/UFH	Postpartum prophylactic anticoagulatioon therapy or intermediate-dose LMWH/UFH
High risk thrombophilia¥ without previous VTE	Prophylactic or intermediate-dose, or adjusted dose LMWH/UFH	Postpartum prophylactic anticoagulatioon therapy or intermediate-dose LMWH/UFH
High risk thrombophilia¥ with a single previous VTE or an affected first-degree relative--Not receiving long-term anticoagulation therapy	Prophylactic intermediate-dose or adjusted-dose LMWH/UFH	Postpartum prophylactic anticoagulatioon therapy or intermediate or adjusted-dose LMWH/UFH for 6 weeks (therapy level should be equal to the selected antepartum treatment)
Two or more episodes of VTE--Not receiving long-term anticoagulation therapy (regardless of thrombophilia)	Intermediate-dose or adjusted-dose LMWH/UFH	Postpartum prophylactic anticoagulatioon therapy or intermediate or adjusted-dose LMWH/UFH for 6 weeks (therapy level should be equal to the selected antepartum treatment)
Two or more episodes of VTE--Not receiving long-term anticoagulation therapy (regardless of thrombophilia)	Adjusted-dose LMWH/UFH	Resumption of long-term anticoagulation therapy. Oral anticoagulants may be considered postpartum based upon planned duration of therapy, lactation, and patient preference.

Abbreviations: LMWH, low molecular weight heparin, UFH, unfractionated heparin; VTE, venous thromboembolism
*VTE risk assessment should be performed prepregnancy or early in pregnancy and repeated if complications develop, particularly those necessitating hospitalization or prolonged immobility.
†First-degree relative with a history of thrombotic episode, or other major thrombotic risk factors (eg, obesity, prolonged immobility, cesarean delivery).
‡Low-risk thrombophilia: Factor V leiden heterozygote; prothrombin G20210A mutation heterozygote; protein C or protein S deficiency, antiphospholipid antibody.
¥High-risk thrombophilias include Factor V leiden heterozygosity prothrombin G20210A mutation heterozygosity, heterozygosity for factor V Leiden and prothrombin G20210A mutation, or antithrombin deficiency.