Development of a Guideline for Treatment of Deep and Superficial Venous Thrombosis in the Emergency Department

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Outline

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Abstract

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Purpose: The purpose was to implement an evidence based guideline on deep venous thrombosis (DVT) for the Emergency Department (ED). **Specific aims:** a) conduct an organizational assessment of DVT treatment practices b) compare organizational results with evidence based treatment guidelines c) develop recommendations for treatment of DVT for ED discharge d) conduct an interdisciplinary evaluation of the evidence based guideline. **Significance:** Patients with DVT often present to the ED and are aged 45-64 with an annual cost of $1.5 to $3.2 billion per year. **Methods:** A retrospective review of 149 records in 2010 with adults in an urban Midwestern ED. **Results**: Differences in provider practices were identified. A guideline was developed which included clinical management, social/financial concerns, patient education, anticoagulation monitoring and outpatient follow up. Evaluation included simulation exercises with an interdisciplinary team. Implementation and evaluation through electronic and paper communication, medical record monitoring and patient call back.

Key words: emergency department, deep venous thrombosis, guideline

Development of a Guideline for Treatment of Superficial and Deep Venous Thrombosis in the Emergency Department

Advanced practice nurses are asked to synthesize large amounts of information to make treatment decisions for patients who present to the Emergency Department with deep and superficial venous thrombosis. The use of evidenced based guidelines promotes the delivery of safe and efficient care in these high volume and/or high risk situations. Guidelines reflect the consensus of experts, as opposed to treatment by experience or opinion. They have been shown to decrease length of stay, lower the cost of care and improve clinical outcomes. Adapting the process of Titler's Iowa Model of Evidence-Based Practice to Promote Quality Care (Titler, 2007), a project was undertaken to develop a guideline for discharge of patients with deep and superficial venous thrombosis from the Emergency Department (ED) to outpatient care. Figure 1 illustrates a framework created for guideline development. The process includes identifying the problem and significance of venous thromboembolism in general, and in a specific ED population; reviewing the published literature to establish the current knowledge base in the areas of pathophysiology, treatment practices and pharmacology. Clinical management, along with institutional resources, patient education and outpatient follow-up plans were combined to create a practice guideline. Any working model is dynamic; methods of implementation, continued evaluation and updating have implications for its continued effectiveness.

Identification of the Problem

Significance

Venous thromboembolism (VTE) which encompasses deep venous thrombosis and pulmonary embolism (PE) results in more deaths than breast cancer, HIV and motor vehicle collisions combined. VTE is a major health problem with an annual incidence in the general population estimated at 1 per

1000 individuals worldwide (Othieno, Abu, & Okpo, 2007). In the United States, approximately 900,000 cases occur annually (Heit, Cohen & Anderson, 2005), with estimates for venous disease as high as two million people per year (Weitz, 2006). In the United States, 100,000 to 180,000 deaths occur per year (The Surgeon General Call to Action, 2008). The annual number of non-fatal deep venous thrombosis in the United States is 370,000, with 108,240 occurring in the primary and emergency department settings; the remainder of DVT occur in the acute care setting. The true incidence of disease in the United States may be unknown, as up to one-half of patients with DVT remain asymptomatic.

Economic Burden

The estimated total cost of diagnosis and treatment of VTE in the United States is $1.5 to $3.2 billion dollars per year. The direct medical costs of DVT and PE are large due to both initial hospitalization events and hospital readmissions. On a per-case basis, the median annualized direct medical costs during and after a DVT or PE event were $17,512 and $18,901 per patient, respectively (MacDougall, Feliu, Boccuzzi, & Lin, 2006, Groce, 2008). The economic burden of VTE is not just confined to the diagnosis and treatment of the initial event, but recurrent events as well. The economic impact of recurrent VTE is identified as $10,804 for a primary diagnosis of DVT (Passman, 2010). Data on the economic burden of VTE is limited, and may not include the cost of the disease to society at large. Some individuals with these disorders may be unable to remain productive members of the workforce. Employees may experience limitations based on their inability to stand for prolonged periods of time, they may miss work periodically for recurrence of symptoms, or they may not be able to work at all.

Care Initiatives

Several initiatives have facilitated the building of new knowledge, as well as, the translation of evidence into practice for VTE. In 2006, the United States Surgeon General convened a meeting of recognized experts for a workshop that resulted in the Surgeon General's Call to Action to Prevent Deep

Vein Thrombosis and Pulmonary Embolism. The Director of the National Heart, Lung and Blood Institutes concluded in the Call to Action, that in order to impact the incidence and burden of VTE, stakeholders need to increase public awareness, support the development of evidence-based practices and carry out the scientific research that would address the gaps in knowledge (Nable, 2008). In addition, the National Quality Forum (NQF) hosted a national Deep Vein Thrombosis Summit in 2006, to establish a patient-centered national action plan for DVT prevention, treatment and research. The Agency for Healthcare Research and Quality has ranked the provision of VTE treatment as one of the most important things that can be done to improve patient safety.

Emergency Department Population

Following Institutional Review Board approval, medical records provided a list of patients discharged in 2010 from an urban hospital seen in the ED and diagnosed with superficial or deep vein thrombosis of the lower extremity. Discharge from the hospital included discharge from the ED, discharge from the Clinical Decision Unit, or discharge from inpatient status. Of the 149 patients meeting this criteria, only 9 were directly discharged from the ED, and 8 from the Clinical Decision Unit. The small sample may reflect the trend towards presentation in the clinic setting. Treatment practices showed inconsistent management with low molecular weight heparin both in the department and prescription for home. Electronically generated discharge instructions include information on recommend activity and compression therapy, however, in only one record was it documented that the patient was discharged with elastic stockings. Variability in admission and treatment practices identified the need for an evidence based guideline.

Clinical Knowledge

Fundamental to any treatment plan is a comprehensive understanding of the disease process and current management. As research continues in the pathophysiology, predictive models, diagnosis

and treatment of VTE, providers turn to the literature to enhance and update their knowledge base to translate evidence into practice.

Venous Thrombosis

Venous thrombi are intravascular deposits consisting of platelets, red blood cells and fibrin. The accumulation of these clotting factors and platelets tend to occur in areas of low blood flow and areas of the vessel wall that are irregular or inflamed. Inflammation around the thrombus promotes further platelet aggregation and the thrombus propagates. Once established the thrombus may lyse spontaneously, become organized, persist as an obstruction, recanalize partially or extend more proximally. Spontaneous lysis occurs in about one third of cases. The remaining thrombi become organized and develop varying degrees of recanalization (Ansell, 2006).

Venous thrombosis may occur in any venous segment, but the clinical syndromes typically involve the low flow areas, for example, within valve cusp pockets in the veins of the lower extremities. Clots my also occur at sites of vascular trauma, as happens during surgery, or from intravascular foreign devices. Venous thrombi are more common than arterial thrombi because flow and pressure are lower in the veins than in the arteries (Brashers, 2010).

The pathogenesis of venous thrombosis usually represents an imbalance between prothrombotic and antithrombotic forces in the blood. Virchow is credited with identifying three prothrombotic factors: 1) venous stasis, for example, immobility, obesity, prolonged leg dependence, air travel, age, congestive heart failure 2) venous endothelial damage, for example, trauma, medications, procedures and 3) hypercoaguable states, for example, inherited disorders (Factor V Leiden, hyperhomocysteinemia, methylenetetrahydofolate reductase (MTHFR), antiphospholipid syndrome, tumor necrosis factor and endotoxins. Environmental or acquired risk factors contributing to a hypercoaguable state include malignancy, pregnancy, smoking, oral contraceptives and hormone

replacement. Virchow's triad continues to serve as the unifying concept in the development of VTE; however, what has become apparent is the significance of the interplay between the elements of Virchow's triad and environmental or acquired risk factors.

Thrombosis in the deep veins is termed deep venous thrombosis. There are five major named members of the deep venous system, three below and two above the knee. The three deep veins located below the knee are the anterior tibial vein, the posterior tibial vein, and the peroneal vein. Ultimately these deep veins join to become the large popliteal vein which courses proximally behind the knee and then passes anteromedially to the distal thigh. In the proximal thigh, the femoral vein (previously referred to as the superficial femoral vein) and the deep femoral vein join together to form the common femoral vein which passes upward above the groin crease to become the iliac vein. All venous blood is eventually received by the deep venous system on its way back to the right atrium of the heart.

Thrombus formation in the superficial veins is termed superficial thrombophlebitis. Superficial vein and deep vein thrombosis share the same pathophysiology, pathogenesis and risk factors. Often superficial vein thrombosis is the result of an inflammatory condition, with thrombosis being a secondary event. Superficial thrombosis in veins of the lower extremity often occurs in varicosities that have become inflamed or infected, however, there is a 4-20% incidence of concomitant DVT. Even more important is the fact that patients with superficial thrombophlebitis without varicose veins have a 40% chance of concomitant DVT, particularly true when the greater saphenous or lesser saphenous vein is involved (Ansell, 2006, Fronek, 2008).

Deep venous thrombosis is perhaps clinically more important than superficial venous thrombosis because of the potential for embolization. Proximal DVT result in pulmonary emboli in up to

50% of cases if carefully sought, although the majority of these cases are asymptomatic. Fatal PE is most likely to occur in the setting of proximal vein DVT.

Deep venous thrombosis may also occur in the upper extremity, it is becoming of increasing clinical concern due to the frequency of use of indwelling catheters. Upper extremity deep venous thrombosis occur in the axillary and subclavian veins. Because of the potential loss of vascular access and variation on treatment opinion, these patients require specialist consult and were not addressed in the treatment guideline.

Post Thrombotic Syndrome

In the acute phase of DVT, a fresh thrombus in the deep vein produces an obstruction. In the first few months following DVT, recanalization, a complex process of fibrinolysis, thrombus organization, and neovascularization (proliferation of blood vessels) occurs. This process can result in valve destruction. Damaged valves, insufficient closure and/or occlusion of the veins result in venous hypertension. It is postulated that this venous hypertension disturbs the normal flow in small capillaries, resulting in increased capillary filtration leading to ankle flare, edema caused by excessive fluid in the subcutaneous tissue in the lower leg, and a number of skin changes which include dermatitis, hardening of the skin giving it a red brown pigmentation accompanied by wasting of the subcutaneous fat (lipodermatosclersosis). Finally, this disturbed microcirculation may lead to a decrease of cutaneous oxygen concentration contributing to delayed healing after injury or spontaneous venous leg ulceration. These changes of lifelong limb pain, hyperpigmentation and edema are called chronic venous insufficiency, and when DVT is the source of this insufficiency, it is called postthrombotic syndrome (PTS).

In 20-50% of people with a DVT, post thrombotic syndrome occurs within 5 years. These symptoms are not static, but tend to fluctuate over time for many patients. Recurrent DVT in the same

leg is the strongest risk factor for development of PTS (Schulman & Ogren, 2006). About 3% of patients develop severe post thrombotic syndrome, including venous ulcers (Kahn et al., 2008, Anderson et al., 2007). Variables that predict worst thrombotic scores include greater severity of residual venous symptoms and signs one month after diagnosis of DVT, thrombosis of the common femoral or iliac vein, previous ipsilateral venous thrombosis, higher BMI, older age, and female gender (Kahn et al., 2008).

Diagnosis

Clinical features alone are nonspecific and cannot be relied upon for definitive diagnosis of DVT, only 15%-25% of patients with suspected DVT have objective evidence of thrombosis (Sutter, Turnipseed, Diercks, Samule, & White, 2007). Pain, redness, and warmth are common symptoms reported by patients, and swelling, tenderness to palpation, and erythema are common signs of DVT. These signs and symptoms can reflect other conditions that affect the lower extremities such as cellulitis, congestive heart failure or ruptured Baker's cyst. To help identify in whom diagnostic imaging can be safely avoided or deferred, investigators have studied patient populations with DVT in an effort to construct clinical decision tools to aid with diagnosis. The Wells Predictive Rules is an example of a clinical evaluation tool utilized to predict pretest probability of DVT. The Wells prediction rule, which includes clinical characteristics of physical exam and comorbid conditions, performs better in younger patients without comorbidities or a history of VTE than it does in other patients (Qassem et al., 2007). Courtney, et al. (2010) found the variables with the strongest associations with VTE were patient history of VTE, unilateral lower-leg swelling, recent surgery, estrogen use, oxygen saturation less than 95%, active cancer, and patient history of thrombophilia. Smoking, female gender and race were significantly predictive of not having venous thromboembolism, possibly explained by disproportionate enrollment of women and the function of over testing smokers.

Venography remains the gold standard for the diagnosis of DVT, but its use has diminished considerably with the development of reliable noninvasive techniques. Real time, B-mode compression ultrasonography (also known as compression ultrasound or duplex ultrasound) is currently the diagnostic model of choice for identifying DVT in patients with symptomatic proximal DVT (sensitivity 95%, specificity 96%), although the sensitivity does vary according to which venous segment is involved (Sutter, et al., 2007). Lower extremity ultrasound is not as sensitive for the detection of calf vein thrombosis; several medical societies recommend a follow up ultrasound on non-low risk patients at 5 to 7 days (McIlrath, 2005). Magnetic Resonance (MR) venography is also a sensitive means of detecting proximal venous thrombi but is not useful for distal (below knee) disease.

Blood tests are not used to confirm the diagnosis of DVT but establish the need for further studies. If clinical suspicion exists, high sensitivity, immunologic d-dimer assays are particularly sensitive for the presence of fibrin breakdown or degradation products, which makes this test particularly sensitive for the presence of intravascular thrombosis, the sensitivity approaches 95% (DeLoughery, 2008), but they have a low specificity for DVT. Therefore patients with a positive d-dimer assay require further testing to establish the presence of thrombosis. False positives can result from any fibrinolytic process, i.e. surgery, trauma, disseminated intravascular coagulation; false negatives may occur in patients on anticoagulants or those with longer duration of symptoms. A higher d-dimer level may correlate with larger clot burdens (Tapson, 2011).

Additional important diagnostics for the patient presenting with DVT include: complete blood count, comprehensive panel of chemistries, clotting factors (partial thromboplastin time and international normalized ratio). Patient's verbal report of hematuria and/or melena requires further testing with urinalysis and/or digital rectal exam respectively.

Guideline Development

The National Guidelines Clearinghouse has over 80 guidelines for the treatment of DVT. The most frequently cited guideline in the literature, is the Antithrombotic Therapy for Venous Thromboembolic Disease American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition), the "Chest" guidelines (Kearon, 2008). The scientific rigor of the Chest guidelines is found in the number of Grade 1A recommendations. It is frequently referenced when cases are brought to litigation.

The Chest guidelines were used to direct the clinical management portion of the guideline, inclusive of anticoagulation, compression therapy and activity. To make the model comprehensive social/financial issues, patient education, and outpatient follow-up became integral portions. Combining these key elements, resulted in the model illustrated in Figure 1.

Clinical Management

Anticoagulation.

***Deep venous thrombosis*.** Anticoagulant therapy is the standard of care in patients with DVT and has been shown to reduce the extension and recurrence of both symptomatic and asymptomatic proximal (involving the popliteal or more proximal veins) and calf DVT. Rapid initial anticoagulation is given to minimize the risk of thrombus extension and fatal pulmonary embolism, whereas extended anticoagulation is aimed at preventing recurrent VTE, and reduction of PTS. The only drugs currently approved for immediate anticoagulation in DVT are the parenteral agents, UFH, LMWH, fondaparinux. Vitamin K antagonists (warfarin) currently compose standard treatment protocols for extended therapy with new drugs in clinical trials. An immediate acting agent is initiated concurrently with the longer acting agent to allow therapeutic levels to be attained. The agents and duration for long term therapy are determined by individual patent circumstances.

***Superficial venous thrombosis*.** In the case of superficial vein thrombosis, where the affected venous segment is short in length or further from the saphenofemoral junction, it is reasonable to use oral or topical nonsteroidal anti-inflammatory drugs. Prophylactic or intermediate doses of low molecular weight heparin (LMWH) or intermediate doses of UFH are recommended for at least 4 weeks.

In patients without contraindication, e.g., renal failure, LMWH is the favored recommendation. Low molecular weight heparin has better subcutaneous bioavailability and a longer half life after subcutaneous injection than UFH. Because of its predictable anticoagulant response, the need for laboratory monitoring is not recommended and is therefore eliminated.

Whenever considering treatment with parenteral agents, heparin-induced thrombocytopenia (HIT) is of concern. Heparin induced thrombocytopenia is a non-hemorrhagic complication of UFH and LMWH therapy, manifesting typically with thrombocytopenia, and in many, with new thrombosis. Heparin induced thrombocytopenia occurs in about 1% of patients receiving UFH for treatment of venous thrombosis (Warkentin, 2007). Platelet count monitoring, commonly every 48 hours, is recommended for early detection of HIT in patients receiving UFH, but not recommended in patients with acute VTE treated with LMWH because of an extremely low incidence (Kearon, 2008). Fondaparinux is unlikely to cause HIT (Weitz, 2006).

***Vitamin K agonists*.** Due to their slow onset of action, oral vitamin K agonists must be overlapped with a parenteral anticoagulant for at least 5 days (bridge therapy). Initially, warfarin may exert a procoagulant effect by decreasing the anticoagulant proteins C and S more rapidly than the reduction in clotting factors. The desired antithrombotic effect of warfarin, takes 4 to 6 days to occur. The therapeutic dose of warfarin varies from patient to patient, reflecting, at least in part, differences in dietary vitamin K intake, genetic polymorphisms in the enzymes involved in warfarin metabolism and

administration of concomitant medications that suppress or potentiate the anticoagulant effects of warfarin (Weitz, 2006).

The goal of warfarin therapy is to achieve an INR of 2.5 (range 2.0 to 3.0), a protocol which reduces the risk of recurrent VTE by 90% as compared with placebo (Tran, McRae & Ginsberg, 2008). An INR of 3 to 4 is associated with more bleeding but no better efficacy, an INR of 1.5 to 1.9 is less effective at preventing recurrent VTE and is associated with similar rates of major bleeding as conventional therapy. Monitoring of INR is performed daily or every other day until the results are in the therapeutic range for at least 24 hours. With the advent of routine outpatient treatment of VTE, warfarin dosing regimens that require INR measurements on day 3 and 5 have proven safe (Kovacs et al., 2003).

Further monitoring is generally managed by specialized anticoagulation clinics with dedicated personnel. Other developing programs include the use of point-of-care monitors that allow patients to self-test and self-manage dose adjustments. The use of computerized programs is available to assist in dose adjustments and telephone based medical management. Home monitoring of warfarin therapy is feasible, accurate, and associated with a greater time in the therapeutic range.

***Duration of anticoagulation*.** Decisions related to duration of therapy are made during outpatient follow up. Many factors, such as location of thrombus, risk factors for thrombus, increased bleeding risk, the need for regular laboratory monitoring and dietary restrictions are involved in the decision for the appropriate duration of warfarin therapy, and the intensity of treatment, therefore, the decision to stop or prolong therapy must be individualized. Current evidence favors 4 weeks among patients with superficial thrombus, 3 to 6 months among patients with DVT secondary to transient risk factors and for at least 12 months among patients with a second episode of DVT. Proximal DVT are treated for a longer duration that distal DVT. While the appropriate duration of anticoagulation for idiopathic or recurrent DVT is not definitively known, there is evidence of substantial benefit from

extended duration therapy. Duration of anticoagulation based on genetic risk factors is undertaken on a case by case basis. In those with VTE in the presence of underlying cancer, therapeutic doses of LMWH are indicated long term (3 to 6 months).

New anticoagulant agents. Researchers are focusing on finding more selective anticoagulant agents that will inhibit only one factor in the coagulation cascade, for example, factor Xa or thrombin. Factor Xa inhibitors block thrombin generation, idraparinux, a new parenteral agent, is dosed once weekly. If given at the time of diagnosis, this would provide adequate parenteral anticoagulation while waiting for a therapeutic response from warfarin. Oral agents, rivaroxaban and apixaban, are advantageous in that their rapid onset of action with peak plasma levels achieved within two to four hours may obviate the need for parenteral anticoagulant for initial VTE management. The new oral thrombin inhibitors include dabigatran. Dabigatran has been approved for prevention of stroke or systemic embolism in patients with nonvalvular atrial fibrillation, and with a predictable anticoagulant effect, would require no periodic monitoring (Schulman & Ogren, 2009).

***Complications of anticoagulation*.** Bleeding is the most common side effect of anticoagulation therapy, whether administered parenterally or orally. Bleeding episodes are normally defined as major if they are intracranial, retroperitoneal, if they lead to hospitalization or transfusion, and if they are fatal. Major bleeding occurs in approximately 2% of patient treated with IV UFH (Tran et al., 2008) Treatment of the elderly patient with VTE is complicated by an age-associated increase in the risk of bleeding, the consequence of increased drug interactions, and the frequent coexistence of other diseases including renal insufficiency, malnutrition and vascular fragility

A safe rapidly-acting antidote to reverse the anticoagulant effect is required in a patient receiving anticoagulant therapy who presents with a major bleed. Protamine sulfate, which completely neutralizes the anticoagulant effects of UFH, and partially reverses those of LMWH, has no activity

against fondaparinux. Vitamin K is used to reverse warfarin. None of the newer agents has a specific antidote. The lack of an antidote is particularly problematic for idraparinux because of its 80 hour half-life.

Alternate treatments. In selected patients, not included in our guideline, with extensive proximal DVT, catheter-directed thrombolysis, systemic thrombolytic therapy, percutaneous venous thrombectomy and operative venous thrombectomy offer additional options for aggressive treatment. For patients with acute proximal DVT, if anticoagulant therapy is not possible because of the risk of bleeding, recommendations are made for placement of an inferior vena cava filter, until bleeding risk resolves and the patient can receive a conventional course of anticoagulant therapy.

Activity Recommendations

Providers have historically prescribed bedrest for VTE patients, fearing the progression of a new DVT, or the dislodgment of clot, resulting in a PE. Findings reported by the Registro Informatizado de la Enfermedad ThromboEmbolica (RIIETE) registry, validated earlier studies suggesting that bedrest has no influence on the risk of developing PE among patient with acute DVT of the lower limbs (Trujillo-Santos, et al., 2005). Randomized trials and observational studies show faster resolution of pain and swelling with early ambulation and leg compression compared with immobilization, and a similar incidence of new PE on lung scanning after 10 days of treatment (Kearon et al., 2008). Anderson, Overend, Godwin, Sealy and Sunderji (2009) found a lack of evidence that there was a significant difference between ambulation and bedrest for risk of developing a PE or development and progression of a new DVT. Early ambulation in preference to initial bedrest, when this is feasible, is recommended in the Chest guidelines.

Compression Therapy

A Cochrane review (Kolbach, Sandbrnk, Hamulyak, Prins, and Neumann, 2008) reported greater than 50% relative risk reduction in the incidence of post thrombotic syndrome among patients wearing compression stockings, whether over the counter stockings (low compression) or more expensive custom-fit stocking with a pressure of 30-40mmHg at the ankle. At nine days, no difference in PE or size of thrombus was found between thigh and knee high stockings. The Multicenter Advanced Study for a ThromboEmbolism Registry (MASTER) data indicated there is suboptimal prescription of elastic stockings, with 28% of patients not prescribed elastic stockings. Among the groups where therapy was suboptimal were elderly patients and those treated at home (Arpaia et al., 2009).

Although many view compression therapy as potentially harmless, it can lead to complications. Pressure sores may develop if the pressure is given at an extremely high level because it will reduce blood supply to the skin. Similarly, the application of moderate pressures to people with impaired arterial blood supply to the legs may result in exacerbation of arterial insufficiency.

Social/Financial Issues

Thirteen studies compared the outcomes of patients with VTE treated with low molecular weight heparin (LMWH) administered at home to the outcomes of those treated with unfractionated heparin (UFH) in the hospital. Inclusion criteria were strict; most studies excluded patients with previous VTE, thrombophilic conditions or significant comorbid illnesses, pregnant patients, and patients unlikely to adhere to outpatient therapy. Studies were carried out in settings with well developed patient education and home care support infrastructures. Rates of PE, major bleeding and death during follow-up were not different between treatment groups (Segal, Streiff, Hoffman, Thronton, and Bass, 2007). The Cochrane Database of Systematic Reviews (2007) on home versus in-patient treatment for DVT concluded that patients treated at home with LMWH are significantly less likely to have recurrence of VTE compared to their counterparts treated in the hospital with UFH or LMWH. Home-treated

patients had a lower mortality and are less likely to have major bleeding but were more likely to have minor bleeding than their hospital treated counterparts.

Outpatient management proved to be a cost-saving strategy, showing a cost reduction from 35%-56% (Backman et al., 2004, Boccalon, Elias, Chale, Cadene and Gabriel, 2000). Also identified as benefits of outpatient treatment are patient satisfaction and improved health-related quality of life. Over 97% were satisfied or very satisfied with treatment received in an outpatient program, and 94% said they would enroll again if future treatment was necessary (Zed, 2005).

Critical to determining the appropriateness of outpatient management is appropriate is the completion of a thorough history. Special considerations need to be considered on an individual basis, a history of previous VTE, upper extremity DVT, pregnancy, breastfeeding, obesity and cancer. Table 1 provides a list of exclusionary criteria that would preclude outpatient management.

Financial resources, insurance, Medicare/Medicaid or self-pay status need to be addressed. An assessment regarding the presence of a support system, potential lack of adherence or the patient's inability to learn administration of self-injections may influence decisions about inpatient or outpatient status. Institutional resources may need to be mobilized to assist with these issues. Inpatient case managers who discharge patients with a diagnosis of DVT, and hospital social service departments have experience with helping patients access medication through patient assistance programs and the organization's charitable foundations. Emergency Department personnel are often called upon to address some of these issues and offer creative solutions to make sure the treatment plan can be executed outside of "regular business hours."

Patient Education

The public has limited knowledge of DVT, how to recognize symptoms, the natural progression of the disease, treatment of the disease, complications of disease, and how to talk to their providers. Computer generated teaching sheets on the pathophysiology of DVT are easily printed for the patient. Patient teaching packets which address administration of injectable medications are provided by pharmaceutical suppliers. Patient education also includes dietary considerations for patients taking warfarin, appropriate activity levels, compression stockings and comfort measures. All patients discharged from the Emergency Department should repeat back to the discharge nurse, signs and symptoms of complications: chest pain, shortness of breath and bleeding.

After a first time VTE, the risk of recurrence over the next 8 years is 30% (Schulman & Ogren, 2006). Baglin, Luddington, Brown and Baglin (2003) suggested that risk factors should be classified in three groups: temporary, idiopathic (not identified) and non-removable. In these groups the recurrence incidence was reported as 4.3%, 11.7% and 23.7% respectively, after 2.4 years of follow up. Patients who initially present with symptomatic PE rather than symptomatic DVT have a higher risk or recurrence. Although the genetic risk factors increase the likelihood of an initial VTE, they have little impact on the risk of recurrent VTE (Goldhaber, 2010, Kahn et al., 2008).

Risk factors, obesity, hypertension, diabetes mellitus, smoking, hypercholesterolemia are associated with arterial and venous thrombosis (Ageno, Becanttini, Brigton, Selby, and Kamphuisen, 2008, Stein, Beemath and Olson, 2005).Many of the VTE risk factors might be modifiable by adopting a heart healthy life style. Oral contraceptives that combine an estrogen and a progestin, along with post menopausal estrogen replacement therapy are associated with increased VTE risk (Spencer, Lessard, Emery, Reed and Goldber, 2007) and should be discontinued, leading to a discussion of alternate birth control forms. Thrombophilia workups and duration of anticoagulation with respect to risk factors are addressed on an individual basis.

Follow-up post discharge

Plans need to be made for the patient after discharge. If a patient has established primary care, provider to provider communication ensures office follow up. Lab (INR) is arranged in accordance with the primary provider in 2 days at the office or anticoagulation clinic. Patients who are not part of a health system require staff to assist with arrangement for follow up.

Implications in Practice

Prior to implementing a guideline into practice, it is necessary to determine that it is comprehensive, and that it can be easily applied in the clinical setting. Multidisciplinary groups consisting of physicians, nurse practitioners, registered nurses, case managers, utilization review, social services and clinical pharmacists met to apply the proposed guideline to hypothetical case scenarios. Revisions were made to the guideline based on the expertise of the various disciplines. As suggested in the literature, these simulations allow health care practitioners to safely acquire skills and experience they need in the clinical setting without putting patients at risk.

Guidelines must be communicated to practitioners and easily available for their utilization. Presentations at departmental meetings validate the work and it is reflected officially in the recording of minutes. Paper communication through a note book in the department facilitates rapid implementation and allows updates without the need for information technology personnel. As time permits, converting paper formats to electronic data bases would increase efficiency and promote computerized provider order entry.

Monthly lists of all patients presenting to the Emergency Department having a positive study for deep or superficial venous thrombosis are generated and allow for reviewing the care of specific patients and practitioners. Over time, this data can then be reviewed in aggregate to identify

meaningful trends. As care trends to outpatient and primary care settings, guidelines such as the ones instituted in the ED would be appropriate to share with providers in the clinic setting.

Conclusion

The level of awareness brought forth by major initiatives, along with the economic burden associated with acute and long term treatment of VTE, has resulted in extensive work creating multiple risk assessment scales and guidelines for treatment.

Guidelines incorporate data obtained from a review of the literature available at the time of publication. Revisions to the guidelines are based on monitoring of the current research and recommendations of professional societies. Paramount in applying guidelines into practice is the process of individualizing them to meet the needs of unique patient situations, as well as the needs of the institutions where they seek care.

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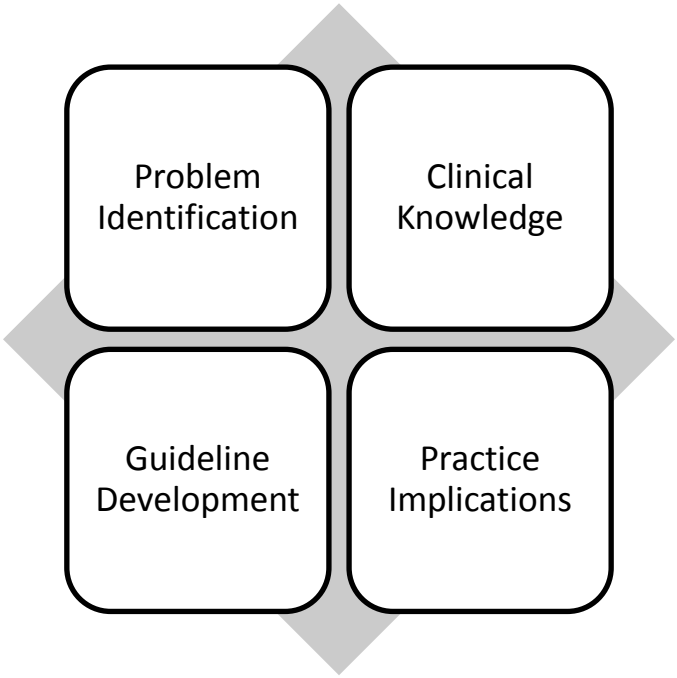

Figure 1. Components of Guideline Development

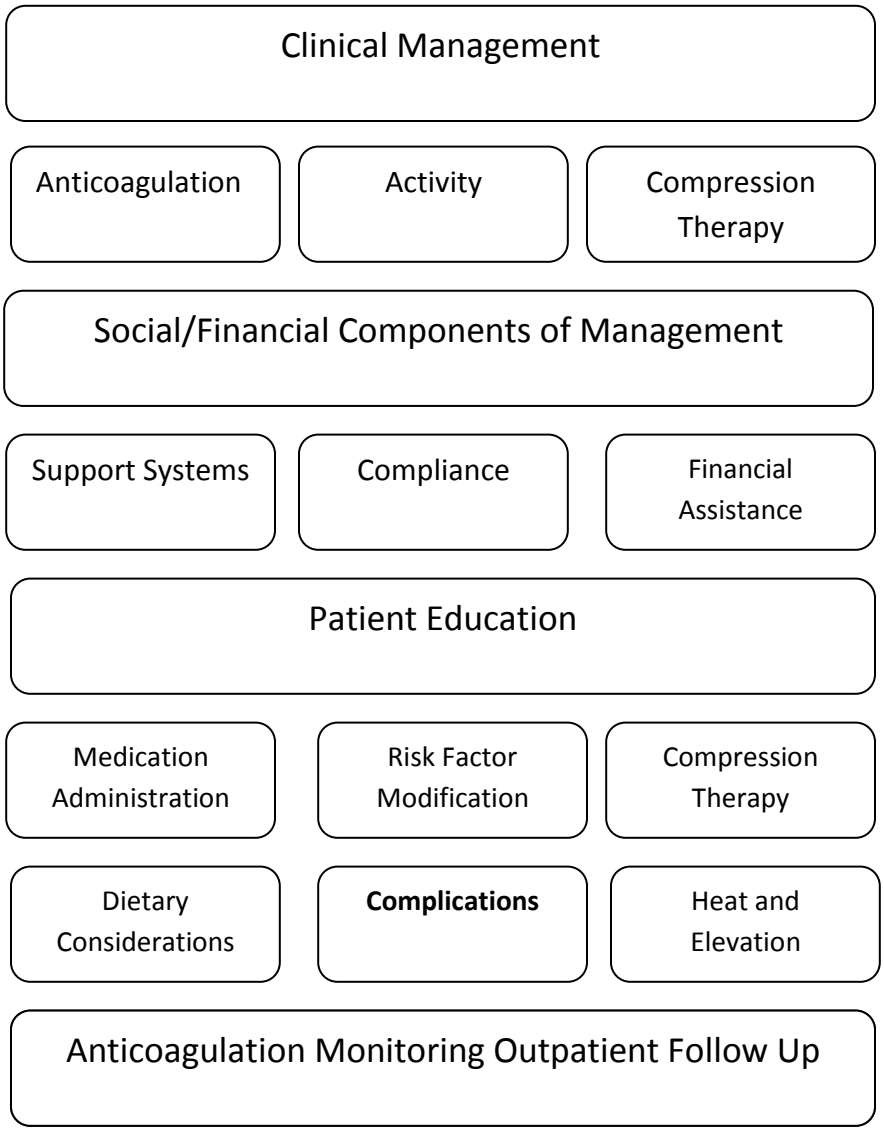

Figure 2. Components of DVT Guideline

Table 1. Exclusionary Criteria for Outpatient Management

Large clot burden, extensive iliofemoral thrombosis, history of DVT, upper extremity DVT
Signs or symptoms of pulmonary embolus
Currently on anticoagulant or antiplatelet medication
Allergy to UFH, LMWH, warfarin or history of HIT
Severe renal impairment, creatinine clearance of <30ml/min
High risk for bleeding or active bleeding
Recent major abdominal surgery
Neurosurgery, ocular surgery, intracranial bleeding within past 10 days
Gastrointestinal or genitourinary bleeding within past 4 days
Hemorrhagic stroke within past 6 weeks
Hemoglobin <10mg/dl, platelets <100,000mm3
Co-morbid conditions requiring inpatient hospital care: endocarditis, severe hypertension, recent major trauma, chronic obstructive pulmonary disease, congestive heart failure

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