



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



Click here to download a print version of this course.



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.

- Definition
- Risk Factors and Presentation
 - Risk Factors
 - Risk Factors- Post Partum
 - Risk Factors - VTE Location
 - Risk Factors – Inherited Thrombophilias
 - Pathogenesis
 - Clinical Presentation
- Testing
 - Laboratory
 - Imaging
 - Types of Imaging Used
- Diagnosis
 - Diagnosis
 - Compressive Ultrasonography (CUS)
 - Diagnosis
 - Summary
 - Differential Diagnosis
- Management and Treatment
 - Prevention and Management
 - Laboratories
 - Dosing



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 (particularly 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].

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 pregnancy and the puerperium.

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

Left lower extremity DVT



Click the VTE locations on the right to learn more.



The VTE risks are 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 Homozygous
Protein S deficiency	Prothrombin G20210A Mutation Homozygous
	Antiphospholipid Syndrome



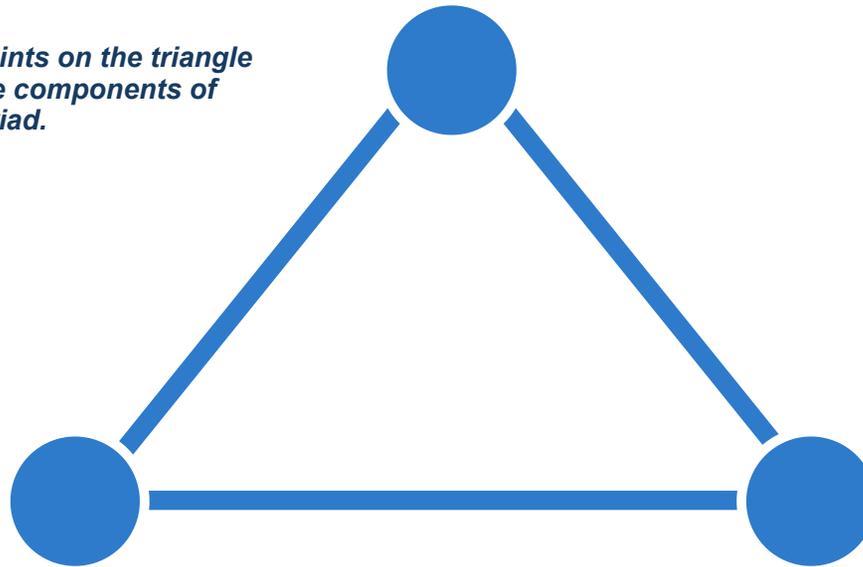
Briefly, the most common inherited thrombophilias are illustrated with the following studies with variable range in risk of VTE in pregnant patients.



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.

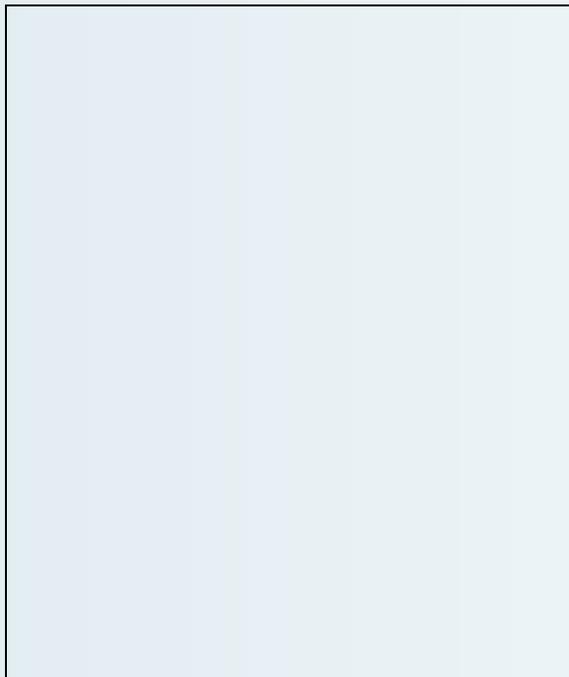
The venous pooling and valvular incompetence are due to hormonally induced dilation of capacitance veins decreasing the linear flow velocity in the lower extremities although blood volume and total venous return are supra-normal in pregnancy [38].

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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, hemagglutination).
- 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.

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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.

