

Understanding Deep Vein Thrombosis Home Study Course

8 CE Hours
Text and Online Study Guide

Presented by the:
Center for Massage Therapy Continuing Education

*PO Box 117 • Elk Point, SD 57025
866-784-5940 • www.massagetherapyceu.com*

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Center for Massage Therapy Continuing Education, LLC

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PO Box 117
Elk Point, SD 57025
www.massagetherapyceu.com
Phone: 866-784-5940
info@massagetherapyceu.com

© 2024 Melissa M. Dawahare, ND, PLLC
www.drmelissa.com

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It is the responsibility of the practitioner to determine the appropriateness of the principles presented in terms within the scope of practice. This information is in no way meant to diagnose or treat medical conditions.

Instructions for the Understanding Deep Vein Thrombosis home study course

Thank you for investing in the *Understanding Deep Vein Thrombosis* home study course, a 8 CE hour course designed to further your knowledge on the subject of deep vein thrombosis and how it relates to and affects the practice of massage therapy. This guide will contain all of the instructions you will need to complete this course. This is a 8 CE hour course, so that means it should take you approximately 8 hours to read the text, watch the online video resources, and complete the examination and course evaluation.

PLEASE READ THE FOLLOWING DIRECTIONS FOR COMPLETION OF THIS COURSE.

The following are steps to follow in completing this course:

- 1. Read the instructions and review the text and exam.**
- 2. View the bank of online video resources at:**
<https://www.youtube.com/playlist?list=PLnvS9HaUaKta--rT-QPMDQRHISv3VUkt5>
- 3. Access the online examination in your account at www.massagetherapyceu.com. Once there, click on the “Student Login” link on the top left. Enter your information, and once you are logged in you will see your course and the “Test” button. If you are already logged in, you will see a “Member Area” link.**
- 4. On a separate piece of paper, either type or hand write, answer the case study questions located at the end of the exam in this guide on page 42. Either fax or email your answers to 605-761-2261 or info@massagetherapyceu.com.**
- 5. Complete the online examination and print your certificate. The exam is open book and there is no time limit for completion.**

You must pass the exam with a 70% or better to pass this home study course. You are allowed to access and take the exam up to 3 times if needed. There is no time limit when taking the exam. Feel free to review the text while taking the exam. There are no trick questions on the exam. All of the answers are clearly found in the text. The exam is also included at the end of the text for review before taking the exam.

Good luck as you complete this course. If you have any questions please feel free to contact us at 866-784-5940, 712-490-8245 or info@massagetherapyceu.com. You can expect to receive your certificate of achievement within about one week after mailing your materials back. Most state boards require that you keep your “proof of completion” certificates for at least four years in case of audit. Thank you for taking our *Understanding Deep Vein Thrombosis* home study course.

Understanding Deep Vein Thrombosis Text

Overview

This continuing education home study course provides the basic information a professional massage therapist must know about deep vein thrombosis (DVT) in order to provide safe and effective massage care for clients affected by DVT. The course covers the following topics in detail on deep vein thrombosis:

- Definitions
- Statistics
- Causes
- Risk Factors
- Overlapping Medical Conditions
- Signs and Symptoms
- Diagnosis
- Treatment
- Prevention
- Prognosis
- Complications
- Massage Therapy Contraindications
- Managing Risk in Massage Practice
- Appropriate Referral
- Client Education
- Clinical Research
- Educational Resources

Massage therapists are well advised to learn everything they can about the risk of DVT in massage practice, how to assess the risk, and how to work in cooperation with the client's physician or other health care provider. It is important for massage therapists to know about DVT because it can happen to anyone. DVT can cause serious illness, disability, and sometimes death if not diagnosed and treated properly. The positive news is that DVT is preventable and treatable.

Deep vein thrombosis is the formation of a blood clot or thrombus in a deep, large vein of the body. It is a form of thrombophlebitis. Thrombophlebitis, as the name describes, is the inflammation of a vein with clot formation. The thrombus leads to partially or completely blocked circulation. DVT usually affect large leg veins like the femoral vein or popliteal vein and the deep veins of the pelvis, but they can occur in other parts of the body.

According to current CDC (Centers for Disease Control and Prevention) statistics, the actual number of people affected by DVT is unknown but estimated to be about 900,000 people per year in the United States. About 60,000 – 100,000 Americans die from DVT. Many people have long term complications and recurrences. It is a leading cause of preventable hospital deaths and of maternal deaths. In the U.S. an estimated \$10 billion in medical care costs is spent on DVT and DVT related problems.

Venous thrombosis or blood clots form in the body's deep veins via three ways. The first is damage to the vein's wall or inner lining. The second includes a decreased flow rate of blood or a sluggish, slow blood flow. The third is thicker blood or an increased tendency of the blood to clot which is known as hypercoagulability.

DVT, or the formation of a blood clot in the deep body veins, occurs when a vein's inner lining is damaged by a physical, chemical, or biological factor. Factors such as these include surgery, serious injuries, inflammation, and other immune responses.

DVT are also caused by sluggish blood flow. When blood flow is slowed as in cases of immobilization after surgery, being in bed with illness, or traveling for a long time, this creates the ideal conditions for a deep vein thrombosis.

If a massage client has thicker blood or an increased risk of blood clotting, this can additionally cause DVT. Conditions that increase risk of blood clotting include inherited conditions like Factor V Leiden, birth control pill use, and hormone therapy.

Risk factors for DVT include but are not limited to a history of DVT, increased risk of blood clotting, injuries to deep veins, sluggish blood flow, pregnancy and post-natal period up to 6 weeks, cancer treatment, central venous catheters, advanced age > 60, smoking, and being overweight or obese.

Other risk factors for DVT include:

- Birth control pill usage
- Certain medications like erythropoietin and estrogen
- Hospitalization
- Immobilization
- Prolonged travel
- Orthopedic casts
- Surgery
- Thrombophilia (tendency to form clots)

These and other risk factors for DVT will be discussed in more detail later in the course. Those with a prior history of DVT or more than one risk factor are at an even greater risk for the condition.

Several overlapping medical conditions lead to DVT. These include:

- Cancer
- Heart failure and disease
- Infections
- Inflammatory diseases
- Nephrotic syndrome
- Obesity
- Respiratory disease
- Stroke

A deep vein thrombosis can occur with or without symptoms. About half of your massage clients with DVT will have signs or symptoms. In many cases, the affected extremity has discolored skin, is painful, tender, swollen, red, warm to touch, and the superficial veins are engorged.

The most serious complication of DVT is a pulmonary embolism (PE). A pulmonary embolism occurs when the blood clot in a deep vein breaks off and travels through the bloodstream to the lungs, gets stuck, and blocks blood flow in the pulmonary circulation. Symptoms include unexplained shortness of breath, pain with deep breathing, and coughing up blood.

A PE is a medical emergency and a very serious condition that can cause death. Another complication of DVT is post thrombotic syndrome. This is a late complication which includes edema, pain, discomfort, and skin problems.

A medical doctor diagnoses DVT based on medical history, physical exam, and diagnostic tests. Risk factors are identified and other causes of symptoms are ruled out. Commonly used diagnostic tests for DVT include a D-dimer blood test and a Doppler ultrasound of the affected vein or extremity in question. Other tests may be utilized.

Medications used to treat DVT include those to thin the blood, those to interfere with the blood clotting process, and those to dissolve clots. Acute treatment can include the use of thrombolytic agents to break down the clot. Blood thinners or anticoagulants are used to prevent further accrual and formation of blood clots. If drugs are not possible, other treatments such as blood filters which catch clots or compression stockings which prevent blood from pooling and clotting are available. Diagnosis and treatment of DVT are meant to prevent the more serious complication of a pulmonary embolism.

The key is DVT prevention. In many medical and surgical settings, anticoagulants, compression stockings, and intermittent pneumatic compression devices are used in deep vein thrombosis prevention.

Many steps can be taken to prevent DVT. Regular physician visits, compliance with treatment programs prescribed, staying active, and exercising the lower legs during long trips are just a few of these steps. If a massage client exhibits signs or symptoms of DVT or PE, have them contact their doctor at once. It is a medical emergency.

Prognosis for individuals affected by DVT depends on compliance with treatments and prevention plans. A lower extremity DVT left untreated has a 3% PE related mortality rate. An upper extremity DVT left untreated rarely results in death.

A DVT is considered a medical emergency and should not be directly massaged. Acting conservatively and cautiously, DVT should be ruled out as a cause of all limb and extremity swelling. Massage therapy contraindications, managing risk, referrals, client education, current clinical research, and educational resources are covered at the end of this course.

Definitions

The following list includes some alternative names used for a deep vein thrombosis and some terms used in conjunctions with DVT care. These can include:

- Blood clot in the leg
- Deep vein thrombosis (DVT)
- Pulmonary embolism (PE)
- Post-phlebitic syndrome
- Post-thrombotic syndrome (PTS)
- Thromboembolism
- Thrombophlebitis
- Venous thromboembolism (VTE)
- Venous thrombosis
- Healthcare associated venous thromboembolism (HA-VTE)

Each of the definitions is defined below:

Deep vein thrombosis is a blood clot located in a deep vein, usually the arm or leg.

Pulmonary embolism is a blood clot that has traveled from a deep vein to the lung. PE can be deadly.

Post-phlebotic syndrome is the old name for what is now termed *post-thrombotic syndrome (PTS)*. It is the development of chronic venous insufficiency following a DVT.

Thromboembolism is the obstruction of a blood vessel by a blood clot. Usually the blood clot has dislodged from another site in the circulation.

Thrombophlebitis is the inflammation of a vein (phlebitis) with presence of a thrombosis (blood clot).

Venous thromboembolism is a name used in conjunction with both DVT and PE. DVT and PE are also known as VTE. It is the formation of blood clots in the vein. As previously mentioned, when a clot forms in the deep veins, it is called a deep vein thrombosis. If the clot breaks loose and travels to the lungs, it is called a pulmonary embolism.

Venous thrombosis is a blood clot or thrombus that forms in a vein.

Healthcare associated venous thromboembolism is a DVT or PE that occurs as a result of hospitalization, surgery, or other healthcare treatment or procedure.

What is Deep Vein Thrombosis?

Deep vein thrombosis is a serious medical condition where a blood clot or a thrombus forms in a large vein deep inside the body that results in partial or complete block of blood flow.

DVT is of particular interest to massage therapists because it is critical to avoid any movement or pressure, which could dislodge a clot from the veins of the extremities. This could initiate an embolus. An embolus is a blood clot, air bubble, piece of fatty deposit, or other object that is carried in circulation and lodges in a blood vessel to cause an embolism.

From basic anatomy and physiology, massage therapists may recall that arteries have smooth muscle in their walls. Arteries contract and withstand the pressure of the heart pumping blood.

Veins have a thin layer of muscle in their walls, but they don't contract the way arteries do. In the veins, the normal movements of the body along with one-way valves help the blood back to the heart. Contraction of the body's large muscles during regular activity squeezes the veins and also helps blood return to the heart.

Massage therapists may also remember there are several kinds of veins in the body. Superficial veins, which lie just below the skin, are superficial and easily seen on the surface. Deep veins are located deeper within the body. Blood travels from these superficial veins into the deep veins via small perforator or communicating veins. Superficial and communicating veins have valves, which allow blood to flow only in the direction of the heart when the veins are compressed.

Blood clots occur in conditions where the blood thickens and clumps together. Blood clots can form in either superficial or deep veins. When they form in superficial veins, these clots are called thrombophlebitis or phlebitis. Phlebitis rarely causes serious problems. Blood clots found in superficial veins don't break off and cause an embolism because the communicating vein valves prevent them from entering the deep venous system. See *Diagram 1* for a visual of what has been described.

Diagram 1

Deep Vein Thrombosis (DVT)

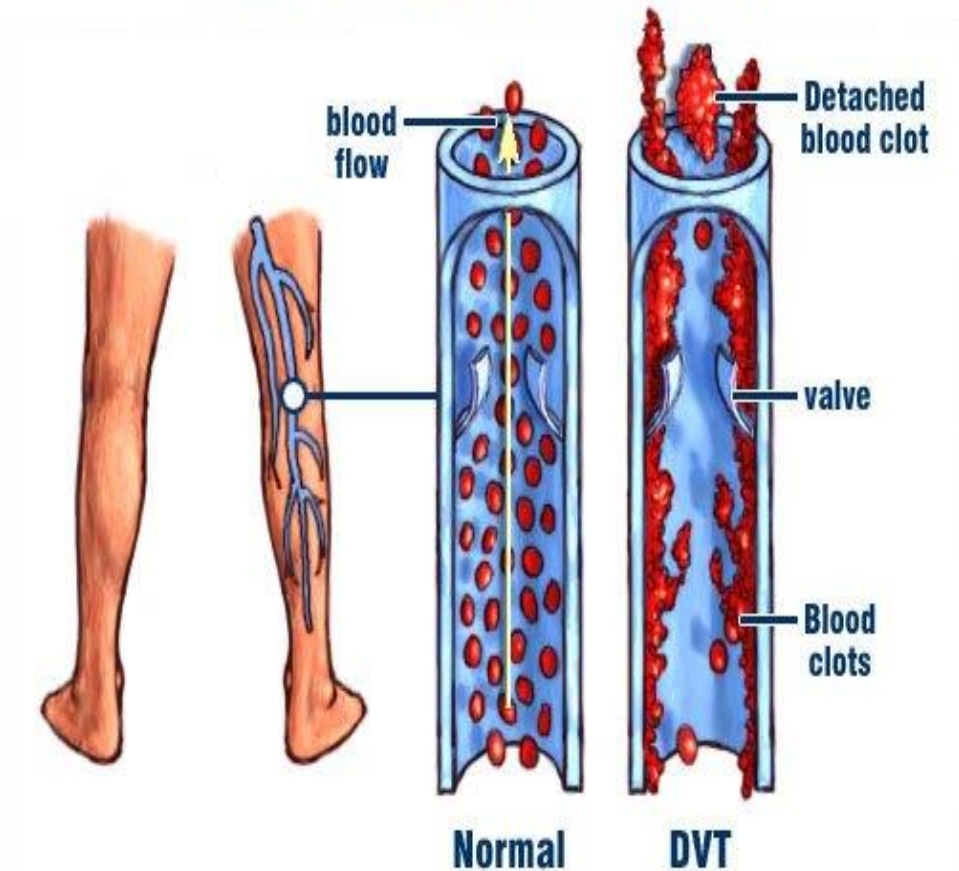


Image used with permission from http://www.dcn.ed.ac.uk/clots/clots_patient_area/stroke.html#DVT

DVT typically affect the deep large veins in the pelvis, thighs, calves, and legs. They can occur in other parts of the body like the arm. If a thrombosis occurs spontaneously in the arm, this is known as Paget-Schroetter Syndrome. Diagnosis and treatment of DVT, no matter where they are located, are similar.

A blood clot or thrombus in the deep venous system of the body is not necessarily life threatening all by itself. It becomes dangerous when a piece of the clot or thrombus breaks off. As mentioned, this is called an embolus. The plural of embolus is called emboli.

The clot blocks blood flow causing pain and swelling. If the blood clot travels through the heart into the pulmonary circulation system, it can become lodged in the lung and this is called a pulmonary embolus. When blood clots are in the thigh, they are more likely to break off and cause a PE than clots in the lower leg or other parts of the body.

DVT can lead to serious medical conditions like a PE if it is not diagnosed and treated correctly. PE is a life-threatening medical condition, which may damage the lungs and other organs in the body and even lead to death. PE is discussed in more depth in this course under the *DVT Complications* section. See *Diagram 2* for what has been described in the text.

Diagram 2 – Movement of Blood Clot to the Lungs Causing PE

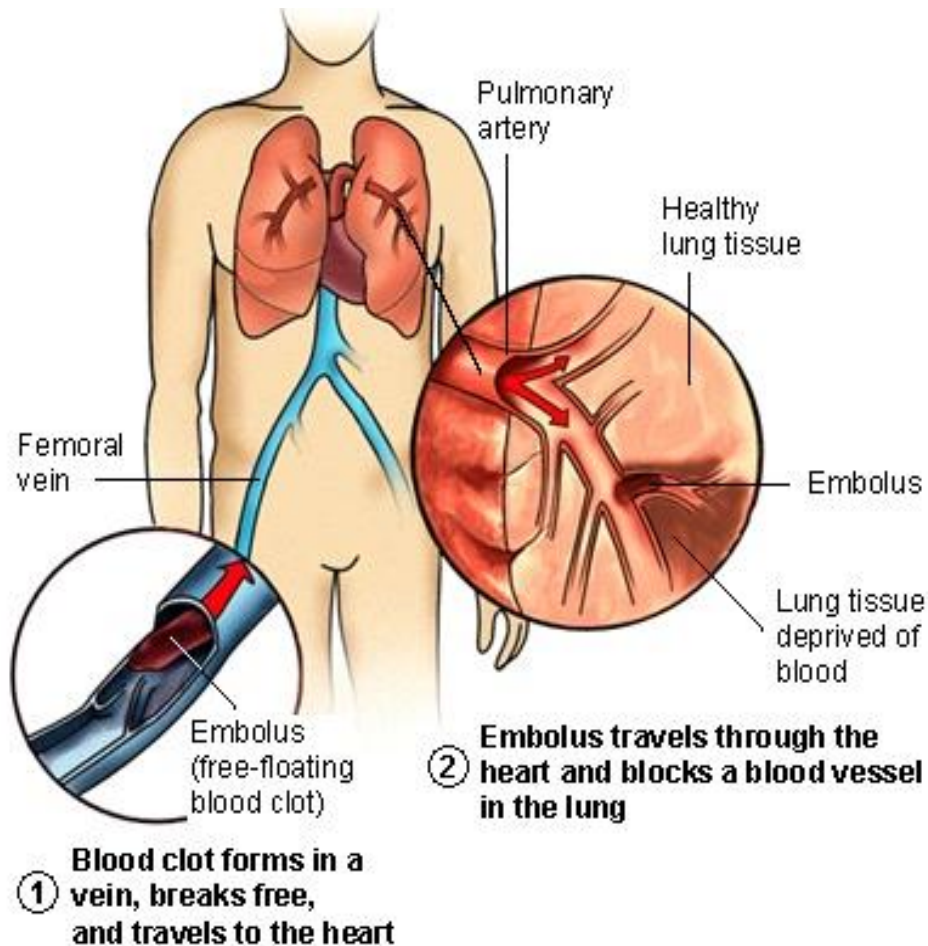


Image used with permission from http://www.dcn.ed.ac.uk/clots/clots_patient_area/stroke.html#DVT

DVT Statistics

According to current CDC (Centers for Disease Control and Prevention) statistics, the exact number of people affected by DVT is unknown but estimated to be about 900,000 people per year in the United States. This means DVT occurs in 1-2 persons per 1,000 every year. DVT is less common among the pediatric population.

About 60,000 – 100,000 Americans die from DVT and PE annually. As a comparison, more people die in the United States from PE than from breast cancer and AIDS combined. Sudden death is the first symptom in about 25% of people who have PE. Approximately 10-30% of individuals diagnosed with DVT will die within one month of the diagnosis.

Many people have long term complications and recurrences. Among those with DVT, about 50% will have long term complications like post-thrombotic syndrome. PTS is due to chronic venous insufficiency and results in swelling, pain, discoloration, and scaling to the affected limb. About 33% of those with DVT and PE will have recurrence within 10 years.

In the U.S. an estimated \$10 billion in medical care costs are spent on DVT and DVT related problems. It is a leading cause of preventable hospital deaths and of maternal deaths. About half of people with DVT have minimal to no symptoms. Statistics also show that the risk of developing DVT is 8 times higher during a hospitalization. Many of those patients develop a DVT within the first month after discharge.

The Surgeon General’s Office reports African Americans are at a 30% higher risk for DVT than whites. Additionally, in the U.S. Hispanic community, every 19 minutes, a Hispanic American will be diagnosed with a first time occurrence of DVT. About 5-8% of the U.S. population has one of the genetic risk factors for inherited thrombophilias which increase the risk of thrombosis.

Venous thromboembolism (VTE) is a leading cause of hospital deaths in the U.S. Healthcare associated venous thromboembolism (HA-VTE) costs exceed \$5 billion annually. It is estimated that half of blood clots are healthcare associated. About 70% of these are preventable. Methods of prevention are covered later in the course. See *Diagram 3* for a summary.

Diagram 3

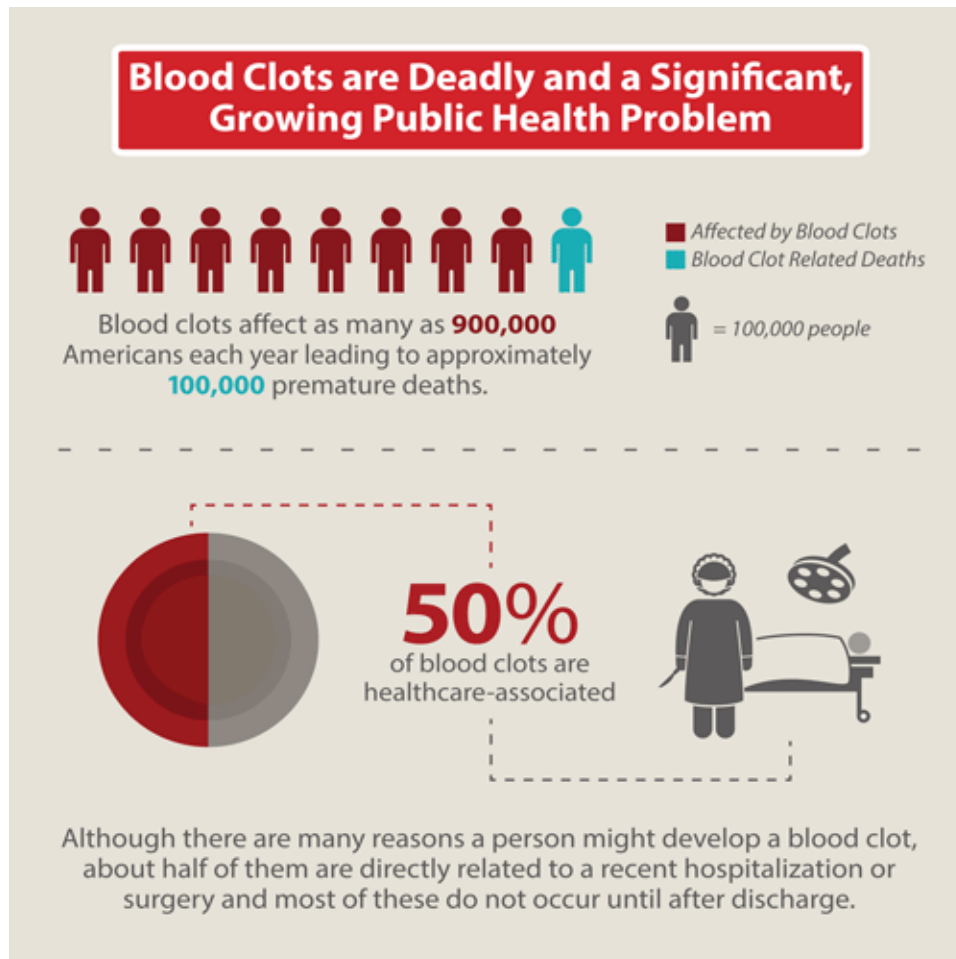


Image used with permission from <http://www.cdc.gov/ncbddd/dvt/ha-vte-data.html>

DVT Causes

In most cases, blood clots are considered a normal part of healing. Blood clots form to help the body heal after an injury. For instance, clots help stop bleeding in cuts and wounds. Blood clots allow the injured or traumatized tissue to begin to repair itself without excessive blood loss. Clot formation is affected by the quality of the blood vessel wall, the rate of blood flow, and the thickness of the blood.

Venous thrombosis or blood clots form in the body's deep veins via three ways. The first is damage to the vein's wall or inner lining, called endothelial damage. The second includes a decreased flow rate of blood or a sluggish, slow blood flow, called venous stasis. The third is thicker blood or an increased tendency of the blood to clot which is known as hypercoagulability.

As mentioned, the first way DVT occurs is when a vein's inner lining is damaged by physical, chemical, or biological factors. Factors causing endothelial damage may include surgery, serious physical injuries, inflammation, and other immune responses. The following is a more complete list of causes for endothelial trauma or damage to the veins:

- An immune response
- Biological factors
- Bruised leg
- Chemical factors
- Complication of an invasive procedure of the vein
- Fracture to the leg or pelvis
- Inflammation
- Serious physical injury
- Surgery

The second cause of DVT is sluggish blood flow or venous stasis. When blood flow is slowed as in the case of immobilization after surgery, being in bed with illness, or traveling for a long time, ideal conditions for the development of a deep vein thrombosis are created. Venous stasis occurs in any of the following (this is not a complete list):

- Bedrest
- Being in bed with illness
- Giving birth in the last 6 months
- Hospitalization
- Immobilization after surgery
- Obesity
- Pregnancy
- Prolonged travel or sitting
- Serious illness
- Surgery, especially hip, knee, or female reproductive organ surgery

The third cause of DVT is thicker blood or an increase tendency of the blood to clot. Conditions that increase risk of blood clotting include inherited conditions like Factor V Leiden, birth control pill use, and hormone therapy. Tendency for the blood to clot faster than normal is known as hypercoagulability and here is a partial list of things that may cause this:

- Cancer
- Genetic or inherited conditions like Factor V Leiden
- Polycythemia vera – too many red blood cells
- Prescription medications like birth control pills or estrogen hormone therapy
- Smoking

In summary, when a deep vein thrombosis occurs, the body signals the clotting process to occur at the wrong time and wrong place. DVT or blood clots form when there is vein damage, venous stasis, or hypercoagulability. Basically, blood clots are caused by anything that causes blood not to circulate normally or clot properly. Blood is meant to flow and stagnation creates a clot potential.

Risk Factors for DVT

Some of the risk factors for developing deep vein thrombosis were discussed in the “What Causes DVT?” section above. The most common risk factors are hospitalization and surgery. Other common risk factors include advanced age, obesity, infection, immobilization, use of estrogen containing contraceptives, tobacco use, and prolonged air/car travel. A more complete list of these risk factors will be given at the end of this section.

Certain people may be at a higher risk for DVT. These groups include minority groups and women. Minority groups often have less access to health care and this could be one reason for the increased risk. Women, especially those who smoke, often have risk factors for DVT due to pregnancy, childbirth, birth control usage, and hormone replacement therapy.

Since DVT and PE can be difficult to diagnose and some individuals have no symptoms at all, minority groups and women should be educated in the signs and symptoms of these conditions.

If any of your massage clients’ fall into a high-risk category for DVT, encourage them to speak with their doctor. Educate them about the basic signs and symptoms of DVT and help them learn about prevention. The *DVT Educational Resources* section of this course has a useful handout for this.

Some of the risk factors listed below have been mentioned and discussed earlier in the text but are included here in an attempt to be complete. Other risk factors for DVT include but are not limited to:

- Age >60 years
- Bedrest during a hospital stay or paralysis
- Blood disorders or factors that make the blood thicker
- Cancer and some cancer treatments
- Cancer patients with multiple surgical procedures
- Central venous catheters
- Congestive heart failure and cardiac disease
- Diabetes
- Elderly patients and increasing age
- Family history of DVT or PE
- Genetic blood clotting disorders like Factor V Leiden
- History of DVT (deep vein thrombosis)
- History of PE (pulmonary embolism)
- History of VTE (venous thromboembolism)
- Immobility or restricted mobility (bedrest, long plane or car rides)
- Infectious disease
- Injury to a deep vein from surgery or broken bones
- Low levels of activity
- Medications (hormone replacement therapy or oral contraceptives/birth control pills)
- Obesity
- Pacemakers
- Pregnancy and the first 6 weeks after giving birth
- Procedures where a catheter is passed through the vein in the groin
- Recent surgery (abdominal, pelvic, hip, knee, other neurosurgical procedures)
- Respiratory failure
- Sitting in cases of prolonged travel
- Smoking and smokers
- Trauma

The risk for DVT increases if you have more than one of the risk factors listed above. Even though there are specific risk factors, remember that DVT can occur in almost anyone at any age. Half of people affected have symptoms while the other half don't.

Overlapping Medical Conditions with DVT

There are a few medical conditions seen concurrently with the diagnosis of deep vein thrombosis. A few of the most common ones include:

- Cancer
- Heart disease
- Obesity
- Pulmonary disease
- Surgery

Cancer

There are aspects of cancer and cancer treatment, which increase a client's chance of a deep vein thrombosis. Your massage clients who are dealing with cancer have a greater risk of developing DVT. Particular cancers like anus, colon, lung, pancreas, rectum, small intestine, stomach, and other advanced forms of cancer increase the risk of DVT above normal levels in your massage clients. This is why it is a common overlapping medical condition seen with DVT.

Cancer treatments, instead of the cancer itself, often leave patients at an increased risk for blood clots. Complications from DVT are a top leading cause of death among cancer patients. Since injury to blood vessel walls and thickened blood lead to DVT, treatments like surgery and chemotherapy that create these conditions in the vascular system are to blame for increased DVT risk. Still other cancer treatments limit the body's ability to manufacture anticoagulants. Types of cancer most often linked with an increased DVT risk are as follows:

- Colon
- Liver
- Lymphatic system
- Ovaries
- Pancreas
- Stomach

Fortunately, DVT can be prevented even in cancer patients. Your massage clients with cancer can be educated about DVT prevention. This course addresses prevention methods in another section.

Heart Disease

Cardiovascular disease or heart disease is a general term used to describe disorders affecting the heart muscle or blood vessels of the heart. Cardiovascular disease is a leading cause of death in the U.S. Those individuals with heart disease are often at risk of developing DVT for various reasons. They usually have poor vascular circulation due to artery blockages and sluggish blood flow. These conditions may lead to blood pooling and clots.

The following factors increase your massage clients' risk for cardiovascular disease and therefore possibly DVT:

- Diabetes
- Diets low in complex carbohydrates like vegetables, fruits, and whole grains
- Family history of heart disease

- Glucose intolerance
- High cholesterol
- Hypertension
- Obesity
- Physical inactivity
- Smoking

Luckily, DVT can be prevented people with heart disease and education is the key to that prevention.

Obesity

The National Institutes of Health (NIH) defines obesity as a Body Mass Index (BMI) of greater than 30 (>30). Obesity, particularly central adiposity or central obesity, increases a person's chances of developing deep vein thrombosis. When body weight is within normal limits, perhaps a BMI below 25 (<25), DVT can be easily prevented.

Pulmonary Disease

Your massage clients who struggle with Chronic Obstructive Pulmonary Disease (COPD) are at risk for DVT. Inflammation, which is often present in respiratory illnesses, affects the proper functioning of the veins and arteries. As covered earlier in the course, anything that injures the veins or endothelial damage is associated with the formation of blood clots. Again, DVT can be prevented in these clients as well, so there is reason to be hopeful.

Surgery

Patients are at increased risk for deep vein thrombosis in the first few days and weeks following surgery. Pelvis, hip, and knee surgeries are those with the greatest risk for DVT occurrence in populations who are vulnerable. There are several reasons for this:

- Clotting factors in the blood increase (due to inflammation and the normal healing of the surgical incision site) thereby elevating the risk of inappropriate blood clot formation (hypercoagulability)
- Blood flow is sluggish or slow in immobilized patients (venous stasis)
- Blood vessels may be harmed during surgery (endothelial damage)

Encourage your massage clients who are preparing for surgery to identify their risk factors with their doctor. Also, encourage them to have a physical exam or other diagnostic tests as needed before the surgery. Working with healthcare professionals to identify and track risks dramatically reduces the risk of DVT associated with surgery or other surgical procedures.

Postoperatively, patients are encouraged to walk as soon as possible and pneumatic devices (discussed further in the *Prevention* section of this course) are applied to the legs to promote venous return. Again, surgery or other surgical procedures, being immobile or extended hospitalizations due to injury or illness, increase the risk for deep vein thrombosis.

Signs and Symptoms of DVT

As a massage therapist, it would be helpful to be able to recognize possible signs and symptoms of DVT. The signs and symptoms can be related to the DVT itself or a PE. In either case, referring your massage client to their physician for evaluation is the best course of action if you suspect DVT and/or PE. Both conditions are serious and have life-threatening consequences if not treated.

As mentioned about 50% of people with DVT will have signs and symptoms, which mean about half of those with DVT don't experience any noticeable symptoms. Massage therapists need to be aware that DVT often

occurs without any signs or symptoms. A blood clot can be clinically silent and difficult for physicians to diagnose.

The signs and symptoms of DVT are due to the obstruction of blood returning to the heart. This causes a pooling of blood in the leg. For those with symptoms, the symptoms will be seen in the leg or extremity with the deep vein clot. If signs do occur, they can include:

- Blue coloration in skin, nail beds, or both
- Calf or thigh ache
- Cord-like feeling in the leg
- Cramping or “charley horse” in affected body part
- Dilation or enlargement of surface or superficial veins
- Discoloration or redness of affected area or in one leg
- Leg pain in one leg
- Nonspecific, non-local pain or tenderness which feels like a deep ache
- Pain in the leg affected while standing or walking
- Pain or swelling in arms or neck if blood clot is in arm or neck
- Skin is warm to touch
- Swelling or edema of the affected leg, ankle, and foot, and along a vein in the leg
- Tenderness with touch, squeezing, standing, or movement in affected leg or extremity
- Warmth in the area of leg which is painful or swollen

Many other conditions like muscle strains, skin infections, cellulitis, or phlebitis, mimic symptoms of DVT. Because of this, DVT can be difficult to diagnose without specific tests. If your massage client displays any of these symptoms, refer them to their physician immediately. Please see *Picture 1* for an image of how a deep vein thrombosis may present clinically in a massage therapy setting.

Picture 1 – Deep Vein Thrombosis



Image used with permission from <http://en.wikipedia.org/wiki/File:DVT2010.JPG>

Since a person with DVT may not display symptoms, a pulmonary embolism may be the first sign a person has to alert them to the presence of DVT. This means that patients may not be aware of a deep vein clot until they experience signs and symptoms of a PE. If your massage client displays any of the PE symptoms, refer them to seek medical attention immediately. Signs of a PE include:

- Bloody phlegm
- Chest pain or discomfort worse with cough or deep breath
- Coughing up blood
- Fainting
- Feeling lightheaded or dizzy
- Pain upon deep inspiration
- Rapid breathing (tachypnea)
- Rapid heart rate (tachycardia)
- Sense of anxiety or nervousness
- Unexplained or sudden shortness of breath

One final condition to mention is superficial thrombophlebitis. Blood clots can occur in the superficial venous system. This is often due to trauma to the vein, which causes a small blood clot to form. Inflammation in the area causes the following symptoms:

- On palpation, vein feels firm like a thick cord
- Redness
- Swelling
- Tenderness
- Warmth

Varicose veins predispose a person to superficial thrombophlebitis. Varicose veins are distorted or tortuous veins that form when vein valves fail. Blood backs up and the varicose vein results.

In summary, if you suspect a client has the symptoms of DVT, have them call their health care provider immediately. If they have a known DVT and develop chest pain, shortness of breath, difficulty breathing, coughing blood, fainting, loss or consciousness, or other serious symptoms, have them call 911 or go to the emergency room.

DVT Diagnosis

While it is outside of a massage therapist's skill set to diagnose DVT, massage therapists do use assessment skills when working on their clients' extremities. Notice if the skin is warm or cool to the touch. Discern the presence of swelling and edema in the limbs. Knowing the signs and symptoms of DVT allows you to make a good referral to a qualified medical professional for diagnosis of DVT.

DVT diagnosis relies on the clinical skill of medical professionals. Physicians, physician's assistants, or nurse practitioners diagnose DVT. Their clinical assessment, based on medical history, physical examination, and results from specific tests supports the diagnosis of DVT. Doctors identify risk factors and rule out other causes of symptoms. The objective diagnostic tests used are tailored to each patient's situation.

Medical History

A routine medical history is taken by the physician and involves a series of questions about symptoms. Questions regarding overall health, prescription and over the counter medications, supplements, surgeries, injuries, and history of cancer are included in this intake. A thorough history is taken regarding risk factors for

DVT, family or previous history of DVT, prolonged travel, and other variables. Women are additionally asked about use of birth control pills and pregnancy since these are risk factors for DVT. Screening for pulmonary embolism may include questions about the presence of chest pain or shortness of breath and are also part of a complete medical history.

Physical Examination

During the physical exam, the medical professional checks the affected limb for signs of DVT. They check for areas of increased warmth, swelling, tenderness, pain, or discoloration in the affected leg or limb. Blood pressure, other vital signs, and heart and lung exams may also be performed.

Measuring the circumference of the affected limb and the unaffected limb at a fixed point is a useful physical exam technique. Palpation of the venous tract in the affected limb is another technique used. While both of these are helpful, DVT cannot be diagnosed or ruled out on these exams alone.

Other physical exams used by medical professionals to diagnose DVT have included Pratt's sign, the Pratt Test, and Homan's sign. A positive Pratt's sign is a possible indication of femoral DVT. The Pratt test is positive when pressure on the posterior calf elicits pain. The Homan's sign is considered positive for DVT if passive dorsiflexion of the foot elicits pain in the posterior calf.

Pratt's sign is a possible sign of femoral deep vein thrombosis. Clinically, it is seen as the presence of dilated pretibial veins in the affected leg. These engorged veins remain dilated even after raising the leg and using the force of gravity to help blood return. It is not the same as the Pratt Test.

The Pratt test is a simple test that checks for DVT in the leg by compressing a vein with the hands. With the patient supine, the leg is bent. The doctor holds the calf with both hands and presses on the popliteal vein in the proximal calf. It is positive for DVT when the patient feels pain.

The Homan's sign is considered positive for DVT if passive dorsiflexion of the foot gives the client pain in the posterior calf. Unfortunately, this exam is not reliable in DVT diagnosis. Today, it is known to be undependable in predicting a deep vein thrombosis. Despite this, some medical and massage literature continue to mention using Homan's sign to check for the presence of deep vein thrombosis.

Again, even though the mention of the Homan's sign persists in some of the literature, it is not a recommended exam and is not a helpful indicator of DVT. Further, manipulating or massaging the area while performing the test could be unsafe if it dislodges an existing thrombus and creates an embolus.

As a massage therapist with a concern or suspicion of DVT in your client, the best course of action is to consult the client's physician immediately instead of testing for a positive Homan's sign. If a massage therapist is concerned enough about the presence of DVT in their client to use this test, they are concerned enough to consult the person's medical provider. Suspected DVT is a medical emergency and referral to their doctor is appropriate.

Probability Scoring

There is a set of clinical prediction rules for DVT diagnosis called probability scoring. This probability scoring or Wells Score Criteria are as follows:

- Active cancer treatment in last 6 months +1 point
- Calf swelling >3 cm compared to other calf +1 point
- Collateral superficial veins +1 point
- Pitting edema +1 point
- Previous DVT +1 point
- Swelling of entire leg +1 point

- Localized pain in deep venous system +1 point
- Paralysis or recent cast of immobilization of lower limb +1 point
- Bedridden >3 days or surgery in past 4 weeks +1 point
- Alternative diagnosis at least as likely -2 points

Interpretation:

Scores of 2 or higher – DVT is likely; refer to physician for leg vein imaging

Scores of <2 – DVT is unlikely; refer to physician for blood tests to rule out DVT

For general massage practice, knowledge and interpretation of the Wells Score Criteria are not necessary and not within the massage therapy scope of practice. They are included here for informational purposes and to help illustrate what medical professionals are looking for during the diagnosis of DVT.

Blood Tests

There are some laboratory blood tests used to help diagnose DVT. These may include:

- APTT (activated partial thromboplastin time)
- CBC (complete blood count)
- D-dimer
- Electrolytes
- Fibrinogen
- Liver enzymes
- PT (prothrombin time)
- Renal function

There are also blood tests used to check if a person has an increased chance of blood clotting or hypercoagulability. These may include:

- Activated protein C resistance
- Antiphospholipid antibodies
- Antithrombin III
- DIC (disseminated intravascular coagulation) screening
- Genetic testing
- Protein C and protein S levels

As mentioned, other conditions have similar symptoms to those of DVT. These conditions can include muscle cellulitis, phlebitis, strains, and skin infections. Specific diagnostic tests help the medical professional make a diagnosis. Some of those tests include:

- CT (Computed Tomographic) scans
- Doppler ultrasound
- Magnetic Resonance Imaging (MRI)
- Venography
- Ventilation-perfusion (VQ) scan

Computed Tomographic (CT) Scan

CT scans use computer processing to create pictures of the internal structures of the body. They are helpful in DVT diagnosis. *Picture 2* shows an abdominal CT scan showing a blood clot in the common iliac vein. The arrow points to the clot.

Picture 2 – Blood Clot in an Abdominal CT Scan



Image used with permission from http://en.wikipedia.org/wiki/File:Iliac_vein_deep_vein_thrombosis.JPG

Doppler Ultrasound

Doppler ultrasound is a standard method of diagnosing the presence of DVT. This procedure uses ultrasound or sound waves to map the flow of blood through the legs. The sound waves travel through the leg and reflect back, thus allowing the computer to make an image. These images can show the presence of a clot.

Location and size are a few things ultrasound can reveal. Often ultrasounds are compared over time to see if a blood clot has increased or decreased in size.

Doppler ultrasound is the most popular method of DVT diagnosis. It is easy, painless for the patient, and effective for diagnosing thrombi in deep veins of leg or groin. Doppler ultrasound is less effective for blood clots below the knee. *Picture 3* depicts an ultrasound image of a clot. An arrow points to the clot.

Picture 3 – Blood Clot in Left Common Femoral Vein (L CFV) on Ultrasound

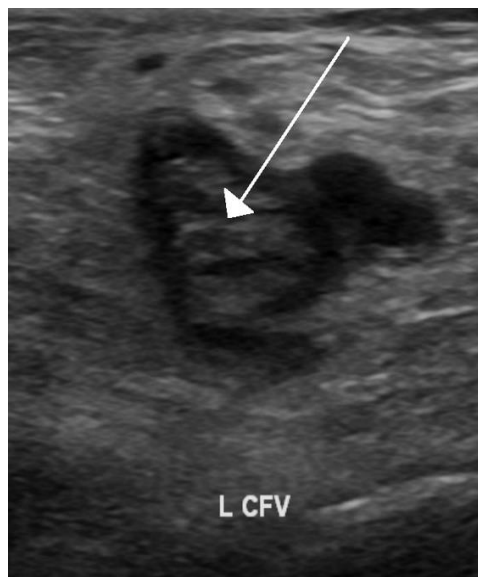


Image used with permission from <http://en.wikipedia.org/wiki/File:DVTUS.PNG>

MRI

Magnetic Resonance Imaging or MRI uses magnets to generate clear images of the body's internal structures. MRI is useful in detecting DVT of the thigh and pelvic areas.

Venography

In venography, also called intravenous venography, dye is injected into the veins. The dye makes the vein visible on x-ray. X-rays are taken to reveal the location of blood clots. It is a very accurate way to diagnose DVT, yet it is invasive, expensive, and uncomfortable for the patient. Venography requires a high level of expertise to perform and interpret. While venography is the gold standard for DVT diagnosis, it is rarely used because of these strong disadvantages. See *Picture 4* for a venogram.

Picture 4 – Venogram of DVT



Image used with permission from https://commons.wikimedia.org/wiki/File:Phlebographie_mit_Thrombose.jpg

VQ Scan

When the medical professional is worried about PE, they may recommend a lung ventilation perfusion scan or VQ scan. A lung VQ scan shows how well oxygen and blood are flowing to the lungs.

Overall, as discussed, a blood clot can be clinically silent. It does not always produce signs or symptoms. DVT can be difficult to diagnose even for skilled physicians. The best course of action for a massage therapist suspecting a DVT in their client is to refer to an appropriate healthcare provider.

DVT Treatment

Prevention of DVT in the first place is obviously the best case scenario, but what happens when a person has already been diagnosed with DVT? Once DVT is diagnosed, ideally treatment begins right away. This decreases the chance that the thrombus will grow and helps decrease the risk of pulmonary embolism.

Fortunately, if your massage clients are diagnosed with DVT, there are many ways to manage the problem and multiple treatments that help. DVT is treated with medications, other devices, and therapies. Some of the treatment options that this course covers include:

- Everyday management
 - Compression stockings
- Hospitalization
- Medications
 - Anticoagulation
 - Thrombolysis
- Surgical procedures
 - Inferior vena cava filter
 - Thrombectomy
- Lifestyle and home remedies

The primary goals of DVT treatment include:

- Stopping the blood clot from increasing in size
- Preventing the blood clot from breaking off and causing a PE
- Decreasing the chance of recurrent DVT

Length of treatment varies greatly. Treatment length of DVT in people with an easily reversible and identifiable cause of the problem is usually about 4-6 weeks of therapy. For those people with a risk of developing a new thrombosis, therapy may continue for months to years. Still others may remain on medication for life.

Everyday Management

For your massage clients who live with the diagnosis of DVT daily, there are a few things you can suggest to minimize the pain and discomfort. They can elevate the affected leg whenever possible to help blood return. Heat or ice application may relieve pain and/or decrease swelling.

Compression stockings or strong support hose are worn and used to help reduce or prevent swelling. They decrease pooling of the blood and improve blood flow in the legs. This helps to decrease the risk for blood clots. Compression stockings provide gentle pressure on the legs, which keeps the blood from pooling and clotting.

There are several types of compression stockings:

- Support pantyhose, least support
- Over the counter compression hose, medium support
- Prescription strength compression hose, maximum support

It is important your massage clients wear these every day. The stockings are worn on the legs from the arch of the foot to just above or below the knee. Compression stockings are tight at the ankle and become looser as they move up the leg.

The use of prescription strength compression stockings is recommended immediately and usually continued for a minimum of 1 year after the DVT diagnosis. These stockings also reduce the risk of post thrombotic syndrome, which is a syndrome of signs and symptoms occurring after DVT diagnosis.

Hospitalization

At the other end of the treatment spectrum from everyday management is hospitalization. It is considered in patients with two or more of the following risk factors:

- Bilateral DVT
- Cancer

- Chronic heart failure
- Immobility
- Kidney insufficiency
- Low body weight, <154 lbs.

People in these groups are at more risk for complications during their treatment for DVT. Hospitalization can help manage those risks.

Medications

Medications are used to prevent and treat DVT. Prescription drugs used to treat DVT fall into two groups: anticoagulants, like heparin or warfarin, or thrombolytics.

Anticoagulants, also known as blood thinners, are medications that prevent the growth and development of blood clots. Anticoagulants don't actually thin the blood. They block certain clotting factors in the bloodstream thereby preventing the body's ability to clot. They stop existing clots from getting bigger. They are the most common medications used for DVT treatment.

Thrombolytics are drugs that dissolve a clot by disintegrating it. Licensed medical providers like physicians or nurse practitioners prescribe these medications. Medications like these can be taken via pill, injections under the skin, or intravenously (IV).

These drugs are not without risks and disadvantages. Contraindications for both these types of medications include abnormal/allergic reaction to blood thinner medications, bleeding in the brain, major trauma, or recent major surgery such as open-heart surgery.

Anticoagulants

Generally, anticoagulation is the main treatment for DVT. Anticoagulation is accomplished in two parts. A person is placed on heparin for a brief course, usually a few days to a week. Heparin is given as an injection or via IV. Simultaneously, they are started on a 3-6 month oral course of warfarin. Warfarin is given in pill or oral form. It takes a few days for warfarin to work, so heparin is used in the meantime because it acts quickly.

Once the warfarin starts to work, the heparin is stopped. If heparin is given via IV, a hospital stay is required. Heparin may also be injected once or twice a day, which can decrease the length of the hospital stay. Pregnant women are usually treated with heparin since warfarin is dangerous in pregnancy.

As mentioned, treatment for DVT using blood thinning medications usually lasts 3-6 months. Any of the following situations will change the length of treatment:

- In certain illnesses, like cancer, the use of blood thinners may continue as long as illness is present
- If the blood clot occurred after a short-term risk like surgery, treatment length may be decrease
- History of previous blood clots or DVT means treatment time is extended

For patients who have recurrent DVT (defined as two or more), anticoagulation medication treatment can last a lifetime. Warfarin increases the chance that a person will bleed from their normal daily activities. It must be taken exactly as prescribed and monitored by blood tests to determine the correct dosage. Anticoagulants like heparin or warfarin keep more clots from forming and prevent the old ones from getting bigger. They do not dissolve existing clots.

The most common side effect of anticoagulants is bleeding. This side effect can be life threatening. Internal bleeding is another problem with anticoagulation therapy. Your massage therapy clients who are on blood thinners will have regular blood tests to measure their body's ability to clot, usually a PT and a PTT.

Lab tests guide the physician or prescriber of the drug to adjust the dosage if needed. If your massage clients on blood thinners start to bruise easily or bleed, insist they call their doctor right away to have a lab test. This could be a sign their medicine needs an adjustment.

If a massage client of yours is on an anticoagulant, encourage them to follow the prescription instructions, taking only the amount prescribed. Have them discuss potential side effects with their prescribing physician. If your client wants to take herbal remedies or vitamin supplements, insist they check with their doctor for potential interactions.

Patients on heparin or warfarin must take the medication exactly as prescribed. These drugs have serious side effects including excess bleeding. If too much is taken, the risk of increased bleeding occurs. If too little is taken, the person is still at risk for additional blood clots. Periodic blood tests are needed to monitor clotting time in the person's body. Also remember pregnant women should not take warfarin.

Thrombolytics

The drug of choice to dissolve blood clots is a thrombolytic. Thrombolytics like tissue plasminogen activator (TPA) are given to quickly dissolve clots. They are given via IV. Generally, thrombolytics are usually reserved for those more extensive, large blood clots, like an iliofemoral thrombosis or PE, that cause severe symptoms. The big disadvantage of these drugs is serious bleeding complications. Since they can cause sudden bleeding, they are used only in life-threatening situations.

Knowing which massage clients are or have been on anticoagulants and thrombolytics is important for massage therapists. Once a person's blood has been anticoagulated they are at risk for spontaneous bleeding. Deep massage or vigorous moves by the massage therapist may cause small bruises or bleeds.

Deep vigorous massage and deep ischemic level compression is contraindicated for clients on anticoagulants and thrombolytics. Generally, for clients who are anticoagulated, massage therapy pressure should be decreased. It is a good idea to communicate with the client's physician to see what level of pressure can be safely used or if any massage pressure can be used at all.

Surgical Procedures

In rare cases, surgery is used when medications don't work. There are several surgical procedures for DVT treatment. One of them is a thrombectomy. This is the insertion of a mechanical thrombectomy device into the clot to remove it. It is useful for those who are unable to take anticoagulants due to allergy or excess bleeding. If a person can tolerate anticoagulants, the medications can be placed into the thrombectomy device and the drug is delivered directly into the clot.

Another procedure is the insertion of an inferior vena cava filter (IVC filter). The filter reduces the chance of pulmonary embolism and is helpful for those who have a contraindication to anticoagulants. It is also useful in situations where the person develops a PE while on medication therapy.

A small metal filter is placed into a large vein in the abdomen called the inferior vena cava. The inferior vena cava is the major vein that collects blood from the legs. The filter can potentially catch any blood clots that break off in a vein. The IVC filter prevents these breakaway clots from traveling to the lungs. They are sometimes referred to as umbrellas because of their shape.

The IVC filter has considerable drawbacks. It does not prevent new blood clots from forming. Another disadvantage is these filters are a potential risk factor for thrombosis themselves. Typically, they are used as a temporary measure to prevent deadly pulmonary embolisms. See *Picture 6* for an image of an IVC filter.

Picture 6 – An Inferior Vena Cava Filter

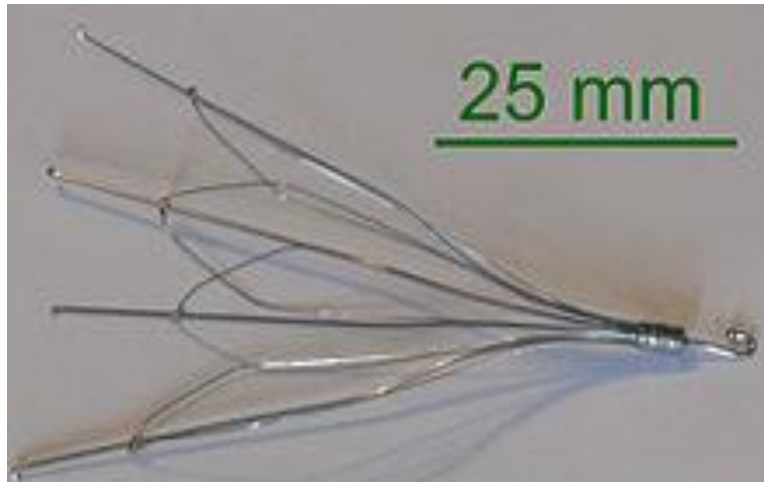


Image used with permission from https://commons.wikimedia.org/wiki/File:Inferior_vena_cava_filter.jpg

Lifestyle and Home Remedies

With the exception of the compression stockings mentioned, the treatments of hospitalization, medications, and surgery are drastic measure used to treat DVT. As a massage therapist, you many wonder what alternative and holistic remedies clients with DVT might utilize.

While the alternative and holistic lifestyle and home remedies are helpful for a person with DVT, they can only be used in conjunction with their overall medical plan. DVT can be a medical emergency and often needs drastic treatments like those already discussed.

Here are a few lifestyle and home remedies you can suggest to your massage clients with DVT as part of their overall self-care plan:

- Eating a plant based diet with the elimination of all animal products and animal fats is known to facilitate the flow of blood through the arteries and veins thereby decreasing the chance of blood clots developing.
- Lifestyle changes like weight loss, smoking cessation, and controlling blood pressure all decrease the risk of DVT. Obesity, smoking, and high blood pressure increase DVT risk.
- Regular exercise and an active lifestyle.
- When sitting for extended time periods, exercise the lower calf muscles. Get up and walk around. If walking around is not an option, raise and lower heels while keeping toes on floor. Alternate with raising toes with heels planted on the floor.
- If on previous bedrest due to surgery or something else, get moving. Movement decreases the likelihood that blood clots will develop.
- Wearing prescription strength compression stockings if recommended by healthcare provider.
- Regular doctor visits and lab tests to assess if medications and other treatments need to be adjusted.
- Monitor Vitamin K intake while on blood thinners. Vitamin K affects the action of warfarin. Foods high in vitamin K include canola oil, soybean oil, and green leafy vegetables like kale, spinach, and mustard greens.
- Monitor for signs of excessive bleeding, which is a side effect of taking blood thinners as mentioned. A minor injury can be a serious problem if the person is on anticoagulants.

One final note on treatment is concerning the treatment of superficial blood clots. When a superficial clot is symptomatic, they can be treated with warm compresses, leg compression, and anti-inflammatory medications. When superficial thrombophlebitis occurs near the groin where the superficial and deep venous systems join together, there is a potential that the thrombus could occur and extend to the deep venous system. These people may end up needing anticoagulants and should be evaluated by a licensed medical professional.

Prevention of DVT

In the prevention of DVT, minimizing risk factors is key. DVT blood clots seem to occur with little to no warning but usually they have been developing slowly over time. Knowing the signs and symptoms of DVT and taking preventative actions can decrease a person's risk of DVT. Overall, a few general ways to manage risk factors and prevent DVT include:

- Living a healthy lifestyle by eating a plant based whole foods diet, losing excess weight, regular exercise, smoking cessation, and controlling blood pressure.
- When mobility is limited such as on long airplane flights or long car trips, remain active by walking or by using ankle and calf exercises.
- Discuss DVT risks with your doctor or medical professional.
- Before planned surgeries or hospital stays, take precautions like using compression stockings, utilizing calf and leg exercises as appropriate, and following recommendations of physicians.

Each of the above general statements will be discussed further in the following categories. Here are the different areas of DVT prevention covered in this course:

- Compression stockings
- Lifestyle changes
 - Diet
 - Exercise
- Pre and post-surgical DVT prevention
- Pregnancy
- Travel

Compression Stockings

The use of compression stockings is considered both a treatment and a preventative measure in deep vein thrombosis care. Wearing compression stockings if they are prescribed is helpful in prevention of DVT. As already mentioned several times, they provide gentle pressure on the leg and improve blood flow, thus reducing blood clot risk. Many physicians recommend wearing compression stockings especially for travel greater than 8 hours. Additionally, compression stockings may help prevent future DVT formation in those with history of clots.

Lifestyle Changes

As a massage therapist, you are in a unique position to encourage your clients to live a healthy lifestyle. Topics like diet and exercise can be easily discussed during the massage if your client is open to talking about them.

As mentioned, prevention and self-care helps reduce risk of DVT in your massage clients. Maintaining a healthy diet and activity are two ways to manage DVT risk.

Exercise, even low impact movements, encourages circulation and help a person lose weight. Diet and eating a plant base diet also helps maintain normal weight and improve cholesterol levels. Have your massage clients check with their healthcare provider before starting a new exercise or diet program.

Healthy Diet

Massage therapists know small dietary changes can improve health greatly. Research increasingly shows that the top 10-15 most deadly diseases in the United States can be prevented and reversed with diet and lifestyle changes. DVT is no exception and can be helped by diet changes too.

Start by giving clients small changes to make. First, suggest no oils, which are high in saturated fats. This can help decrease cholesterol levels. High cholesterol is known to lead to plaque deposits. These deposits narrow the arteries decreasing blood flow and circulation. Both of those are known risks for DVT.

Next, suggest they take out all processed foods including fast foods, things in a box, pastries, cakes, candy, processed sugars, processed drinks, etc. And for your more dedicated clients, finally suggest no animal products, no meat, and no dairy of any kind. Of course not all clients will be open to this, but those who are open and willing to make the changes will not experience DVT problems.

Foods that may protect against DVT include:

- Whole plants, vegetables, and fruits
- Fiber
 - Soluble fiber found in oat bran, beans, peas, oatmeal, rice bran, barley, strawberries, citrus fruits, and apple pulp
 - Insoluble fiber found in whole wheat bread, bran cereals, rye, whole brown rice, barley, beets, carrots, cabbage, brussel sprouts, apple skins, turnips, and cauliflower
- Omega-3 fatty acids
 - Found in avocados, walnuts, chia seed, and flax seeds
- Soy products like tofu, soymilk, soybeans, etc.

Fiber from plant-based sources is known to help lower blood cholesterol levels. Omega-3 fatty acids from plant-based sources are known to lower blood pressure, lower triglycerides, reduce blood clot risk, and decrease risk of abnormal heart rhythms and death. Finally, drinking plenty of water is another way to improve the diet, stay hydrated, and decrease risk of blood thickening and clotting.

As mentioned in the medication treatment section of the course, people on anticoagulant medications should watch their intake of vitamin K. Vitamin K affects how these drugs work. Foods high in vitamin K include green leafy vegetables, canola oils, and soybean oils.

For your Internet savvy massage clients, suggest the website www.nutritionfacts.org. This nonprofit organization has hundreds of science based nutrition research videos on what kind of diets prevent and reverse hundreds of different diseases. The website has over 10 videos on blood clots alone which can be found by using the key word search “blood clots”.

Exercise

When the muscles of the leg are inactive, blood can pool in lower extremities, which increases DVT risk. Simple exercises and just 30 minutes of moderate activity a day help a person lose weight and may reduce DVT risk. Walking or gardening increase circulation and make it easier to lose excess weight.

If your massage client has been immobile for a while, have them start slowly and gradually build up to the desired level of activity. Yard work, housework, gardening, walking, stair climbing, and even dancing are forms of exercise. Have your clients pick activities they enjoy and encourage clients to engage in these activities on a regular basis.

When the muscles of the legs are active, muscle contract and provide gentle pressure on the veins. This gentle pressure assists normal circulation and pushes blood back to the heart. Regular mobility and exercise are profound ways to maintain proper blood circulations, putting your massage clients in a low risk group for developing DVT.

Pre and Post-Surgical DVT Prevention

In people who are hospitalized for surgery, the risk of DVT is increased nearly 8 times. Those having hip or knee surgeries are at the highest risk. Most hospitalized patients have at least one risk factor for DVT or PE. It is crucial for them to be prepared because of this.

The two main reasons surgery increases DVT risk includes:

- Potential damage to blood vessels in surgery
- Sluggish blood flow in those on bedrest or with mobility restrictions

Routinely, injectable heparin is given to prevent thrombosis in people who just had surgery. Early walking and ambulation is the main treatment used with surgical patients. Walking helps increase venous blood movement and prevents blood pooling. Preventative care for DVT might include movements like stretching as well. This can help lessen DVT risk.

Intermittent Pneumatic Compression (IPC) devices or pneumatic devices are used in hospitals to prevent DVT. Pneumatic devices are applied to the legs and help pump the blood when the skeletal muscles are not contracting due to immobility or limited mobility.

IPC machines use air bladders and are wrapped around the thigh and calf. The bladders inflate and deflate, squeezing the muscles and increasing blood return. These machines are very helpful in preventing DVT and PE in hip and knee surgical patients.

If your massage client is preparing for a hospitalization or surgery, have them discuss these things with a physician. Creating an action plan helps prevent and greatly reduces the risk for DVT. Their doctors may prescribe a blood thinner or use other methods described above.

In hospital settings, the staff works hard to minimize the potential for DVT formation in at risk groups. Hospitals routinely use compression stocking, early ambulation, low dose blood thinners, and many other strategies in DVT prevention.

Pregnancy

The risk of DVT goes up when a woman is pregnant due to normal physiological changes with the pregnancy. In pregnancy, the blood thickens to prevent postpartum hemorrhaging. Normally, this is not a problem. However, if the woman has other risk factors, the risk for DVT could be substantial.

The main issue with anticoagulants in pregnancy concerns warfarin as mentioned. Warfarin is known to harm the fetus if administered early in pregnancy. Therefore, this medication is not routinely given to pregnant women.

Prolonged Travel

There is no direct link between travel and DVT. Yet it is known that sitting for extended periods of time puts a person at a higher risk for DVT especially if they have other risk factors.

One suggestion for prolonged travel would be to wear compression stockings or tights while traveling. A second suggestion would be to perform ankle and calf exercises while seated. A third suggestion would be to

walk around whenever possible during long travel periods. These things have been shown to reduce the incidence of blood clots in people on long flights.

The Centers for Disease Control and Prevention (CDC) have some recommendations for traveling longer than 4 hours. These include:

- Avoid crossing legs for long periods of time
- Decrease alcohol and caffeine consumption
- Drink plenty of water and stay hydrated
- Moving around every two hours

Additionally, have your massage clients talk to their doctor about their personal DVT risks and other health issues before prolonged travel. Remember, the risk of DVT is greatly reduced by taking preventative measures and recognizing signs and symptoms.

There are a variety of exercises you can recommend to your massage clients that help reduce the risk of DVT by encouraging blood circulations. These may include toe touches, heel touches, rotating the ankles in clockwise and counter clockwise directions, flexing and extending the calves of the leg, and any others you can think of to promote circulation in the lower extremities.

Travel Tips for DVT Prevention

The actual risk for developing DVT while traveling is small. The risk increases if travel time is greater than 4 hours or if the person has other DVT risk factors. Here are some tips to suggest to massage clients when they travel:

- Avoid alcohol
- Drink plenty of fluids
- Flex and point feet every 20 minutes while sitting
- Flex and stretch feet to encourage blood flow in lower leg
- If driving by car, stop about every hour and walk around
- Move the legs to encourage blood flow in calves
- Use compression stockings or blood thinners if prescribed by physician
- Walk up and down the aisles of the bus, train, or airplane hourly
- Wear loose and comfortable clothing

Overall, preventing deep vein thrombosis is much easier than treating one after it has occurred. To review, the most common preventive measures discussed include the following:

- Exercise the lower calf muscles in any fashion described
- Make lifestyle changes like smoking cessation, weight loss, or lowering blood pressure
- Move soon after surgery
- See and follow up with a doctor regularly about the treatment plan
- Take medications as prescribed
- Wear compression stockings if recommended by a physician

In summary, if your massage client is at risk for DVT, they can prevent the condition by using compression stockings and making lifestyle changes in their diet and exercise habits. Seeing a doctor for regular visits during pregnancy and otherwise, taking medications as prescribed, moving as soon as possible after surgery or illness, and following traveling tips are also ways to prevent DVT.

DVT Prognosis

DVT usually requires immediate medical care. Some DVT can lead to other long lasting problems such as leg swelling, aching, color changes, and even leg sores. Conversely, other DVT disappear on their own with no complications.

The prognosis for those with DVT is fairly good. If diagnosed and treated properly, DVT or PE will usually resolve successfully. Most people can return to their previous activities. Activity is important in helping to prevent further blood clots.

Many DVT disappear without a problem, but can return. There is a chance your massage clients who have had DVT may have another one. It depends on the details regarding their first DVT. For instance, if they had a blood clot due to surgery or trauma, the risk factor was temporary and their risk of another occurrence is low. If the blood clot occurred spontaneously without risk factors being present, they have a 30% chance of developing one in the next 10 years. Massage clients living with risk factors for DVT or having a known DVT are at a higher risk for second occurrence of DVT.

You may have massage clients who continue to have long term pain and swelling in the extremity. This is known as post phlebotic syndrome and is discussed further under complications. Using compression stockings during and after DVT helps prevent this condition.

Other massage clients may develop blood clots in the thighs. These are more likely to break off than clots in the lower leg or other parts of the body. When they break off, they may travel to the lung and can cause pulmonary embolism (PE). This can be a challenging prognosis without proper treatment for people.

Living with deep vein thrombosis poses some challenges for your massage clients. As mentioned, they are at greater risk for having another one. As their massage therapist, you can encourage them to:

- Take steps to prevent DVT (found in the *Prevention* section)
- Check their legs for signs and symptoms of DVT (found in *Signs and Symptoms* section)
- Contact their physician immediately if signs and symptoms of DVT occur

There are some ongoing health concerns to be aware of for massage clients with deep vein thrombosis. These patients may be on blood thinners to treat or prevent DVT. Sometimes a person's blood becomes too thin and this leads to bleeding. If it occurs in the body, this side effect can be life threatening.

If bleeding occurs in the digestive system, signs and symptoms may involve:

- Abdominal pain
- Black, tarry stools
- Bright red blood in stool
- Bright red vomit
- Vomit that looks like coffee grounds

If bleeding occurs in the brain, signs and symptoms can include:

- Confusion
- Loss of movement in arms or legs
- Memory loss
- Severe head pain
- Sudden vision changes

Encourage massage clients who may be on blood thinners and experiencing any of these signs or symptoms to seek treatment right away. Excessive bleeding after a fall or injury is another sign the blood thinners may have thinned the blood too much. If this occurs in a client of yours, refer them for proper treatment.

People living with DVT and on blood thinners need to talk to their doctors before taking any other medications because there are many possible interactions or problems that could occur. For example, taking aspirin with a blood thinner may raise a person's risk for bleeding.

People on blood thinners must also consult their doctors about how diet can affect these medications. For instance, foods high in vitamin K may alter how warfarin, a blood thinner discussed previously, works. As covered, Vitamin K is found in canola oil, soybean oil, green leafy vegetables, and others. A doctor can warn clients of these potential interactions and provide alternatives for a healthy and balanced diet.

A final point to make about the prognosis of those with DVT is on that of traveling. While living with risk factors for DVT, clients will want to know if long distance travel is safe for them. Most of the time, those at risk for DVT or those who experienced prior DVT or PE can still travel on long distance trips provided simple precautions are taken.

For massage clients traveling, you may suggest any of the following precautions as well as other previously mentioned in this course:

- Two weeks prior to departure for a long trip, practice sitting calf and leg exercises that they can use during the trip
- Stretch legs as much as possible on trip
- Wear compression stockings to help circulation of blood in the legs
- Drink plenty of fluids to stay hydrated
- If traveling longer than 4 hours, have them talk to their doctor about recommending a blood thinner before they leave

As you can see, the prognosis of those with DVT can be favorable provided some simple precautions are taken and the person is educated and watches for potential problems.

DVT Complications

There are two major complications of deep vein thrombosis (DVT), pulmonary embolism (PE) and post-thrombotic syndrome (PTS). The primary complication to be concerned with in DVT is a pulmonary embolism as it can be fatal.

Pulmonary Embolism

A pulmonary embolism occurs when a thrombus or blood clot blocks an artery in your lung. More specifically, a pulmonary embolism occurs when a blood clot is lodged in the pulmonary artery (the artery that carries blood from the heart to the lungs) causing severe respiratory dysfunction. Most pulmonary emboli come from the deep leg veins and travel to the lungs via the blood circulation.

Pulmonary embolism is a major complication of deep vein thrombosis. It occurs when a DVT breaks off and moves into the lungs, blocking circulation to the lungs, creating a medical emergency. Over 90% of pulmonary embolisms arise from the legs. PE is a life threatening condition and can present with chest pain and shortness of breath. If you suspect this in a massage client, refer them immediately because PE requires immediate medical attention.

If a blood clot breaks loose from the wall of a vein and travels to the lungs, this may block the pulmonary artery or one of its branches. Blood flow is blocked from the heart. Pulmonary artery obstruction by an emboli or migrating clot may be life threatening. Signs and symptoms of PE include:

- Chest pain or discomfort
- Coughing up blood
- Fainting
- Feeling lightheaded or dizzy
- Pain worse with deep breathing or coughing
- Rapid heart rate
- Rapid respiratory rate
- Sense of anxiety or nervousness
- Sudden shortness of breath that is worse with breathing
- Unexplained coughing
- Unexplained shortness of breath

Massage clients experiencing these symptoms should seek medical attention right away. PE is a serious medical problem in the US. About 300,000 Americans die annually from PE. Most of these result from a DVT. Complications from DVT kill more Americans than breast cancer and AIDS combined.

Overall, remember that a blood clot can break free in the legs and travel to the lungs or anywhere else in the body. This is life threatening and should be treated in an emergency room or hospital. Rapid treatment of DVT helps prevent this complication in the first place.

Post-Thrombotic Syndrome

Post-phlebotic syndrome or post-thrombotic syndrome (PTS) is another common complication that can occur after deep vein thrombosis. Post-phlebotic syndrome refers to a chronic swelling or edema in the leg that had the DVT. The affected leg becomes chronically swollen and painful. Changes in skin color may be noted. Formation of ulcers around the foot or ankle may also be noted.

This syndrome is used to describe a collection of signs and symptoms. PTS occurs in people with deep vein thrombosis. It is a long-term complication of DVT. Signs and symptoms may show up right away or may show up a year or two later. Signs and symptoms can include:

- Chronic and persistent pain
- Chronic swelling
- Dermatitis
- Development of varicose veins
- Leg edema or swelling
- Leg pain
- Nocturnal cramping
- Skin discoloration or pigmentation changes
- Ulceration on medical aspect of lower leg
- Venous claudication

This syndrome is caused by damage to the veins from the blood clot. The damage reduces blood flow to the area. Unfortunately, PTS is common in those who have had DVT and little is known about who will or will not develop it. It can be difficult to diagnose because symptoms are similar to DVT.

Approximately 330,000 people in the U.S. are affected by post-thrombotic syndrome. Generally, about 40% of people who have a leg DVT will experience PTS. It usually appears in the first 6 months following the DVT, but may appear up to 2 years later.

Treatment options for post-phlebotic syndrome include medications like aspirin or diuretics and the use of compression stockings.

Massage Therapy Contraindications

Is massage therapy contraindicated in DVT? Yes, massage therapy is contraindicated in known or suspected DVT. It is critical to avoid any pressure or movement that could dislodge the clot from the veins of the extremity. This could create an embolism.

Massage therapists should also avoid massage therapy anytime DVT risk is elevated. Since DVT risk is increased in the first few days to weeks following surgery, this is a time when massage therapy is contraindicated. Exactly how long the risk period lasts post surgically is unclear. The best massage therapy practice in that case is to avoid massage pressure on the lower extremities until the client's doctor verifies the increased risk period has passed.

As mentioned previously, DVT is a medical emergency. Massage therapy is not indicated in suspected cases of DVT. Suggest in a firm manner that the client call his or her physician for medical advice and what to do next. If the massage client is unable to reach their doctor or health care provider, send them to the emergency room for immediate care. Encourage your client to seek prompt medical attention.

A common thought by the massage therapist is, "What if I am wrong in suspecting DVT? I don't want to alarm or scare my client unnecessarily." It is within a massage therapist's scope of practice to suspect a problem and act on it.

It isn't within the massage therapy scope of practice to fully assess, diagnose, or treat the medical condition of DVT. It is up to the client's doctor to determine if DVT is present and assess if the problem is serious or not. This is why a medical opinion should be sought from the client's physician as soon as possible.

Managing DVT Risk in Massage Therapy Practice

How can a massage therapist manage the risk of DVT in massage practice? One way to manage the risk of using massage therapy in clients with DVT would be to avoid all massage. This might also apply to clients who have cancer, obesity, stroke or other overlapping medical conditions associated with DVT discussed in this course. Avoiding massage in all these cases is probably an overly conservative approach.

Another way to manage the risk and uncertainty of DVT in massage practice along with the therapeutic need for massage is to sharpen your interview skills. Get specific information from the client regarding their exact diagnosis and location of DVT.

In order to safely work with the DVT population of clients, you need to determine which group of DVT patients your client falls into. The first group is those clients who are suspected of having DVT because they are showing symptoms. The second group is massage clients who have an increased risk for DVT because they have one or more of the DVT risk factors. These two situations require different interviewing skills and follow-up actions on the massage therapist's part.

In the first case of suspected DVT due to actively showing symptoms, it is helpful to recognize the signs and symptoms of DVT. Remembering the following facts about DVT can be helpful:

- About 50% occur without signs or symptoms
- Can occur in upper or lower extremity
- Most common in lower extremity
- Usually unilateral, although can be bilateral

The presence of any one of the following signs or symptoms puts the client in the “suspicious for DVT” group. Any of these symptoms or the ones covered in the *Signs and Symptoms* section of the course are a red flag for the practicing massage therapist:

- Blue coloration in skin, nail beds, or both
- Calf or thigh ache
- Cord-like feeling in the leg
- Cramping or “charley horse” in affected body part
- Dilation or enlargement of surface or superficial veins
- Discoloration or redness of affected area or in one leg
- Leg pain in one leg
- Nonspecific, non-local pain or tenderness which feels like a deep ache
- Pain in the leg affected while standing or walking
- Pain or swelling in arms or neck if blood clot is in arm or neck
- Skin is warm to touch
- Swelling or edema of the affected leg, ankle, and foot, and along a vein in the leg
- Tenderness with touch, squeezing, standing, or movement in affected leg or extremity
- Warmth in the area of leg which is painful or swollen

Asking about these things during your client interview and/or client paperwork is appropriate and encouraged. Even though it is outside of the scope of massage therapy practice to diagnose DVT, the massage therapist may recognize signs and symptoms of DVT and proceed with the appropriate referral to the person’s physician right away.

With the first group of massage clients who are suspected of having DVT because they are showing symptoms, the action for the massage therapist to take is immediate referral. Please refer back to the section *Massage Therapy Contraindications*.

With the second group of massage clients who have an increased risk for DVT because they have one or more of the DVT risk factors, it is helpful to recall and recognize the risk factors for DVT. Here is the list again:

- Age >60 years
- Bedrest during a hospital stay or paralysis
- Blood disorders or factors that make the blood thicker
- Cancer and some cancer treatments
- Cancer patients with multiple surgical procedures
- Central venous catheters
- Congestive heart failure and cardiac disease
- Diabetes
- Elderly patients and increasing age
- Family history of DVT or PE
- Genetic blood clotting disorders like Factor V Leiden
- History of DVT (deep vein thrombosis)
- History of PE (pulmonary embolism)
- History of VTE (venous thromboembolism)
- Immobility or restricted mobility (bedrest, long plane or car rides)
- Infectious disease

- Injury to a deep vein from surgery or broken bones
- Low levels of activity
- Medications (hormone replacement therapy or oral contraceptives/birth control pills)
- Obesity
- Pacemakers
- Pregnancy and the first 6 weeks after giving birth
- Procedures where a catheter is passed through the vein in the groin
- Recent surgery (abdominal, pelvic, hip, knee, other neurosurgical procedures)
- Respiratory failure
- Sitting in cases of prolonged travel
- Smoking and smokers
- Trauma

If these risk factors come up during the client interview or paperwork, the massage therapist can inquire further. Not all the risk factors are equal and some carry more weight than others. Massage therapy training doesn't include assessment of the likelihood of DVT, so leave the diagnosis to the physicians.

In summary, if a massage therapist is working with a population who has these DVT risk factors, here are a few general suggestions or guidelines to follow:

- Never massage a person showing symptoms of DVT
- Be alert for risks of DVT
- Sharpen your interview skills
- Consult the person's physician
- If time does not allow for consultation with the client's doctor, avoid the extremity(ies) in question for that session and communicate with the physician in preparation for a future session
- Ask the client's health care provider if massaging the extremities with pressure is allowed

Appropriate Referral

When should the massage therapist refer clients with DVT? A massage therapist must refer a client to their health care provider or physician if the client is experiencing any of the signs and symptoms of DVT. Have them go to the emergency room or call 911 if they are known to have DVT and develop chest pain, coughing blood, fainting, loss of consciousness, shortness of breath, or other PE symptoms noted in the section on pulmonary embolism.

Client Education

What can a massage therapist do to help clients with DVT? If your client suspects they have DVT, there are several things they can do to help them self. First, have them make a doctor's appointment. If they are experiencing symptoms of PE, call 911 rather than wait for a doctor's visit.

They won't need any special preparation for the doctor to diagnose DVT, but because the visit can be quick and there are many issues to cover, you can help them prepare for the visit. Here are some ideas of what they can do to get ready for the appointment:

- Bring a family member or friend to help them absorb all the information given in the visit
- Discuss their activity level including being seated for long periods of time and traveling by car or plane
- Make a list of all prescription and over the counter medications, vitamins, and supplements they take
- Write down any symptoms they have been experiencing even those unrelated to DVT
- Write down key personal medical information like family history of blood clotting disorders

- Make a list of questions, most important to least important to ask the health care provider

Since the time with the physician is limited, a prepared list of questions allows your massage client to get the most out of their appointment time. In addition to asking prepared questions at the visit, advise them to always ask a question if they don't understand something covered in the visit. Here is a sample list of questions to ask:

- What is likely causing my symptoms or condition?
- What are other possible causes for my symptoms or condition?
- What kinds of tests will I need?
- What is the best course of action?
- What is an appropriate level of activity now that I have been diagnosed with DVT?
- What about activity level when the clot is gone?
- Will I need to restrict physical activity or travel plans?
- What are the alternatives to the primary approach you suggest?
- How do I manage DVT with my other health conditions?
- Is massage therapy completely contraindicated or just in the extremity with DVT in my case?
- Is there a specialist I should see?
- Are generic medications available for what you are prescribing me?
- Do you suggest any brochures, printed material, or websites I should read?

Your massage client can expect the doctor to ask a number of questions. Being prepared to answer them will help this part of the visit go quicker and smoother. This gives your client more time to cover other things they have concerns about like the use of massage therapy in their specific case. The health care provider will likely ask:

- When did symptoms first start?
- How severe are the symptoms?
- Are the symptoms continuous or occasional?
- What appears to improve the symptoms?
- What seems to worsen the symptoms?
- Have you been inactive lately or sitting/lying down for long periods?
- Is there any family history of health problems related to blood clots?

While the massage client waits for the appointment, they can begin simple self-care measures. Warm washcloths applied as a compress to the affected area are helpful. Elevation of the leg or extremity can help with discomfort.

DVT Clinical Research

To find the latest clinical research being conducted on DVT you can refer to the U.S. National Institutes of Health website. That link is:

- <http://clinicaltrials.gov/ct/gui/search?term=deepee+vein+thrombosis>

Additionally you can refer to the National Institutes of Health Heart, Lung, and Blood Institute. That link is:

- <http://www.nhlbi.nih.gov/health/health-topics/topics/dvt/trials>

DVT Educational Resources

For further study on the topic of DVT, the CDC created an online continuing education course called *Stop the Clot: What Every Healthcare Professional Should Know*. This course is free of charge to all interested healthcare professionals like massage therapists.

- <http://www.cdc.gov/ncbddd/dvt/training.html>

Several handouts for your massage clients describing basic information about DVT as well as the risks, signs, and symptoms are available free of charge from the CDC:

- http://www.cdc.gov/ncbddd/dvt/documents/vte_risk-infogr.pdf
- <http://www.cdc.gov/ncbddd/dvt/infographic-impact.html>

For more general information on DVT, visit the any of the following organization's websites:

- National Institutes of Health – National Heart, Lung, and Blood Institute <http://www.nhlbi.nih.gov/>
- North American Thrombosis Forum <http://www.natfonline.org/>

To download materials and resources for massage therapy client education:

- National Alliance for Thrombosis and Thrombophilia (NATT) <http://www.stoptheclot.org/>
- ClotCare <http://www.clotcare.com/>

References

Centers for Disease Control and Prevention (CDC) <http://www.cdc.gov/ncbddd/dvt/index.html>

Mayo Clinic <http://www.mayoclinic.com/health/deep-vein-thrombosis/DS01005>

MedicineNet.com http://www.medicinenet.com/deep_vein_thrombosis/article.htm

Medline Plus <http://www.nlm.nih.gov/medlineplus/ency/article/000156.htm>

National Institutes of Health – National Heart, Lung, and Blood Institute
http://www.nhlbi.nih.gov/health/dci/Diseases/Dvt/DVT_WhatIs.html

PubMed Health <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001209/>

WebMD <http://www.webmd.com/dvt/tc/deep-vein-thrombosis-topic-overview>

Wikipedia (images) http://en.wikipedia.org/wiki/Deep_vein_thrombosis

Understanding Deep Vein Thrombosis Exam

1. Common risk factors for DVT include:
 - A. Immobility
 - B. Speech disorders
 - C. Fibromyalgia
 - D. TMJ
2. Overlapping medical conditions occurring with DVT include all of the following except:
 - A. Cancer
 - B. Obesity
 - C. Stroke
 - D. Migraines
3. The most serious complication of DVT is:
 - A. Cracking joints
 - B. Immobility
 - C. Pulmonary embolism
 - D. Venous thrombosis
4. A pulmonary embolism is a blood clot:
 - A. That has traveled from a vein to the lung
 - B. That has traveled from a vein to the brain
 - C. Located in a superficial vein, usually in the arm or leg
 - D. Located in a deep vein, usually in the leg
5. HA-VTE stands for what?
 - A. Healthcare associated vein thrombotic syndrome
 - B. Healthcare associated venous thromboembolism
 - C. Healthy arteries venous thromboembolism
 - D. Healthy arteries veins thrombosis embolism
6. DVT typically affect the deep, large veins of all of the following except the:
 - A. Pelvis
 - B. Thorax
 - C. Thighs
 - D. Calves
7. This risk of developing DVT during a hospitalization is ____ times higher than normal.
 - A. 6
 - B. 7
 - C. 8
 - D. 9
8. Blood clot formation is affected by all of the following except the:
 - A. Blood vessel wall quality
 - B. Rate of blood flow
 - C. Thickness of blood
 - D. Amount of oxygen in the blood

9. Hypercoagulability is:
- A. An increased tendency of the blood to clot
 - B. A decreased tendency of the blood to clot
 - C. Sluggish or slow blood flow
 - D. Rapid or fast blood flow
10. Venous stasis can occur due to any of the following except:
- A. Bedrest
 - B. Pregnancy
 - C. Herpes virus
 - D. Prolonged travel
11. Which of the following is not considered a possible cause of hypercoagulability?
- A. Factor V Leiden
 - B. Polycythemia vera
 - C. Prescription medications like warfarin
 - D. Smoking
12. According to the text, all of the following are risk factors for DVT except:
- A. Stress
 - B. Cancer
 - C. Smoking
 - D. Obesity
13. Which of the following is an overlapping medical condition that may be seen with DVT?
- A. Eczema
 - B. Herpes zoster
 - C. Pulmonary disease
 - D. Sinus infections
14. Clients with heart disease are at risk for DVT due to:
- A. Excellent vascular circulation, open arteries, and smooth blood flow
 - B. Poor vascular circulation, blocked arteries, and sluggish blood flow
 - C. Poor vascular circulation, open arteries, and smooth blood flow
 - D. Excellent vascular circulation, blocked arteries, and sluggish blood flow
15. Which of the following is not a reason surgery increases DVT risk?
- A. Hypercoagulability
 - B. Arterial stasis
 - C. Endothelial damage
 - D. Venous stasis
16. Signs and symptoms of DVT may include all of the following except:
- A. Blue color in skin or nails
 - B. Calf ache or pain
 - C. Swelling and warmth in the leg on palpation
 - D. Swelling and cold in the leg on palpation

17. Signs and symptoms of a PE include all of the following except:
- A. Bloody phlegm
 - B. Bradycardia
 - C. Tachypnea
 - D. Tachycardia
18. A useful physical exam technique used in DVT diagnosis is:
- A. Measure the circumference of affected limb and unaffected limb at fixed points
 - B. Measure the circumference of affected limb and unaffected limb at different points
 - C. Measure only the circumference of affected limb
 - D. Measure only the circumference of unaffected limb
19. All of the following are reliable DVT physical exam techniques except:
- A. Homan's sign
 - B. Check for areas of increase warmth and swelling in affected extremity
 - C. Check for areas of tenderness and pain in affected extremity
 - D. Palpation of the venous tract
20. Lab tests used to help confirm a DVT diagnosis may include all of the following except:
- A. APTT
 - B. PT
 - C. Thyroid panel
 - D. Fibrinogen
21. Hypercoagulability can be detected by which laboratory test?
- A. CBC
 - B. Antithrombin III
 - C. Glucose level
 - D. Potassium (K⁺) level
22. Diagnostic tests for DVT include all of the following except:
- A. CT scans
 - B. Doppler ultrasound
 - C. X-rays
 - D. MRI
23. The most popular method of DVT diagnosis is:
- A. Echocardiogram
 - B. Venography
 - C. X-rays
 - D. Doppler ultrasound
24. VQ scans are used to diagnose:
- A. PE (pulmonary embolism)
 - B. ADD (attention deficit disorder)
 - C. CP (cerebral palsy)
 - D. DS (Down syndrome)

25. The primary goals of DVT treatment include all of the following except:
- A. Stopping the blood clot from growing in size
 - B. Stopping the blood clot from shrinking in size
 - C. Preventing the blood clot from breaking off
 - D. Decreasing recurrent DVT
26. Compression stockings provide _____ pressure on the legs to prevent blood pooling and clotting.
- A. No
 - B. Gradual
 - C. Ischemic
 - D. Gentle
27. The most commonly used prescription medications used for DVT are:
- A. Anticoagulants and antibiotics
 - B. Antihypertensives and beta-blockers
 - C. Anticoagulants and thrombolytics
 - D. Antibiotics and antivirals
28. Contraindications for thrombolytics include all of the following except:
- A. Bleeding in the brain
 - B. Major trauma
 - C. Recent massage therapy
 - D. Open heart surgery
29. Types of surgical procedures for DVT include:
- A. Arthrocentesis and arthroscopy
 - B. Thrombectomy and IVC filter
 - C. Angiogram and arthroscopy
 - D. SVC filter and echocardiogram
30. Lifestyle changes you can suggest to your massage clients with DVT include all of the following except:
- A. Stabilization splints
 - B. Plant based diet
 - C. Weight loss
 - D. Smoking cessation
31. When sitting for extended periods of time as in air travel or long car rides, clients with DVT risk should:
- A. Exercise the unaffected extremities only
 - B. Remain immobile
 - C. Sit as still as possible so they don't dislodge the blood clot
 - D. Exercise their lower calf muscles and/or the affected extremities
32. Physicians may recommend compression stockings to DVT patients who are traveling more than _____ hours.
- A. 8
 - B. 10
 - C. 12
 - D. 14

33. Sources of insoluble fiber include all of the following except:
- A. Whole wheat bread
 - B. Whole brown rice
 - C. Cakes and pastries
 - D. Carrots
34. Surgery increases DVT risk because of potential damage to blood vessels and:
- A. Sluggish blood flow in those with mobility restrictions
 - B. Fast blood flow in those with no mobility restrictions
 - C. Sluggish blood flow in those with no mobility restrictions
 - D. Fast blood flow in those with no mobility restrictions
35. Pneumatic devices are used in hospitals to prevent DVT because they:
- A. Squeeze the muscles and limit blood return to the heart
 - B. Tickle the muscles and promote blood return to the heart
 - C. Tickle the muscles and limit blood return to the heart
 - D. Squeeze the muscles and promote blood return to the heart
36. When traveling more than 4 hours the CDC recommends all of the following except:
- A. Moving around every two hours
 - B. Drinking more sugary drinks for a boost of glucose
 - C. Staying hydrated by drinking plenty of water
 - D. Decrease alcohol and caffeine consumption
37. All of the following are travel tips for DVT prevention except:
- A. Move legs to encourage blood flow in calves
 - B. Flex and point feet every 20 minutes
 - C. Keep legs still to prevent blood flow in calves
 - D. Wear loose and comfortable clothing
38. Symptoms of bleeding in the digestive system include all of the following except:
- A. Black tarry stools
 - B. Bright red blood in stool
 - C. Bright red vomit
 - D. Diarrhea
39. What vitamin may alter how anticoagulants like warfarin work?
- A. Vitamin A
 - B. Vitamin C
 - C. Vitamin D
 - D. Vitamin K
40. The two major complications of DVT are:
- A. Headache and post-herpetic syndrome
 - B. Pulmonary embolism and post-thrombotic syndrome
 - C. Pulmonary embolism and migraines
 - D. Vomiting blood and post-thrombotic syndrome

41. Signs and symptoms of post-thrombotic syndrome include all of the following except:
 - A. Chronic and persistent pain
 - B. Dermatitis
 - C. Skin discoloration or pigment changes
 - D. Joint arthritis

42. Massage therapy is contraindicated in known or suspected DVT because massage pressure or movement could:
 - A. Dislodge the clot from the vein initiating an embolus
 - B. Increase the clot size in the vein
 - C. Decrease the clot size in the vein
 - D. Dislodge the clot from the artery initiating an embolus

43. If a massage therapists suspects DVT in a client, the best course of action would be:
 - A. Hysterically suggest they contact their doctor and demand care right away
 - B. Calmly suggest they contact their medical provider or go to an ER for prompt medical attention
 - C. Suggest continuing with the massage session and getting medical care later
 - D. Ignore the suspicion as it would be too embarrassing if you were wrong

44. To manage the risk of DVT in massage therapy practice, a therapist can do all of the following except:
 - A. Sharpen interview skills
 - B. Know risk factors for DVT
 - C. Diagnose DVT
 - D. Know signs and symptoms of DVT

45. All of the following are true about DVT except:
 - A. About 50% occur with no signs or symptoms
 - B. They are most common in the lower extremity
 - C. They usually occur unilaterally
 - D. They always occur bilaterally

Using a separate piece of paper, answer the following case study questions. Please email or fax this to: info@massagetherapyceu.com or 605-761-2261.

Case Study #1

A 62-year-old female massage client with a history of diabetes presents to your massage office for her normal monthly massage session. She complains of new pain in her right leg after returning home from a European vacation. You examine the extremity and visualize a red, swollen right lower extremity. You note the leg is hot to touch and you visual swelling and edema in the right ankle. Answer the following case study questions using the text and the information provided in the case study.

1. Using page 12 of the text or any others, identify at least 3 of this massage client's risk factors for acute DVT.

2. Using pages 14-15 of the text or any others, identify at least 4 signs and symptoms of acute DVT presenting in this case.
3. Using pages 32-34 of the text or any others, design a course of action or protocol using at least 1 step for this massage therapist to take.
4. Using pages 16-20 of the text or any others, list at least 3 ways acute DVT is diagnosed.
5. Using pages 20-25 of the text or any others, list at least 3 ways acute DVT can be treated.

Case Study #2

Your 58-year-old male client presents to your massage clinic for a massage. He has history of a left lower extremity DVT 5 months ago after surgery. It was successfully treated with blood thinners. Now he reports some chronic and persistent pain in the area. Additionally he complains of chronic left leg cramps in the night. You examine the left leg and notice some flaking, discolored skin or dermatitis in the area. You also note some chronic edema and swelling in the left ankle and leg.

1. Using pages 30-32 or any others of the text, identify at least 5 signs and symptoms presenting in this case.
2. You suspect he may have Post-Thrombotic Syndrome (PTS). Using pages 30-32 or any others of the text, identify at least 3 risk factors that make you suspect he has PTS.
3. Using pages 30-34 in the text or any others, design a protocol or course of action using at least 5 steps for this massage therapist to take.
4. Using pages 25-28 of the text or any others, list at least 5 things a person can do to minimize their risk of DVT.
5. Using pages 32-34 of the text or any others, list at least 3 guidelines to follow when working with a population who possesses risk factors for DVT?

This completes the *Understanding Deep Vein Thrombosis* exam.