Venous thromboembolism (VTE) may complicate the course of acute medical diseases in hospitalized patients. A number of studies have identified medical patient groups at increased risk for VTE, including patients with congestive heart failure, respiratory insufficiency, infectious or inflammatory diseases, or neurologic disorders. In the absence of thromboprophylaxis, the overall incidence of VTE in these patients may be as high as about 20%. At least 3 large, randomized controlled trials comparing low molecular weight heparins and fondaparinux with placebo have shown a significant reduction in the incidence of VTE when pharmacologic prophylaxis was administered. A subsequent meta-analysis of these and smaller trials has demonstrated that thromboprophylaxis in medical patients significantly reduces the incidence of symptomatic events and of pulmonary embolism-related mortality. Based on these findings, clinical guidelines recommend the use of thromboprophylaxis in medical patients at increased risk of VTE. Observational studies have shown that about 40% of patients admitted to medical departments are eligible for this treatment. The optimal duration of prophylaxis is less established; guidelines currently recommend a maximum of 14 days, but some patients with persistent immobilization may benefit from longer treatment. The EXCLAIM study was the first study to compare extended-duration, out-of-hospital VTE prophylaxis with low molecular weight heparin with the currently recommended standard in acutely ill medical patients. Extended prophylaxis significantly reduced the incidence of VTE, including symptomatic VTE, but at the cost of a significant increase in the incidence of major bleeding. The results of the EXCLAIM study have stressed the need for a more accurate stratification of medical patients, both for the risk of VTE and bleeding. In medical patients, the risk of VTE is determined by the concomitant presence of immobilization, acute illness leading to hospitalization, and patient specific risk factors. The definition of immobilization remains particularly controversial and ranges from total bed rest to limited mobility (e.g. bathroom privileges). Up to two thirds of patients have concomitant risk factors, each possibly playing a role in determining the individual risk of VTE. On the other hand, up to half of patients admitted to medical wards have moderate to severe renal insufficiency, and the majority receive multiple concomitant therapies, therefore increasing the risk of bleeding. The problem of extended prophylaxis remains open, since observational studies have reported a non negligible incidence of symptomatic VTE in rehabilitation facilities of 2.4%. Clinical trials evaluating new oral anticoagulant drugs for the prevention of VTE in medical patients may further contribute to this issue. In particular, a clinical trial evaluating rivaroxaban for the prevention of VTE in high risk medical patients, the MAGELLAN study, has been recently completed and the results are expected to be presented at the next American College of Cardiology meeting. In MAGELLAN, a double blind, double dummy study, patients were randomized to receive rivaroxaban administered at the dose of 10 mg od for 35 +/- 4 days or enoxaparin 40 mg od for 10 +/- days.

Anticoagulation therapy for the prevention of venous thromboembolic events is indicated in patients after major orthopaedic surgery and in hospitalised acutely ill medical patients, who have a high or moderate risk of venous thromboembolism (VTE), respectively. Clinical trials have clearly demonstrated that short-term anticoagulation reduces the risk of VTE in these patient groups and that longer-term anticoagulation is beneficial for some indications. Evidence-based guidelines for thromboprophylaxis have been developed based on these studies. However, despite these guidelines, thromboprophylaxis is still underused, or used suboptimally, in many patients. This is, in part, because of the limitations of traditional anticoagulants such as unfractionated heparin, low-molecular-weight heparin, synthetic pentasaccharides, and vitamin K antagonists. Newer oral anticoagulants, such as rivaroxaban, apixaban, and dabigatran etexilate, have certain advantages over traditional agents. They can be administered orally at a fixed dose without routine coagulation monitoring and have minimal food and drug interactions. These characteristics may result in better adherence to guidelines and improved patient outcomes. This review provides an overview of phase III clinical trial data for these newer anticoagulants in major orthopaedic surgery and in hospitalised acutely ill medical patients, and discusses their potential for extended use in the post-hospital discharge setting. All three newer oral anticoagulants are approved in many countries for the prevention of VTE after hip replacement or knee replacement surgery in adult patients, and it is likely that these drugs will contribute considerably towards reducing the substantial healthcare burden associated with VTE.


OBJECTIVE: To summarize and review current medical literature regarding the efficacy and safety of antithrombotic therapy for primary venous thromboembolism (VTE) prophylaxis in various ambulatory cancer populations. DATA SOURCES: A literature search was conducted in PubMed (1966-September 2012) and International Pharmaceutical Abstracts (1970-September 2012) using the terms venous thromboembolism, primary prophylaxis, anticoagulation, antithrombotic agents, cancer, and ambulatory. The bibliographies of pertinent studies and topic articles were reviewed for additional references. STUDY SELECTION AND DATA EXTRACTION: All English-language articles were evaluated for inclusion. All randomized trials were included in the review. DATA SYNTHESIS: Malignancy has been identified as a major independent risk factor for the development of VTE in the surgical, medically ill, and ambulatory populations. Primary VTE prophylaxis has been identified as an area of great impact in cancer patients because of the difficulties associated with the treatment of VTE and the greater risk for its recurrence in this population. Although primary VTE prophylaxis is recommended in all surgical and hospitalized cancer patients without contraindications to anticoagulants, its role in ambulatory cancer patients is less certain because of varying patient, cancer, and treatment-related factors. Fourteen randomized studies have investigated the use of antithrombotic agents for primary VTE prophylaxis in ambulatory cancer patients. Strong evidence for primary prophylaxis exists for several populations with advanced or metastatic cancer considered to be at high risk, including those with pancreatic cancer, lung cancer, or multiple myeloma. Evidence is inconsistent or lacking for lower risk cancer populations, such as those with breast cancer, or for those with malignant glioma, which carries a high risk for VTE and bleeding relative to the general ambulatory cancer population. CONCLUSIONS: Use of antithrombotic agents has reduced the rate of primary VTE, with minimal increases in bleeding risk in specific ambulatory cancer populations. Further investigation is needed to guide and narrow recommendations for primary VTE prophylaxis in ambulatory cancer patients. © 1967-2013 Harvey Whitney Books Co. All rights reserved.

Introduction: Venous thromboembolism (VTE) is a common and potentially avoidable cause of morbidity and mortality in patients hospitalized for acute medical illness. Objective: Our objective was to conduct a systematic review of studies that assessed the efficacy and safety of new oral anticoagulant (OAC) drugs versus standard pharmacological drugs and/or placebo in prevention of VTE in acute medically ill patients. Methods: PubMed.org and ClinicalTrials.gov databases were searched to identify studies that evaluated the efficacy and safety of a new OAC versus the standard pharmacological treatment and/or placebo in the prevention of VTE in medically ill patients. Relative risks (RR), weighted means and 95% CIs were calculated. Statistical heterogeneity was evaluated using Chi2 and I2 statistics. Two studies were included in the meta-analysis. The primary outcome in both studies was the composite of VTE-related death, symptomatic non-fatal pulmonary embolism (PE), symptomatic deep venous thrombosis (DVT) and asymptomatic proximal DVT. Both studies compared a factor (F)Xa inhibitor with enoxaparin in standard short-term thromboprophylaxis followed by a period where the FXa inhibitor was compared with placebo as prolonged thromboprophylaxis in medically ill patients. The primary major safety outcome in both studies was a composite of treatment-related major bleeding and clinically relevant non-major bleeding. A total of 14 629 patients were randomized. Results: Compared with subjects treated with enoxaparin followed by placebo, the RR of the primary outcome during the prolonged treatment period was 0.79 (95% CI 0.66, 0.94), the RR for the primary outcome during the first short-term treatment period was 1.03 (95%CI 0.81, 1.31). For major bleeding during the prolonged treatment period, the RR was 2.69 (95% CI 1.65, 4.39) for patients treated with an FXa inhibitor compared with enoxaparin/ placebo. For major bleeding during the shorter treatment period, the RR was 2.01 (95% CI 1.10, 3.65) in favour of enoxaparin. Conclusion: In acute medically ill patients, prolonged thromboprophylaxis with an oral FXa inhibitor is more protective than regular short-term treatment with enoxaparin. However, treatment with FXa inhibitors is significantly associated with major bleeding, both in long- and short-term treatment compared with enoxaparin. © 2012 Springer International Publishing AG. All rights reserved.


OBJECTIVE: Venous thromboembolism prevention during critical illness is a widely used quality metric. The objective of this systematic review was to systematically review the efficacy and safety of heparin thromboprophylaxis in medical-surgical patients in the ICU.

DATA SOURCES: We searched EMBASE, MEDLINE, the Cochrane Controlled Trials Register, Clinicaltrials.gov, and personal files through May 2012.

STUDY SELECTION: Randomized trials in adult medical-surgical ICU patients comparing any heparin (unfractionated heparin or low-molecular-weight heparin) with each other or no anticoagulant prophylaxis, evaluating deep vein thrombosis, pulmonary embolism, major bleeding, or mortality.

DATA EXTRACTION: Independently, in duplicate, we abstracted trial characteristics, outcomes, and risk of bias.

DATA SYNTHESIS: Seven trials involved 7,226 patients. Any heparin thromboprophylaxis compared with placebo reduced rates of deep vein thrombosis (pooled risk ratio, 0.51 [95% CI, 0.41, 0.63]; p<0.0001; I=77%) and pulmonary embolism (risk ratio, 0.52 [95% CI, 0.28, 0.97]; p=0.04; I=0%) but not asymptomatic deep vein thrombosis (risk ratio, 0.86 [95% CI, 0.59, 1.25]; p=0.43). Major bleeding (risk ratio, 0.82 [95% CI, 0.56, 1.21]; p=0.32; I=50%) and mortality (risk ratio, 0.89 [95% CI, 0.78, 1.02]; p=0.09; I=0%) rates were similar. Compared with unfractionated heparin, low-molecular-weight heparin reduced rates of pulmonary embolism (risk ratio, 0.62 [95% CI, 0.39, 1.00]; p=0.05;
I=53%) and symptomatic pulmonary embolism (risk ratio, 0.58 [95% CI, 0.34, 0.97]; p=0.04) but not deep vein thrombosis (risk ratio, 0.90 [95% CI, 0.74, 1.08]; p=0.26; I=0%), symptomatic deep vein thrombosis (risk ratio, 0.87 [95% CI, 0.60, 1.25]; p=0.44; I=0%), major bleeding (risk ratio, 0.97 [95% CI, 0.75, 1.26]; p=0.83; I=0%), or mortality (risk ratio, 0.93 [95% CI, 0.82, 1.04]; p=0.20; I=31%).

CONCLUSIONS: Trial evidence to date suggests that any type of heparin thromboprophylaxis decreases deep vein thrombosis and pulmonary embolism in medical-surgical critically ill patients, and low-molecular-weight heparin compared with bid unfractionated heparin decreases pulmonary embolism and symptomatic pulmonary embolism. Major bleeding and mortality rates do not appear to be significantly influenced by heparin thromboprophylaxis in the ICU setting. Trial methodology, indirectness, and the heterogeneity and imprecision of some results temper inferences from this literature.


Objective: To identify processes that may help hospitals and health care professionals optimize current venous thromboembolism (VTE) prophylaxis practices. Methods: Review of the literature. Results: Consistent with other sectors of society, the application of business models and improvement tools, such as PDCA (Plan, Do, Check, Act), Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control), root cause analysis, and Corrective Actions Programs may help direct quality improvement processes for VTE prevention in individual hospitals or institutions. Several real-world examples are described using these quality improvement process models for identifying and implementing active VTE prevention strategies, such as computer-based clinical decision support systems, risk assessment forms, and educational interventions. Conclusion: Each hospital should undergo a process of quality improvement to identify needs for optimizing VTE prevention, and to select a strategy that is most appropriate for their local needs. Despite the clear gap between current practice and guidelinerecommended practice, substantial improvements in VTE prevention can be made.


Venous thromboembolism (VTE) carries significant morbidity and mortality and affects a large portion of hospitalized patients. VTE prophylaxis is rated by the Agency for Healthcare Research and Quality as the most effective of 79 patient safety practices it assessed in 2001. Since 1997, Blue Cross Blue Shield of Michigan/Blue Care Network (BCBSM/BCN) have partnered with Michigan hospitals and providers in statewide registry-based collaborative quality improvement initiatives (CQI) aimed at improving the safety and quality of surgical and medical care; many of these collaborative have a particular focus on VTE prevention. The CQIs are uniquely structured to catalyze hospitals and practitioners to become self-optimizing. In this review, we describe the model BCBSM/BCN and participating Michigan hospitals have developed to improve the prevention and diagnosis of VTE for patients in the state of Michigan.


Background: Increased risk of deep vein thrombosis (DVT) and pulmonary embolism (PE) following major orthopedic surgery (MOS) is well described in the literature. In order to reduce this risk, ACCP guidelines for thromboprophylaxis include recommendations for these patients. Currently, there is a gap between clinical practice and the implementation of these recommendations. Aims: The aim of this study is to identify and compare the global adherence to the last 4 editions of ACCP guidelines (6th, 7th, 8th and 9th ed.) for thromboprophylaxis after MOS. Methods: A systematic review of literature was performed following PRISMA methodology. Ovid, PubMed and Embase databases were used. Studies reporting adherence to ACCP guidelines for thromboprophylaxis after MOS during the last 10 years were included. Primary outcomes were: adherence to ACCP guidelines for global, in-patient and post-discharge thromboprophylaxis. Proportions of adherence were calculated for each outcome. Results: Of 3993 titles identified, a total of 14 studies reporting adherence to the 6th, 7th or 8th editions of ACCP guidelines were included. No studies evaluating the 9th ed. were found. The global adherence to the recommendations for MOS was 54.3%. Adherence to in-hospital and post-discharge thromboprophylaxis was 90.1% and 66.72%, respectively. The 6th edition showed the highest rate of adherence (59.58%). During the last 10 years, a statistically significant (P < 0.005) reduction in the rates of compliance was found Conclusion: We observed a significant decrease in the rates of adherence to the recommendations when comparing 2001 (6th) and 2008 (8th) editions. As adherence to post-discharge thromboprophylaxis is significantly lower, further efforts are required to increase this rate and reduce the risk of DVT and PE. Reasons that could explain these results are discussed.


Purpose: To compare benefits and harms of low molecular weight heparin (LMWH) versus unfractionated heparin (UFH) as thromboprophylaxis in intensive care unit (ICU) patients. Methods: We conducted a systematic review with meta-analysis and trial sequential analysis (TSA) of randomised controlled trials (RCTs) comparing LMWH with UFH as thromboprophylaxis in adult ICU patients. We searched Ovid Medline, PubMed, Embase, Cochrane Library, UpToDate, Guidelines International Network, PROSPERO and the metaRegister of Controlled Trials through 3 December 2014. Random effects risk ratios (RR) and 95 % confidence intervals (CI) were derived for the endpoints deep vein thrombosis (DVT), pulmonary embolism (PE), major bleeding, mortality and net clinical benefit (any DVT, any PE, major bleeding and/or mortality). Results: Eight RCTs (5567 patients) were included, whereof two were considered to have overall low risk of bias. Pooled
analyses showed that LMWH compared with UFH reduced the risk of any DVT (RR 0.84, 95 % CI 0.71-0.98, p = 0.03) and resulted in a net clinical benefit (RR 0.90, 95 % CI 0.83-0.97, p = 0.01). There was no statistically significant difference in the risk of any PE (RR 0.65, 95 % CI 0.41-1.03, p = 0.06), major bleeding (RR 0.99, 95 % CI 0.77-1.28, p = 0.96) or mortality (RR 0.93, 95 % CI 0.78-1.12, p = 0.43). TSA supported the results of the conventional analysis on the outcome net clinical benefit but not on risk of any DVT. Conclusions: Evidence from this systematic review revealed a beneficial effect of LMWH compared with UFH when used as thromboprophylaxis in ICU patients.


Efficacy of clinical guidelines to improve patient care is highly dependent on the ability of hospital teams to interpret and implement advised standards of care. Trimester and bi-annual rotation changes often see transference and loss of acquired experience and knowledge from wards with ensuing shortfalls in patient safety and care quality. Such shortfalls were noticed in the ability of our unit to adhere to national venous thromboembolism (VTE) prophylaxis measures. A prospective quality improvement audit was embarked upon to address this. An initial audit of VTE prophylaxis in 112 patients demonstrated just 71% compliance with suggested measures. Errors were predominantly medical in origin and secondary to poor understanding, interpretation, and knowledge of VTE guidelines. Errors were also noted in nursing and patient compliance to measures. Repeated re-auditing demonstrated increased error (following initial improvement post audit) after periods of medical staff rotation. Through education of junior medical and nursing staff, and of patients, the unit was able to achieve 100% compliance. Rota changes often induce conflict of interest between maintaining adequate services and high levels of patient care or providing suitable and informed induction programmes for new medical staff. Emphasised education of VTE prophylaxis guidelines has now become part of induction of junior medical staff, whilst ward based measures ensure daily compliance. The success of the audit strategy has led to its use throughout other surgical units within the hospital.


There is a gap between knowledge and recommendations regarding venous thromboembolism (VTE) on the one hand and daily practice on the other. This fact has prompted a Swiss multidisciplinary group consisting of angiologists, haematologists, internists, and emergency medicine and pharmaceutical medicine specialists interested in VTE, the SAMEX group, to set up a series of surveys and studies that give useful insight into the situation in our country. Their projects encompassed prophylactic and therapeutic aspects of VTE, and enrolled over 7000 patients from five academic and 45 non-academic acute care hospitals and fifty-three private practices in Switzerland. This comprehensive Swiss Clinical Study Programme forms the largest database surveying current clinical patterns of VTE management in a representative sample of the Swiss patient population. Overall the programme shows a lack of thromboprophylaxis use in hospitalised at-risk medical patients, particularly in those with cancer, acute heart or respiratory failure and the elderly, as well as under-prescription of extended prophylaxis beyond hospital discharge in patients undergoing major cancer surgery. In regard to VTE treatment, planning of anticoagulation duration, administration of LMWH for cancer-associated thrombosis, and the use of compression therapy for prevention of post-thrombotic syndrome in patients with symptomatic proximal DVT require improvement. In conclusion, this programme highlights insufficient awareness of venous thromboembolic disease in Switzerland, underestimation of its burden and inconsistent application of international consensus statement guidelines regarding prophylaxis and treatment adopted by the Swiss Expert Group.

In the last decade, greater focus has been directed toward venous thromboembolism (VTE) prophylaxis in hospitalized, non-surgical patients. Both deep venous thrombosis and pulmonary embolism are potentially preventable causes of patient morbidity and mortality related to hospitalization. Despite the availability of high-quality, evidence-based guidelines for VTE prevention, there is compelling evidence that many hospitalized patients do not receive appropriate VTE prevention measures. Hospitalists play an important role in the implementation of appropriate VTE prophylaxis measures for this patient population; thus, knowledge of updated recommendations is vital to their practice, as well as patient safety. We provide a comprehensive evidence-based clinical review of VTE prophylaxis for nonsurgical hospitalized patients, including risk factors and risk assessment, indications for prophylaxis, recommended therapeutic options, and updates from recently released practice guidelines by the American College of Physicians and the American College of Chest Physicians, published in 2011 and 2012, respectively.


Venous thromboembolism (VTE) remains the most common preventable cause of death in hospitalized patients. There is much evidence to show the efficacy of prophylactic strategies to prevent VTE in at-risk hospitalized patients. For example, pharmacological prophylaxis reduces the risk of pulmonary embolism by 75% in general surgical patients and by 57% in medical patients. Thus international guidelines strongly recommend effective preventive strategies for all hospitalized patients defined as moderate to high risk for VTE. Effective pharmacological thromboprophylaxis includes low-dose unfractionated heparin (UFH), low molecular weight heparin (LMWH), fondaparinux, and warfarin. Mechanical prophylaxis with graduated compression stockings and intermittent pneumatic compression is also recommended as an alternative or in combination with pharmacological prophylaxis. Although the volume of evidence supporting the use of thromboprophylaxis is growing, the number of patients receiving a adequate prophylaxis is not. Several studies have shown that nearly half of the patients undergoing major surgery or hospitalized for medical illnesses do not receive appropriate antithrombotic prophylaxis. Reducing the discrepancy between evidence-based recommendations and clinical practice seems to be a cost-effective goal. Developing and promoting local protocols and educational activities to encourage prophylaxis in daily clinical practice may be effective. New oral anticoagulant drugs with potentially favorable pharmacokinetic and pharmacodynamic characteristics have been developed. After the positive results of phase 3 clinical trials, some of these drugs have been approved for clinical use in the prevention of VTE in the high-risk setting of major orthopedic surgery. These agents include the direct thrombin inhibitor dabigatran etexilate and the direct factor Xa inhibitors rivaroxaban and apixaban. Copyright Thieme Medical Publishers 333 Seventh Avenue, New York, NY 10001, USA.


Acutely ill medical patients may be at increased risk of venous thromboembolism, both during hospitalization and after discharge. International guidelines recommend thromboprophylaxis for high-risk medical patients with low bleeding risk for a maximum of 14 days. There are two approaches to identify the high-risk patient: adhering to the inclusion criteria used in randomized clinical trials or using risk assessment models. With both approaches, about 40% of medical
inpatients should result at increased risk of venous thrombosis. However, in the real world, medical inpatients are more fragile than patients enrolled in clinical trials, and thus also require a careful assessment of the individual bleeding risk. The complex balance between risks and benefits of thromboprophylaxis has become particularly relevant in studies assessing extended prophylaxis beyond hospitalization in this setting. In the present review, we will summarize the most recent evidence on this topic.

192
Bradley A. Unseen but present danger: improving the safe prescribing of anti-embolism stockings (AES). BMJ Quality Improvement Reports. 2014;3(1)
A strong evidence base exists supporting thromboprophylaxis for venous thromboembolism (VTE) in surgical patients. Given the ageing population, obesity epidemic, and rise in type 2 diabetes, VTE and peripheral vascular disease (PAD) are likely to become an escalating problem. PAD is a contraindication to the use of anti-embolism stockings (AES). Half of those patients diagnosed with PAD report no symptoms, potentially underestimating its prevalence. Implementation of guidelines for thromboprophylaxis, including the safe prescribing of AES, is therefore imperative. The aims of this project were to establish whether thromboprophylaxis was being prescribed correctly, and appropriately, to all surgical inpatients. This included documented evidence that peripheral pulses had been examined—and, in the case of diabetic patients, that there was documentation of full peripheral neurovascular examination—before AES were prescribed. Data were collected from case notes of all surgical inpatients. Foundation year 1 doctors (FY1s) completed a questionnaire assessing their knowledge of local guidelines. Teaching sessions and posters summarising local guidelines were delivered to FY1s. Appropriate pharmacological prescribing improved from 57.69% to 100%. AES were appropriately prescribed for 65.38% of patients. Post intervention this increased to 79.17%. 0% had documented peripheral neurovascular examination. This increased to 50% post intervention.

47
Health-care organizations need to develop a strategy to ensure that all hospitalized patients receive appropriate thromboprophylaxis. This review describes an evidence-based model which could improve service delivery, meet national targets, save money and reduce the incidence of hospital-acquired venous thromboembolism.

84
We sought to assess the comparative effectiveness and safety of pharmacologic and mechanical strategies to prevent venous thromboembolism (VTE) in patients undergoing bariatric surgery. We searched (through August 2012) for primary studies that had at least 2 different interventions. Of 30902 citations, we identified 8 studies of pharmacologic strategies and 5 studies of filter placement. No studies randomized patients to receive different interventions. One study suggested that low-molecular-weight heparin is more efficacious than unfractionated heparin in preventing VTE (0.25% vs 0.68%, P < .001), with no significant difference in bleeding. One study suggested that prolonged therapy (after discharge) with enoxaparin sodium may prevent VTE better than inpatient treatment only. There was insufficient evidence supporting the hypothesis that filters reduce the risk of pulmonary embolism, with a point estimate suggesting increased rates with filters (pooled relative risk [RR], 1.21 95% CI, 0.57-2.56). There was low-grade evidence that filters are associated with
higher mortality (pooled RR, 4.30 95% CI, 1.60-11.54) and higher deep vein thrombosis rates (2.94 1.35-6.38). There was insufficient evidence to support that augmented subcutaneous enoxaparin doses (>40 mg daily or 30 mg twice daily) are more efficacious than standard dosing, with a trend toward increased bleeding. Of note, for both filters and augmented pharmacologic dosing strategies, patients at highest risk for VTE were more likely to receive more intensive interventions, limiting our ability to attribute outcomes to prophylactic strategies used. © 2013 American Medical Association.

33
PURPOSE: The use of anticoagulants for the prevention of venous thromboembolism (VTE) in hospitalized medical and surgical oncology patients is discussed.
SUMMARY: Hospitalized patients are often at risk for developing VTE, and risk is increased in patients who have cancer. Moreover, the incidence of VTE appears to be rising in hospitalized cancer patients, who have a 2.2-fold increased risk of mortality with a VTE compared with similar patients without VTE. The literature indicates that these patients are often inadequately anticoagulated, despite strong recommendations for prophylaxis. Although there are few studies that specifically address VTE prophylaxis in cancer patients, there are several large trials that have examined data in cancer subgroups. The trials have directly compared low-molecular-weight heparin (LMWH) with placebo, unfractionated heparin with LMWH, factor Xa inhibitor (fondaparinux) with placebo, and fondaparinux with LMWH. Three important guidelines provide current recommendations for VTE prophylaxis; the American Society of Clinical Oncology (ASCO), the National Comprehensive Cancer Network (NCCN), and the American College of Chest Physicians (ACCP) recommend unfractionated heparin, LMWH, or fondaparinux for VTE prophylaxis when there are no contraindications. Pharmacists can play an essential role in ensuring that VTE prophylaxis is appropriate for individual patients. Interventions to improve compliance with guidelines are particularly important now due to financial incentives from quality-focused organizations whose mandate is to decrease preventable mortality events in hospitals.
CONCLUSION: Hospitalized patients with cancer often do not receive appropriate thromboprophylaxis. Guidelines from ASCO, ACCP, and NCCN recommend unfractionated heparin, an LMWH, or fondaparinux for VTE prophylaxis when there are no contraindications to such therapy.

77
Venous thromboembolism (VTE) is a frequent cause of morbidity and mortality for hospitalized patients. About 25% of all VTE are directly related to hospitalization and 50-75% of hospital-acquired VTE occurs in patients admitted into medical wards. Admission into an internal medicine ward for an acute illness increases the risk of VTE by about 8-fold compared to the general population. A meta-analysis of nine randomized trials including 19,958 patients of internal medicine departments showed that anticoagulant prophylaxis with low molecular weight heparins (LMWH) reduces both morbidity and mortality for VTE (RR 0.43, 95% CI 0.26-0.71, absolute risk reduction 0.29% for incidence of VTE), (RR 0.38, 95% CI 0.21-0.69, absolute risk reduction 0.25% for fatal pulmonary embolism, PE) and symptomatic deep vein thrombosis (DVT, RR 0.47, 95% CI 0.22-1.00), with no significant increase in the frequency of major bleeding compared to placebo (RR 1.32, 95% CI 0.73-2.37). The critical and controversial aspects of the relationship between reduction of VTE risk and increase in bleeding events were further investigated by more recent meta-analyses. A paper published in 2009 has analyzed data from 14 randomized trials conducted by June 2008. Compared with placebo or with no treatment, prophylaxis with heparin significantly reduces the risk of all DVT (RR 0.55, 95% CI 0.36-0.92), of proximal DVT (RR 0.46, 95% CI 0.31-0.69), and PE (RR 0.70, 95% CI
0.53-0.93), increasing the risk of any bleeding event (RR = 1.54, 95% CI 1.15 to 2.06), but not of major bleedings. The problem, therefore, is to stratify properly the risk of thrombosis in medical patients. Often this kind of patient is characterized by the presence of co-morbidities that can induce a high thrombotic risk but at the same time also a significant risk of bleeding. It is therefore of primary importance to recognize the criteria for a correct prophylaxis of VTE for each individual patient of an internal medicine ward.

Venous thromboembolism (VTE) is one of the main causes of morbility and mortality in the ospedalized patients. Epidemiologist studies have also demonstrated that VTE is an important and frequent problems in medical patients. In surgical patients is done with greater frequency, but in medical patients prophylaxis is not completely codified and less often less practiced. This review shows epidemiological data, risk factors and classification of the risk of VTE in patients with medical pathologies. Then meta-analyses studies and main studies such as Medenox, Prevent and Artemis, that have examined the prophylaxis of VTE in medical patients are described and discussed, along with their results concerning morbidity and mortality. The current problems of prophylaxis in medical patients are reviewed, such as duration of treatment, optimal dosage of the low molecular weight heparin (LMWH) and the correct risk assessment of VTE. EXCLAIM Study has showed the benefit of extended prophylaxis with statistically significant reduction in VTE events.


Venous thromboembolism (VTE) complications are the leading cause of preventable in-hospital mortality and morbidity in the United States. Initiatives by the National Quality Forum, the Joint Commission, and the Surgical Care Improvement Project aim to improve the prevention of VTE and emphasize the need to recognize the risk of the condition in hospitalized patients. In clinical practice, individual risk assessment using a validated scoring system provides patients with the best care in the prevention of VTE. This is accomplished by a weighted scoring of risk factors, selection of the most appropriate prevention strategy for patients at risk, and regular risk review across the continuum of care. All hospitals should have a local, written, care pathway which assesses inpatient risk of VTE as early as possible upon admission and identifies members of the health care team responsible for applying risk assessment. Venous thromboembolism risk should be regularly reassessed for any changes in the level of risk, with extended out-of-hospital prophylaxis considered for patients with continued risk factors, such as prolonged immobility or illness, treated at home, or in a long-term care facility. Finally, a mandatory alert system requiring the clinician to address the issue of prophylaxis before any orders are carried out by the nursing staff is one way to protect all hospitalized patients.

Objectives: Venous thromboembolism (VTE) causes significant morbidity and mortality in the NHS. An estimated 25,000 NHS inpatients in England died from VTE related complications in 2005. VTE prevention is a clinical priority with National Institute of Clinical Excellence (NICE) guidelines on its prevention and treatment. The Commissioning for Quality and Innovation payment framework (CQUIN) is a reward scheme which pays an increment to providers if they achieve agreed goals, including reducing VTE related morbidity and mortality in adult inpatients. This is measured by the percentage of patients undergoing a VTE risk assessment upon admission. Local payment is rewarded if >90% of patients are assessed monthly. Methods: Adult ENT inpatients were risk assessed for VTE upon admission at Nottingham University Hospitals between April and July 2011. Compliance with the CQUIN target was assessed weekly using a computer generated programme. Interventions were installed and the audit repeated from August to November 2011. Results: During the first 4 months of VTE risk assessment, a mean percentage achieved was 64.8%. Post interventions, this increased to a mean percentage of 92%, achieving the CQUIN target. Conclusions: Compliance with the CQUIN targets can be achieved through interventions including checking that the correct cohort of patients is being assessed, education of junior doctors at induction and a systematic review and modification of the computer algorithm used for data analysis.

12


BACKGROUND: The administration of anticoagulant thromboprophylaxis for all patients with cancer who are hospitalized for acute medical illness is considered standard practice and strongly recommended in clinical guidelines. These recommendations are extrapolated from randomized controlled prophylaxis trials not specifically conducted in cancer cohorts. Because hospitalized patients with cancer constitute a unique population with increased risk of venous thromboembolic events and major hemorrhage, validation of the efficacy and safety of primary thromboprophylaxis in this population is critical. We sought to summarize the rates of venous thromboembolic events and major bleeding episodes among hospitalized patients with cancer who were receiving anticoagulant therapy compared with placebo.

METHODS: A systematic literature search strategy was conducted using MEDLINE, EMBASE, and the Cochrane Register of Controlled Trials. Two reviewers independently extracted data onto standardized forms. The primary end points were all venous thromboembolic events. Secondary end points included major bleeding episodes and symptomatic venous thromboembolic events. Pooled analysis with relative risk using a random effect model was used as the primary measurement.

RESULTS: A total of 242 citations were identified by the literature search. Of these, 3 placebo-controlled randomized trials included venous thromboembolic events as a primary outcome and were analyzed according to cancer subgroups. The pooled relative risk of venous thromboembolic events was 0.91 (95% confidence interval, 0.21-4.0; I(2): 68%) among hospitalized patients with cancer who were receiving thromboprophylaxis compared with placebo. None of the trials reported the rates of symptomatic venous thromboembolic events or major bleeding episodes according to cancer status.

CONCLUSIONS: The risks and benefits of primary thromboprophylaxis with anticoagulant therapy in hospitalized patients with cancer are not known. This is especially relevant because numerous Medicare-type pay-for-performance incentives mandate prophylaxis specifically in patients with cancer. Copyright © 2014 Elsevier Inc. All rights reserved.

12

Background: Residual vein obstruction (RVO) detected on compression ultrasonography of the leg after a few months on anticoagulation therapy might be able to identify patients with deep vein thrombosis (DVT) at high risk of having a recurrent venous thromboembolism (VTE). Purpose: To determine whether RVO is associated with an increased risk of recurrent VTE. Data Source: A systematic literature search strategy was conducted using MEDLINE, EMBASE and the Cochrane Register. Study Selection: We selected 14 articles that included patients with DVT who were assessed for RVO. Data Synthesis: Overall, RVO was significantly associated with recurrent VTE in patients with any (unprovoked and provoked) DVT: OR 1.5 (95% CI: 1.1-2.0). However, the presence of RVO is not associated with a significant increased risk of recurrent VTE (OR: 1.24, 95% CI: 0.9-1.7) in patients with unprovoked DVT that stopped oral anticoagulation therapy at the time of RVO assessment (Fig. 1). (Figure presented) Conclusion: Residual vein obstruction was associated with a significantly increased risk of recurrent VTE in patient with DVT. However, RVO does not seem to be a predictor of recurrent VTE in patients with unprovoked DVT following anticoagulation discontinuation. Further prospective studies are needed to assess the role of RVO in patients with unprovoked DVT.

41
In the last decade, parenteral anticoagulants have proven to be effective in the prevention of venous thromboembolism (VTE) in patients admitted to hospitals. Despite this, some registry studies have shown that pharmacological prophylaxis is still widely underused. We performed a literature search to identify important knowledge gaps in the use of VTE prophylaxis that were not addressed by previous published reports. MEDLINE and HighWire databases covering the years 1999-2009 were searched; only clinical trials of unselected adult subjects were included. Two reviewers independently selected studies and extracted data on inclusion and exclusion criteria, age, weight, comorbidities, study designs, and endpoints. Five of 113 relevant studies were identified from the literature search. Knowledge gaps were disclosed in subject inclusion, exclusion, and stratification regarding young age, under- and overweight, comorbidities, and the selection of clinically significant endpoints. Uncertainties in the dosage, risk stratification of subjects, and effect on hard endpoints as prevention of pulmonary embolism or reduction of mortality reduce the impact of VTE prevention clinical trials.

20
Venous thromboembolism is a relatively common and potentially serious complication in inpatients with inflammatory bowel disease (IBD). There are a number of pathophysiologic mechanisms for venous thromboembolism that are specific to patients with IBD that may be active. The use of anticoagulants for prophylaxis against venous thromboembolism in hospitalized patients with IBD needs to be balanced against the potential for worsening of rectal bleeding. Evidence from randomized trials suggests that heparin and low-molecular weight heparin are generally safe to use in patients with active IBD, and a number of guidelines support their use for thromboprophylaxis in this patient population.

118
Introduction: Venous thromboembolism (VTE) is a leading cause of morbidity and mortality in hospitalized patients. Numerous randomized clinical trials (RCTs) show that the use of thromboprophylaxis in hospitalized patients at risk for VTE is safe, effective and cost-effective. Despite this, prophylactic therapies for VTE are underutilized. System-wide interventions may be more effective to improve the use of VTE prophylaxis than relying on individual providers' prescribing behaviors. Objectives: In this review, we aimed to determine the effectiveness of various system-wide interventions designed to increase the use of thromboprophylaxis in hospitalized medical and surgical patients at risk for VTE. Methods: We searched MEDLINE, EMBASE, and SCOPUS databases to identify studies that assessed an intervention designed to increase use of prophylaxis and/or decrease incidence of VTE. Extracted data included study design, setting, intervention, and outcomes including proportions receiving prophylaxis (RP) and receiving appropriate prophylaxis (RAP). Risk of bias was assessed using Cochrane guidelines. We performed meta-analysis for RCTs and non-randomized studies (NRS) separately. We categorized the interventions into three groups: education (e.g. grand rounds, self-administered course), alerts (e.g. electronic, human), and multifaceted interventions (e.g. combination of education, audit and feedback and alert). We performed a random effects meta-analysis and assessed heterogeneity using the I^2 statistic. Results were pooled if three or more studies were available for a particular intervention group. Results: Out of 1802 records included in our primary screen of titles and abstracts, 79 studies were assessed for eligibility. Fifty-six studies were included in our systematic review, including eight RCTs (N=17,601) and 48 NRS (N=62,770). Among the RCTS, 4 studies included medical patients, 2 included medical and surgical patients, 1 included post-acute care patients and 1 did not report the types of patients included. The NRS were primarily before-and-after design. Fourteen included surgical patients, 10 included medical patients, 10 included medical and surgical patients, 8 included patients from other departments and 6 did not report the types of patients included. Our primary outcomes included received prophylaxis (RP) and received appropriate prophylaxis (RAP). Among the RCTs, there was sufficient data to pool one outcome (RP) for one intervention type (alert). Among the NRS, there was sufficient data to pool two outcomes (RP, RAP) for each intervention type (education, alert, multifaceted). [Table Presented] I^2 results showed substantial statistical heterogeneity among studies. A sensitivity analysis showed that multifaceted interventions which included an alert were more effective at improving rates of RP and RAP than those without an alert. Conclusions: We reviewed a large number of studies which implemented a variety of system-wide strategies aimed to improve thromboprophylaxis rates in many settings and patient populations. We found statistically significant improvements in prescription of prophylaxis associated with alerts and multifaceted interventions, and improvements in prescription of appropriate prophylaxis with the use of education, alerts or multifaceted interventions. Multifaceted interventions with an alert component seem to be the most effective. We chose to pool effect estimates despite significant heterogeneity because the results were generally in the same direction but of different magnitudes. We are continuing to investigate sources of heterogeneity including patient population, setting, baseline prophylaxis rates, and intervention characteristics. The results of our review will help physicians, hospital administrators and policy makers make practical decisions about adoption of specific system-wide measures to improve prevention of VTE. Funded by Canadian Institutes for Health Research.


Venous thromboembolism (VTE) occurs roughly in one out of five cancer patients and is the second cause of death in this population. When all cancer patients are considered together, a sevenfold increased risk for VTE has been calculated. Over the last 20 years, a number of risk factors have been recognized. These have been used in several risk assessment models aimed at identifying high-risk
patients who are therefore candidates for thromboprophylaxis. An easily applicable and reliable risk score is based on the cancer site, hemoglobin levels, pre-chemotherapy platelet and leukocyte counts as well as body mass index. The additional measurement of two biomarkers, namely D-dimer and soluble P-selectin, may improve estimates of the cumulative VTE probability. A variable incidence of VTE has been determined in patients with specific types of malignancy, with the highest odds in those with pancreatic cancer followed by head and neck tumors. In terms of histotype, the risk of VTE is significantly higher in patients with adenocarcinoma than in those with squamous cell carcinoma and in patients with high-grade versus low-grade tumors. Cancer therapy may also be responsible for VTE; specifically, the presence of an indwelling central venous catheter, immunomodulatory drugs such as thalidomide and lenalidomide, monoclonal antibodies, such as bevacizumab, erythropoiesis-stimulating agents and hormonal therapy with tamoxifen place patients at higher risk. The pathogenesis of cancer-related VTE is poorly understood but is likely to be multifactorial. "Virchow's triad," comprising stasis consequent to a decreased blood flow rate, an enhanced blood clotting tendency such as accompanies inflammation and growth factor expression, and structural modifications in blood vessel walls, is thought to play a central role in the induction of VTE. The prophylaxis and treatment of VTE are based on well-established drugs such as vitamin K antagonists and unfractionated and low-molecular-weight heparins as well as on an expanding group of new oral anticoagulants, including fondaparinux, rivaroxaban, apixaban and dabigatran. Furthermore, aspirin has been shown to prevent arterial thrombosis and to reduce the rate of major vascular events. Guidelines for the general management of VTE in cancer patients and in those with an indwelling central venous catheter have been recently developed with the aim of selecting the most rational therapeutic approach for each clinical situation. The main features of VTE based on our own observations of 92 cancer patients and 159 patients with non-neoplastic disease are briefly described herein. © 2013 Springer-Verlag Italia.

49


There is an increasing use of inferior vena caval filters (IVCFs) as prophylactic activity in the absence of a deep venous thrombosis (DVT) to prevent pulmonary embolism (PE) in high-risk patients. These devices are effective in preventing PE in the presence of lower extremity DVT, when anticoagulation is contraindicated or has failed. An electronic databases search of MEDLINE, PubMed, The Cochrane Library, and Google Scholar for relevant articles listed between January 2000 and December 2014 was performed. The review was confined to patients without a history of previous venous thromboembolism and no evidence of changes on venous duplex imaging suggestive of previous DVT. At present, the use of prophylactic IVCF is predominantly in the trauma, orthopedic, and bariatric surgical populations. Currently, no class I studies exist to support insertion of an IVCF in a patient without an established DVT or PE. However, there is a body of class II and class III evidence that would support the use of IVCFs in certain "high-risk" patients who do not have a documented DVT or the occurrence of a PE. Widespread use of prophylactic IVCFs is not supported by evidence and should be discouraged.

4


OBJECTIVE: Venous thromboembolism (VTE) is a common complication in cancer patients. This review summarizes some of the most current knowledge of the epidemiology, risk factors, risk models, prophylaxis, and treatment of VTE in cancer patients.
METHODS: A literature search was conducted using PubMed; the search terms were venous thromboembolism, anticoagulation, and cancer. The bibliographies of pertinent studies and review articles were reviewed for additional references.

RESULTS: Venous thromboembolism is the second leading cause of death in patients with cancer. Cancer patients with VTE have poorer outcomes compared with noncancer patients with VTE. Many risk factors have been identified for VTE in patients with cancer that are patient-related, cancer-related, or treatment-related. Several biomarkers have been identified as potentially predictive of VTE risk. Risk assessment models such as the Khorana Risk Score stratify cancer patients with low, intermediate, and high risk of developing VTE based on baseline clinical and laboratory variables. Currently, enoxaparin is the preferred anticoagulant for initial VTE treatment in cancer patients. Low molecular weight heparin (LMWH) is recommended for both initial and long-term management of cancer-related VTE. Because the optimal duration of anticoagulation in cancer patients with VTE is unknown, the decision to extend anticoagulation requires weighing the risk of recurrent thrombosis against the risk of major bleeding. Patients with recurrent VTE can be bridged with LMWH, transitioned to full-dose LMWH or treated with LMWH dose escalation. While there is insufficient data to determine whether anticoagulation should be held in the setting of thrombocytopenia, full-dose anticoagulation is typically considered unsafe when platelets are < 50 000/muL. Inferior vena cava filters are currently recommended only for patients with acute VTE and contraindications to anticoagulation. Although management of catheter-associated thrombosis has not been well studied in cancer patients, it is recommended that cancer patients with catheter-associated thrombosis be treated with therapeutic anticoagulation for > 3 months. Venous thromboembolism prophylaxis with UFH, LMWH, or fondaparinux is recommended in all hospitalized nonsurgical cancer patients and cancer patients undergoing major cancer surgery. Primary thromboprophylaxis is only currently recommended in high-risk ambulatory cancer patients such as multiple myeloma patients receiving thalidomide- or lenalidomide-based therapy.

CONCLUSION: Cancer-associated thrombosis is a common problem. As we begin to better understand the risk factors and biomarkers for cancer-associated VTE, we can further refine and develop risk-assessment models to determine those patients who would most likely benefit from anticoagulation. While LMWH products are generally preferred in cancer-related VTE, more research will continue to evolve our understanding of treatment and thromboprophylaxis in cancer-associated VTE.


Venous thromboembolism (VTE) is a frequent complication among acutely ill medical patients hospitalized for congestive heart failure, acute respiratory insufficiency, rheumatologic disorders, and acute infectious and/or inflammatory diseases. Based on robust data from randomized controlled studies and meta-analyses showing a reduced incidence of VTE by 40% to about 60% with pharmacologic thromboprophylaxis, prevention of VTE with low molecular weight heparin (LMWH), unfractionated heparin (UFH), or fondaparinux is currently recommended in all at-risk hospitalized acutely ill medical patients. In patients who are bleeding or are at high risk for major bleeding, mechanical prophylaxis with graduated compression stockings or intermittent pneumatic compression may be suggested. Thromboprophylaxis is generally continued for 6 to 14 days or for the duration of hospitalization. Selected cases could benefit from extended thromboprophylaxis beyond this period, although the risk of major bleeding remains a concern, and additional studies are needed to identify patients who may benefit from prolonged prophylaxis. For hospitalized acutely ill medical patients with renal insufficiency, a low dose (1.5 mg once daily) of fondaparinux or prophylactic LMWH subcutaneously appears to have a safe profile, although proper evaluation in randomized studies is lacking. The evidence on the use of prophylaxis for VTE in this latter group of
patients, as well as in those at higher risk of bleeding complications, such as patients with thrombocytopenia, remains scarce. For critically ill patients hospitalized in intensive care units with no contraindications, LMWH or UFH are recommended, with frequent and careful assessment of the risk of bleeding. In this review, we discuss the evidence for use of thromboprophylaxis for VTE in acutely ill hospitalized medical patients, with a focus on (low-dose) fondaparinux.


Patients with cancer are at increased risk of venous thromboembolism (VTE). Anticoagulation therapy has been shown to prevent VTE; however, unique clinical circumstances in patients with cancer can often complicate the decisions surrounding the administration of prophylactic anticoagulation. No national Canadian guidelines on the prevention of cancer-associated thrombosis have been published. We therefore aimed to develop a consensus-based, evidence-informed guideline on the topic. PubMed was searched for clinical trials and meta-analyses published between 2002 and 2013. Reference lists of key articles were hand-searched for additional publications. Content experts from across Canada were assembled to review the evidence and make recommendations. Low molecular weight heparin can be used prophylactically in cancer patients at high risk of developing VTE. Direct oral anticoagulants are not recommended for VTE prophylaxis at this time. Specific clinical scenarios, including renal insufficiency, thrombocytopenia, liver disease, and obesity can warrant modifications in the administration of prophylactic anticoagulant therapy. There is no evidence to support the monitoring of anti-factor Xa levels in clinically stable cancer patients receiving prophylactic anticoagulation; however, factor Xa levels could be checked at baseline and periodically in patients with renal insufficiency. The use of anticoagulation therapy to prolong survival in cancer patients without the presence of risk factors for VTE is not recommended.


Background: Venous thromboembolism (VTE) is the second most common medical complication and a cause of excess length of hospital stay. Its incidence and economic burden are expected to increase as the population ages. We reviewed the recent literature to provide updated cost estimates on VTE management. Methods: Literature search strategies were performed in PubMed, Embase, Cochrane Collaboration, Health Economic Evaluations Database, EconLit, and International Pharmaceutical Abstracts from 2003-2014. Additional studies were identified through searching bibliographies of related publications. Results: Eighteen studies were identified and are summarized in this review; of these, 13 reported data from the USA, four from Europe, and one from Canada. Three main cost estimations were identified: cost per VTE hospitalization or per VTE readmission; cost for VTE management, usually reported annually or during a specific period; and annual all-cause costs in patients with VTE, which included the treatment of complications and comorbidities. Cost estimates per VTE hospitalization were generally similar across the US studies, with a trend toward an increase over time. Cost per pulmonary embolism hospitalization increased from $5,198-$6,928 in 2000 to $8,764 in 2010. Readmission for recurrent VTE was generally more costly than the initial index event admission. Annual health plan payments for services related to VTE also increased from $10,804-$16,644 during the 1998-2004 period to an estimated average of $15,123 for a VTE event from 2008 to 2011. Lower costs for VTE hospitalizations and annualized all-cause costs were estimated in European countries and Canada. Conclusion: Costs for VTE treatment are considerable and increasing faster than general inflation for medical care services, with hospitalization costs being the primary cost driver. Readmissions for VTE are generally more costly than the initial VTE admission.
Further studies evaluating the economic impact of new treatment options such as the non-vitamin K antagonist oral anticoagulants on VTE treatment are warranted.


Many patients admitted to acute care hospitals are at risk for VTE. Nurses play a pivotal role in prevention of VTE events by assessing risk and implementing prophylactic interventions, promptly recognizing and reacting to signs and symptoms of DVT and PE, and collaborating with other team members to ensure rapid treatment ensues. When patients require mechanical ventilation, nurses need to remain alert for complications indicative of VILI, effectively communicate assessment findings to other team members and confidently implement nursing and ordered medical interventions to promote the best possible patient outcomes.


Objective: Patients with inflammatory bowel disease (IBD) are at increased risk of having venous thromboembolism. The magnitude of this risk has yet to be determined. The question of whether IBD patients have an increased risk of arterial thromboembolism and cardiovascular (CV) mortality remains controversial. Design: We searched MEDLINE, Cochrane Library, EMBASE and international conference abstracts and included all controlled observational studies that evaluated the incidence of venous and/or arterial thromboembolic events (TE) and CV mortality in adult IBD. Results: 33 studies enrolling 207,814 IBD patients and 5,774,898 controls and capturing 3,253,639 hospitalizations of IBD patients and 936,411,223 hospitalizations of controls reported a risk of arterial and/or venous TE or CV mortality were included. The risk of venous TE was increased in IBD patients compared to the general population (RR, 1.96; 95% CI, 1.67-2.30) contrary to the risk of arterial TE (RR, 1.15; 95% CI, 0.91-1.45). There was an increased risk of deep venous thrombosis (RR, 2.42; 95% CI, 1.78-3.30), pulmonary embolism (RR, 2.53; 95% CI, 1.95-3.28), ischemic heart disease (RR, 1.35; 95% CI, 1.19-1.52) and mesenteric ischemia (RR, 3.46; 95% CI, 1.78-6.71). Differences in methodology were great between studies resulting in a significant heterogeneity in all previous analysis. CV mortality in IBD patients was not increased compared to the general population (SMR, 1.03; 95% CI, 0.93-1.14). Conclusion: The risk of TE is increased in patients with IBD. This difference is mainly due to an increased risk of venous TE. There is no increased risk of arterial TE or CV mortality in IBD patients, but an increased risk of both ischemic heart disease and mesenteric ischemia. © 2013 European Crohn’s and Colitis Organisation.


Effective venous thromboembolism prophylaxis in hospitalized medically-ill patients and those undergoing orthopaedic surgery remains a challenge for clinicians in the United States. Several new oral anticoagulants, which either directly inhibit the activity of thrombin or factor Xa have been developed and studied for venous thromboembolism (VTE) prevention in phase III trials in these patient populations. These new medications demonstrate several advantages over traditional anticoagulants, including their administration at fixed doses with no requirement for routine coagulation monitoring. Such advantages may potentially be offset by the lack of well-studied methods to reverse their anticoagulant effects and the potential need for standardized testing to monitor their activity in certain situations. This review will provide an overview of the clinical trial
results of dabigatran, apixaban and rivaroxaban for VTE prevention in the orthopaedic and medically-ill hospitalized patients.

123

Background: Even though guidelines for venous thromboembolism risk assessment and prophylaxis are available, patients with identifiable risk factors admitted to acute hospitals are not receiving appropriate prophylaxis. The incidence of venous thromboembolism in hospitalized patients is higher than that of people living in the community who have similar demographics. Knowledge of barriers to healthcare professional compliance with clinical practice guidelines and facilitators to improve compliance will aid appropriate use of venous thromboembolism clinical practice guidelines. Objectives: The main objective of this review was to identify the barriers and facilitators to healthcare professional compliance with clinical practice guidelines for venous thromboembolism assessment and prophylaxis. Inclusion criteria - Types of participants: Studies were considered for inclusion regardless of the designation of the healthcare professional involved in the acute care setting. Focus of the review: The focus of the review was compliance with venous thromboembolism clinical practice guidelines and identified facilitators and barriers to clinical use of these guidelines. Types of studies: Any experimental, observational studies or qualitative research studies were considered for inclusion in this review. Types of outcomes: The outcomes of interest were compliance with venous thromboembolism guidelines and identified barriers and facilitators to compliance. Search strategy: A comprehensive, three-step search strategy was conducted for studies published from May 2003 to November 2011, aimed to identify both published and unpublished studies in the English language across six major databases. Methodological quality: Retrieved papers were assessed by two independent reviewers prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute. Data collection: Both quantitative and qualitative data were extracted from papers included in the review using standardized data tools from the Joanna Briggs Institute. Data synthesis: Quantitative data was pooled using narrative summary due to heterogeneity in the ways in which data was reported. Qualitative data was pooled using Joanna Briggs Institute software. Results: Twenty studies were included in the review with methodological quality ranging from low to high. Reported compliance at baseline ranged from 6.25% to 70.4% and compliance postintervention ranged from 36% to 100%. Eight main categories of barriers and nine main categories of facilitators were identified. The quantitative and qualitative studies identified very similar barriers and facilitators which fell under the same categories. The studies all had components of education involved in their intervention and the review found that passive dissemination or one mode of intervention was not enough to affect and sustain change in clinical practice. Conclusions: This review identified 20 studies that assessed compliance with venous thromboembolism clinical practice guidelines, and identified barriers and facilitators to that compliance. The studies showed that many different forms of intervention can improve compliance with clinical practice guidelines. They provided evidence that interventions can be developed for the specific audience and setting they are being used for, and that not all interventions are appropriate for all areas, such as computer applications not being suitable where system capacity is lacking. Implications for practice: Healthcare professionals need to be aware of venous thromboembolism clinical practice guidelines and improve patient outcomes by using them in the hospital setting. There are a number of interventions that can improve guideline compliance, keeping in mind the barriers and adjusting practice to avoid them. Implications for research: Venous thromboembolism compliance within rural Australian hospitals has not been determined, however as inequalities have been identified in other areas of healthcare between urban and rural regions this would be a logical area to research.
How diagnosing VTE in older patients might differ from diagnosing VTE in younger adult patients (G.J. Geersing): To correctly exclude the presence of VTE without need for further diagnostic work-up, so-called diagnostic decision rules - based on a weighed combination of signs and symptoms and the result of the D-dimer test - have been developed. These strategies have been derived and validated in both primary and secondary care patients suspected of VTE. Notably frail older patients might benefit from such a strategy provided that it can safely rule-out VTE in a substantial proportion of them without needing to be referred for imaging examination. Yet, the accuracy of these existing clinical decision rules to rule-out VTE has never been tested in elderly populations. Geert-Jan Geersing will discuss how diagnosing VTE in older patients might differ from diagnosing VTE in younger adult patients. The predictive performance of clinical decision rules is susceptible to changes in patient populations and these rules might therefore perform worse in older patients in whom the prevalence of both VTE and co-morbidity are higher and the presentation of VTE might be more obscure. Also, the translation of rules derived in hospital setting to primary care or nursing-home setting might be problematic. In addition, current available diagnostic strategies recommend referral for further imaging examination for more than half of the patients, whereas diagnostic decision strategies that would spare higher proportions of older patients the possible hazardous referral for imaging examination might better serve their needs. Based on: Schouten HJ, Koek HL, Moons KG, van Delden JJ, Oudega R, Geersing GJ. Eur J Gen Pract. 2013 Jun; 19(2): 123-7. Validity of clinical decision rules to rule out VTE in older ambulatory patients (H.L. Koek): Dineke Koek will present the results of the "Venous thromboembolism in the elderly" study; a prospective validation study on the accuracy of clinical decision rules to exclude venous thromboembolism in frail older nursing home patients and primary care patients (mean age 80 years) with clinically suspected deep vein thrombosis or pulmonary embolism. VTE occurred in 29% of the patients primarily suspected of pulmonary embolism and in 47% of those primarily suspected of deep vein thrombosis. This prevalence was much higher than in previous studies in populations of younger adult patients (reporting a prevalence between 7% and 20%). This resulted in a higher failure rate (false negative rate) in patients who had a low score on the clinical decision rule and a normal D-dimer test (6% in our study versus below 2% in previous studies). Dineke Koek will also discuss the potency of clinical decision rules to rule in VTE in frail older patients (as opposed to the current approach of ruling out VTE). A combined rule-out and rule-in approach may enable clinicians’ decision-making for up to 58% of patients without the need for further diagnostic work-up. Based on: Schouten HJ, Koek HL, Oudega R, Van Delden JJ, Moons KG, Geersing GJ. Accuracy of decision strategies in diagnosing deep vein thrombosis in frail older out-of-hospital patients - a validation study. Submitted. And: Schouten HJ, Geersing GJ, Oudega R, Van Delden JJ, Moons KG, Koek HL. Accuracy of the Wells-rule for pulmonary embolism in older ambulatory patients. Submitted. The diagnostic value of the D-dimer test using either conventional or age-adjusted cut-off values in older patients with suspected VTE (H.J. Schouten): A normal D-dimer test can rule out VTE in patients with a nonhigh clinical probability according to a clinical decision rule. Since D-dimer levels increase with age, D-dimer testing is less useful to exclude VTE in older patients if the conventional cut-off value (500 mg/L) above which the test is considered abnormal is applied. As potential solution of this problem, researchers proposed to use an age-adjusted cut-off value (age.10 mg/L) in patients >50 years. In the third part of the symposium, Henrike Schouten will discuss the results of systematic review and bivariate random
effects metaanalysis on this topic. We included 13 cohorts that enrolled older patients suspected of VTE in whom D-dimer testing (using both conventional and age-adjusted cut-off values) and reference testing were performed. Based on published data we reconstructed 2x2 tables, stratified by predefined age-categories and applied D-dimer cut-off value. We found that the proportion of patients with a nonhigh clinical probability (according to a clinical decision rule) in whom D-dimer testing could exclude VTE was only 12.4% in those aged more than 80 years. Therefore, D-dimer testing has limited utility in older patients when the conventional cut-off value is applied. Application of age-adjusted cut-off values increased the specificity without modifying the sensitivity which remained >97% in all age categories and would have resulted in correctly avoided imaging examinations in 30-42% of patients over 60 years with a non-high probability as compared to 12-33% when the conventional cut-off value was applied. Based on: Schouten HJ, Koek HL, Oudega R, Geersing GJ, Janssen KJ, van Delden JJ, Moons KG. BMJ 2012 Jun 6; 344: e2985. And: Schouten HJ, Geersing GJ, Koek HL, Zuithoff NP, Janssen KJ, Douma RA, van Delden JJ, Moons KG, Reitsma JB. BMJ. 2013 May 3; 346: f2492. Considerations in decisions to either refer or to withhold additional diagnostic investigations in frail older patients (J.J.M. van Delden): Patients with a high risk of VTE require appropriate imaging examination to confirm or refute the diagnosis. These imaging modalities are mostly not available in primary care and nursing home settings, necessitating patients in the high-risk category to be referred to a hospital. Prior work has shown that frail older patients are vulnerable for distress and complications resulting from transitions to hospital-care. Hence, physicians might feel reluctant to refer frail elderly patients for additional investigations. Hans van Delden will set out the results of a study on physicians’ considerations in their decision-making to either refer for or to withhold additional diagnostic investigations in nursing home patients with suspected VTE. We applied both quantitative and qualitative methods. In the quantitative part, patient outcomes were related to the decision to withhold diagnostic investigations. Referral for additional diagnostic investigations was withheld in four out of ten nursing home patients for whom imaging examination for suspected VTE was indicated. Patients in whom diagnostic investigations were withheld had a higher mortality rate than referred patients. For a better understanding of elderly care physicians’ decisions, in-depth interviews were performed and analysed using the grounded theory approach. In their decisions to forgo diagnostic investigations, physicians incorporated the severity of symptoms and estimated prognosis of the disease in the light of the patients’ chronic condition, potential benefits of diagnostic investigations and whether performing investigations agreed with pre-established management goals in advance care planning.


Objective: To assess the accuracy of the Wells rule for excluding deep vein thrombosis and whether this accuracy applies to different subgroups of patients. Design: Meta-analysis of individual patient data. Data sources: Authors of 13 studies (n=10 002) provided their datasets, and these individual patient data were merged into one dataset. Eligibility criteria: Studies were eligible if they enrolled consecutive outpatients with suspected deep vein thrombosis, scored all variables of the Wells rule, and performed an appropriate reference standard. Main outcome measures: Multilevel logistic regression models, including an interaction term for each subgroup, were used to estimate differences in predicted probabilities of deep vein thrombosis by the Wells rule. In addition, D-dimer testing was added to assess differences in the ability to exclude deep vein thrombosis using an unlikely score on the Wells rule combined with a negative D-dimer test result. Results: Overall, increasing scores on the Wells rule were associated with an increasing probability of having deep vein thrombosis. Estimated probabilities were almost twofold higher in patients with cancer, in patients with suspected recurrent events, and (to a lesser extent) in males. An unlikely score on the
Wells rule (=1) combined with a negative D-dimer test result was associated with an extremely low probability of deep vein thrombosis (1.2%, 95% confidence interval 0.7% to 1.8%). This combination occurred in 29% (95% confidence interval 20% to 40%) of patients. These findings were consistent in subgroups defined by type of D-dimer assay (quantitative or qualitative), sex, and care setting (primary or hospital care). For patients with cancer, the combination of an unlikely score on the Wells rule and a negative D-dimer test result occurred in only 9% of patients and was associated with a 2.2% probability of deep vein thrombosis being present. In patients with suspected recurrent events, only the modified Wells rule (adding one point for the previous event) is safe. Conclusion: Combined with a negative D-dimer test result (both quantitative and qualitative), deep vein thrombosis can be excluded in patients with an unlikely score on the Wells rule. This finding is true for both sexes, as well as for patients presenting in primary and hospital care. In patients with cancer, the combination is neither safe nor efficient. For patients with suspected recurrent disease, one extra point should be added to the rule to enable a safe exclusion.

Gerakopoulos E. Improving venous thromboembolism (VTE) prophylaxis in acute urological admissions during out of hours through the introduction of a urological admission proforma. BMJ Quality Improvement Reports. 2015;4(1)

Venous thromboembolism (VTE) kills more people than breast cancer, road traffic accidents, and AIDS combined, accounting for approximately 25,000 in-hospital deaths in England annually. The cost to the NHS is estimated at £640 million/annum. The most important element of VTE risk assessment strategy in England is to risk assess all patients for VTE on admission. The aim of our quality improvement programme (QIP) was to monitor our practice regarding VTE prophylaxis of the patients’ admitted urgently in our department, and then implement a measure to increase compliance if found to be poor. Our standards were based on the National Institute for Health and Care Excellence (NICE) guidelines which state that all urgently admitted patients must have a completed VTE assessment form within 24 hours of admission and receive appropriate VTE prophylaxis including low molecular weight heparin (LMWH) and/or TED stockings. Our initial audit was conducted over a period of five weeks. All adult patients acutely admitted out of hours (5pm to 8am) were included. We then introduced a specially designed urological admissions proforma and organised several teaching sessions for junior doctors who facilitated acute admissions. Re-audit was performed using the same methods and timescale measuring improvement. Second re-audit six months after the introduction of the proforma, following the induction of the new cohort of junior doctors.

- Primary audit: n=44. Proportion of: completed VTE form=56%, LMWH appropriately prescribed=65%, TEDS=35%. VTE related complications=3 1st re-audit: n=42. Proportion of: completed VTE form=93%, LMWH appropriately prescribed=83%, TEDS=64%. VTE related complications=0 2nd re-audit: n=43. Proportion of: completed VTE form=92%, LMWH prescribed=84%, TEDS=76%. VTE related complications=1 There has been a significant increase of compliance with the NICE guidelines regarding VTE prophylaxis within our department through introducing the specially designed urological admissions proforma and delivering teaching sessions for junior doctors. The implementation of the proforma also led to decreased prevalence of VTE related complications and their subsequent morbidity and mortality.


Pulmonary embolism is the number one cause of preventable death among hospitalized patients. Prescription of either low dose low molecular weight heparin, such as enoxaparin or dalteparin, or prescription of low dose fondaparinux can halve the rate of deep vein thrombosis or pulmonary embolism, without increasing major bleeding complications. Nevertheless, there has been a “failure-
to-prophylax" syndrome, especially among hospitalized medical patients at risk. One approach is to mandate venous thromboembolism prophylaxis for these patients without exception or flexibility. The alternative approach is to institute or maintain an "opt-out" policy so that the responsible clinician can make the final decision as to whether the benefits of prophylaxis outweigh the risks. This paper, makes the case for an "opt-out" policy, so that we can personalize, individualize, and humanize our medical care. Such an approach permits flexibility, encourages collaborative "buy-in" to the concept of prophylaxis, and allows the clinician to withhold anticoagulation in special situations that do not fit prespecified protocols. Ultimately, such an "opt-out" policy might make VTE prophylaxis more effective by avoiding anticoagulation of low thrombosis risk patients who are at high risk of bleeding complications.

**Greig MF, Rochow SB, Crilly MA and Mangoni AA. Routine pharmacological venous thromboembolism prophylaxis in frail older hospitalised patients: where is the evidence? Age & Ageing. 2013;42(4):428-34.**

It has been claimed that there are over 25,000 preventable in-hospital deaths from venous thromboembolism annually in the UK. NICE and SIGN guidelines therefore recommend that all hospitalised patients are risk assessed for venous thromboembolism. The guidelines would recommend using pharmacological thromboprophylaxis for all patients aged 60 and above with reduced mobility and acute medical illness unless obvious contra-indications exist. Meta-analysis data regarding pharmacological thromboprophylaxis for medical patients demonstrate reductions in asymptomatic deep vein thrombosis (DVT) rather than fatal pulmonary embolism and mortality. There is also the potential for increased bleeding risk with this approach. Evidence for older medical in-patients, particularly those aged over 75, is more limited being derived from subgroup analyses of larger clinical trials. In addition, based on exclusion criteria such as increased bleeding risk, frailer older adults were unlikely to have been included within such trials. This commentary will (i) critically appraise available data on the incidence of DVT and PE in older hospitalised patients; (ii) review the evidence available from meta-analyses and subgroup analyses in older medical in-patients for the use of venous thromboembolism prophylaxis; (iii) discuss those situations out-with the guidelines where venous thromboprophylaxis may not be appropriate and even potentially harmful in this patient group and (iv) suggest future research directions.


Background Venous thromboembolism (VTE) can be a devastating postoperative complication, with about one-third of VTEs occurring post-discharge. We previously retrospectively evaluated the Caprini VTE risk assessment model (RAM) in postoperative lung and esophageal cancer patients, demonstrating that high risk? patients were more likely to have a postoperative VTE. In this study, we sought to implement the RAM protocol in thoracic surgical patients to evaluate adherence, safety, and VTE outcomes.

**Haut ER, Lau BD, Kraus PS and et al. PReventability of hospital-acquired venous thromboembolism. JAMA Surgery. 2015;150(9):912-915.**
National bodies (eg, the Centers for Medicare and Medicaid Services) and regional entities (eg, the Maryland Health Services Cost Review Commission) impose financial penalties for hospitalized patients developing VTE despite evidence that not all events are preventable, even with prophylaxis.3 Publicly reported measures from both The Joint Commission’s Core Measures and the Centers for Medicare and Medicaid Services’ Hospital Compare report whether a patient received at least 1 dose of VTE prophylaxis within the first day of hospitalization, rather than considering all prescribed and administered doses for the entire hospitalization.4


BACKGROUND: Optimal thromboprophylaxis for patients at risk of bleeding remains uncertain. This meta-analysis assessed whether intermittent pneumatic compression (IPC) of the lower limbs was effective in reducing venous thromboembolism and whether combining pharmacological thromboprophylaxis with IPC would enhance its effectiveness.

METHODS AND RESULTS: Two reviewers searched MEDLINE, EMBASE, and the Cochrane controlled trial register (1966-February 2013) for randomized, controlled trials and assessed the outcomes and quality of the trials independently. Trials comparing IPC with pharmacological thromboprophylaxis, thromboembolic deterrent stockings, no prophylaxis, and a combination of IPC and pharmacological thromboprophylaxis were considered. Trials that used IPC <24 hours or compared different types of IPC were excluded. A total of 16 164 hospitalized patients from 70 trials met the inclusion criteria and were subjected to meta-analysis. IPC was more effective than no IPC prophylaxis in reducing
deep vein thrombosis (7.3% versus 16.7%; absolute risk reduction, 9.4%; 95% confidence interval [CI], 7.9-10.9; relative risk, 0.43; 95% CI, 0.36-0.52; P<0.01; I²=34%) and pulmonary embolism (1.2% versus 2.8%; absolute risk reduction, 1.6%; 95% CI, 0.9-2.3; relative risk, 0.48; 95% CI, 0.33-0.69; P<0.01; I²=0%). IPC was also more effective than thromboembolic deterrent stockings in reducing deep vein thrombosis and appeared to be as effective as pharmacological thromboprophylaxis but with a reduced risk of bleeding (relative risk, 0.41; 95% CI, 0.25-0.65; P<0.01; I²=0%). Adding pharmacological thromboprophylaxis to IPC further reduced the risk of deep vein thrombosis (relative risk, 0.54; 95% CI, 0.32-0.91; P=0.02; I²=0%) compared with IPC alone.

CONCLUSIONS: IPC was effective in reducing venous thromboembolism, and combining pharmacological thromboprophylaxis with IPC was more effective than using IPC alone.


Venous thromboembolism (VTE) prophylaxis is suboptimal in American hospitals despite long-standing evidence-based recommendations. Data from observational studies indicate a lower uptake of effective prophylaxis in patients hospitalized with medical versus surgical conditions. Reluctance to use prophylaxis in medical patients has been attributed to difficulty in identifying at-risk patients and balancing risks of bleeding against occurrence of VTE. Several risk-assessment models (RAMs) have been proposed to assist physicians in identifying non-surgical patients who need prophylaxis. We conducted a systematic review of published RAMs, based on objective criteria, to determine whether any RAM is validated sufficiently to be employed in clinical practice. We identified 11 RAMs, six derived from primary data and five based on expert opinion. The number, types, and strength of association of VTE risk predictors were highly variable. The variability in methods and outcome measurement precluded pooled estimates of these different models. Published RAMs for VTE lack generalizability and adequate validation. As electronic health records become more ubiquitous, validated dynamic RAMs are needed to assess VTE risk at the point-of-care in real time.


Background: Obese patients are often excluded from clinical trials or are not recruited in sufficient number to assess safety and efficacy of LMWH in this population. It is unclear if standard (i.e. non-adjusted) thromboprophylaxis doses of low-molecular weight heparin (LMWH) provide adequate coverage for obese patients. Similarly, weightadjusted dosing of LMWH is recommended for the acute treatment of venous thromboembolism (VTE). However, product monographs of different LMWH manufacturers state not to exceed their recommended maximum dosage. It is not known if using the actual weightadjusted dose of LMWH (instead of capping the dose) is safe and effective for obese patients treated for acute VTE. Aims: To summarize the event rates of VTE (or recurrent VTE) and major bleeding episodes in obese patients receiving weight-adjusted doses of LMWH for the prevention and treatment of VTE. Methods: A systematic literature search was performed using MEDLINE and EMBASE. The primary outcome measures were VTE and major bleeding events.
Venous thromboembolism was defined as symptomatic proximal lower limbs (popliteal vein or more proximal) deep vein thrombosis or pulmonary embolism. Major bleeding was defined as per the ISTH definition. Weight-adjusted thromboprophylactic LMWH dosing was defined as the use of higher than standard recommended dosing for obese patients. Weight-adjusted therapeutic LMWH dosing was defined as a dose calculated according to patient’s weight regardless of dosage cap as per the manufacturer’s instructions. Rates of the primary outcomes were generated for the indications: (i) Thromboprophylaxis in medically-ill patients; (ii) Acute treatment of VTE. Pooled proportions for the different outcomes during hospitalization (prophylaxis medically-ill patients) and up to 3 months of follow up (acute treatment of VTE) were calculated. Results: A total of eight studies (four on thromboprophylaxis in medically-ill patients; four on the acute treatment of VTE) met inclusion criteria. Two thousand two hundred and twenty patients were included in the systematic review (1200 in thromboprophylaxis studies; 1020 in treatment studies). Medically ill hospitalized patients receiving weight-adjusted thromboprophylactic LMWH had a VTE rate of 2.1% (95% CI: 0.1-6.7%) compared to a rate of 2.9% (95% CI: 1.7-4.4%) for patients receiving standard doses of LMWH thromboprophylaxis. The rate of major bleeding in the weight-adjusted prophylaxis studies was 1.0% (95% CI: 0.02-4.6%). None of the studies included in the systematic review reported the risk of major bleeding among obese patients receiving standard doses of LMWH thromboprophylaxis. The 3-month risk of recurrent VTE and major bleeding in obese patients receiving weight-adjusted LMWH for acute VTE was 2.7% (95% CI: 0.7-5.9%) and 0.8% (95% CI: 0.3-1.6%) respectively. No studies have reported the risk of recurrent VTE or major bleeding among obese patients receiving capped doses of LMWH. Summary/Conclusions: Weight-adjusted doses of LMWH seem safe and effective in the prevention and treatment of VTE in obese patients. Rates of VTE, recurrent VTE and major bleeding episodes compare favorably to previously reported rates in non-obese patients. Future studies assessing the efficacy and safety of different dosing strategies among obese patients are needed.


Background: Obesity is a growing global problem putting people at risk for VTE. Obese patients are often excluded from clinical trials or are not recruited in sufficient number to assess safety and efficacy of LMWH in this population. The bariatric surgical population is a particularly high risk population for VTE. It is unclear if standard (i.e. non-adjusted) thromboprophylaxis doses of low-molecular weight heparin (LMWH) provide adequate protection for obese patients undergoing bariatric surgery, or if higher doses are required. Aims: To determine whether a weight based thromboprophylactic dosing regimen is safe and effective in the post-operative period for obese patients undergoing bariatric surgery. Methods: A systematic literature search was performed using MEDLINE and EMBASE. The primary outcome measures were VTE and major bleeding events. Venous thromboembolism was defined as symptomatic proximal lower limbs (popliteal vein or more proximal) deep vein thrombosis or pulmonary embolism. Weight-adjusted thromboprophylactic LMWH dosing was defined as the use of a higher than standard recommended dose. Major bleeding was defined as per the ISTH definition. Pooled proportions for the different outcomes during hospitalization were calculated. Results: A total of seven studies (one randomized controlled trial and six cohort studies) containing 2396 patients met the inclusion criteria and were included in the analysis. Post bariatric surgery patients receiving weight-adjusted prophylactic doses of LMWH, had an in hospital rate of VTE of 0.54% (95% CI: 0.2-1.0%) compared to 2.0% (95% CI: 0.1-6.4%) for those that did not weight adjust doses. Rates of major bleeding were for both groups: 1.6% (95% CI: 0.6-3.0%) for patients receiving weight-adjusted dosing compared to 2.3% (95% CI: 1.1-3.9%) for those receiving standard doses of LMWH. Summary/Conclusions: Adjusting the dose of LMWH for thromboprophylaxis post-bariatric surgery seems to be associated with a lower rate of VTE.
compared to a strategy of not adjusting the dose. This practice does not lead to an increase in adverse major bleeding events. Future studies assessing the efficacy and safety of weight adjusted dosing of bariatric surgical patients are needed to confirm these findings.


CONTEXT: Symptomatic venous thromboembolism (VTE) after total or partial knee arthroplasty (TPKA) and after total or partial hip arthroplasty (TPHA) are proposed patient safety indicators, but its incidence prior to discharge is not defined.

OBJECTIVE: To establish a literature-based estimate of symptomatic VTE event rates prior to hospital discharge in patients undergoing TPHA or TPKA.

DATA SOURCES: Search of MEDLINE, EMBASE, and the Cochrane Library (1996 to 2011), supplemented by relevant articles.

STUDY SELECTION: Reports of incidence of symptomatic postoperative pulmonary embolism or deep vein thrombosis (DVT) before hospital discharge in patients who received VTE prophylaxis with either a low-molecular-weight heparin or a subcutaneous factor Xa inhibitor or oral direct inhibitor of factors Xa or IIa.

DATA EXTRACTION AND SYNTHESIS: Meta-analysis of randomized clinical trials and observational studies that reported rates of postoperative symptomatic VTE in patients who received recommended VTE prophylaxis after undergoing TPHA or TPKA. Data were independently extracted by 2 analysts, and pooled incidence rates of VTE, DVT, and pulmonary embolism were estimated using random-effects models.

RESULTS: The analysis included 44,844 cases provided by 47 studies. The pooled rates of symptomatic postoperative VTE before hospital discharge were 1.09% (95% CI, 0.85%-1.33%) for patients undergoing TPKA and 0.53% (95% CI, 0.35%-0.70%) for those undergoing TPHA. The pooled rates of symptomatic DVT were 0.63% (95% CI, 0.47%-0.78%) for knee arthroplasty and 0.26% (95% CI, 0.14%-0.37%) for hip arthroplasty. The pooled rates for pulmonary embolism were 0.27% (95% CI, 0.16%-0.38%) for knee arthroplasty and 0.14% (95% CI, 0.07%-0.21%) for hip arthroplasty. There was significant heterogeneity for the pooled incidence rates of symptomatic postoperative VTE in TPKA studies but less heterogeneity for DVT and pulmonary embolism in TPKA studies and for VTE, DVT, and pulmonary embolism in TPHA studies.

CONCLUSION: Using current VTE prophylaxis, approximately 1 in 100 patients undergoing TPKA and approximately 1 in 200 patients undergoing TPHA develops symptomatic VTE prior to hospital discharge.


In Europe, venous thromboembolism (VTE) is the third most common cause of vascular death after myocardial infarction and stroke. It is especially common during and after hospitalisation for surgery and acute medical illness though many other risk factors have now been identified. VTE is often preventable with judicious use of preventative measures in the form of thromboprophylaxis and mechanical antiembolism stockings. In 2014, a study was undertaken across all surgical wards at a teaching hospital in London to assess compliance to national guidelines for VTE risk assessment and subsequent institution of protective measures. The initial results demonstrated that performance could be improved in terms of meeting the national target of assessing 95% of surgical inpatients for risk of VTE at admission, prescribing anti-embolism stockings, ensuring that they are correctly worn,
and reassessing patients 24 hours later. Utilising a multidisciplinary team approach, simple interventions were put in place such as e-mail reminders, posters, and senior input during ward rounds. Three subsequent measurements demonstrated that sustained improvement was achieved with the national guideline of 95% VTE risk assessment met. Improved performance was noted across all parameters considered, highlighting that simple intervention with all team members involved can improve patient safety and care.


After anticoagulation has been started in patients with venous thromboembolism (VTE), three issues need to be addressed: the length of therapy, measures to help prevent postthrombotic syndrome, and a basic workup for malignancy in patients with idiopathic VTE.


Deep vein thrombosis and pulmonary embolism, the common clinical manifestations of venous thromboembolism (VTE), are among the most preventable complications of hospitalized patients. However, survey data repeatedly show poor rates of compliance with guideline-based preventive strategies. This has led the Centers for Medicare and Medicaid Services to deny reimbursement for hospital readmission for thromboembolic complications in patients undergoing total hip or knee arthroplasty. Multiple strategies and national initiatives have been developed to improve rates of VTE prophylaxis during hospitalisation; however, most VTE occurs in the outpatient setting. Epidemiologic data suggest that recent surgery or hospitalization is a strong risk factor for the development of VTE and that this risk may persist for up to 6 months. These observations call into question whether VTE prophylaxis should be administered only during hospitalization or if this preventive strategy should be continued after hospital discharge. Many of the randomized trials showing efficacy of VTE prophylaxis have used longer durations of prophylaxis than are typical for current length of hospital stay, highlighting the issue of how long the duration of prophylaxis should be. Several patient groups have undergone formal testing to evaluate the risks and benefits of extended-duration VTE prophylaxis, but this issue is less clear for other categories of patients. Although there is clear consensus that most hospitalized patients should receive VTE prophylaxis, there is uncertainty about whether to continue VTE prophylaxis in the immediate post-hospital period or for an extended duration. The transition from inpatient to outpatient care is a key event in the coordination of continuity of care, but VTE-specific care transition guidance is limited. In this article, we review the evidence for both standard- and extended-duration VTE prophylaxis and discuss the difficulties in effectively maintaining VTE prophylaxis during the transition from inpatient to outpatient care.


BACKGROUND: Venous thromboembolism (VTE) is a leading cause of morbidity and mortality in hospitalized patients. Numerous randomized controlled trials (RCTs) show that using thromboprophylaxis in hospitalized patients at risk for VTE is safe, effective and cost-effective. Despite this, prophylactic therapies for VTE are underutilized. System-wide interventions may be more effective to improve the use of VTE prophylaxis than relying on individual providers' prescribing behaviors.
OBJECTIVES: To assess the effects of interventions designed to increase the implementation of thromboprophylaxis in hospitalized adult medical and surgical patients at risk for venous thromboembolism (VTE), assessed in terms of: 1. Increase in the proportion of patients who receive prophylaxis and appropriate prophylaxis 2. Reduction in risk of symptomatic VTE3. Reduction in risk of asymptomatic VTE4. Safety of the intervention.

SEARCH METHODS: The Cochrane Peripheral Vascular Diseases Group Trials Search Co-ordinator (TSC) searched the Group's Specialised Register (last searched July 2010) and the Cochrane Central Register of Controlled Trials (CENTRAL, The Cochrane Library) 2010, Issue 3. We searched the PubMed, EMBASE, and SCOPUS databases (19 April 2010) as well as the reference lists of relevant review articles.

SELECTION CRITERIA: We included all studies whose interventions aimed to increase the use of prophylaxis and/or appropriate prophylaxis, decrease the proportion of symptomatic VTE, or decrease the proportion of asymptomatic VTE in hospitalized adult patients. We excluded studies that simply distributed published guidelines and studies whose interventions were not clearly described.

DATA COLLECTION AND ANALYSIS: We collected the following outcomes: the proportion of patients who received prophylaxis (RP), the proportion of patients who received appropriate prophylaxis (RAP) (primary outcomes), and the occurrence of symptomatic VTE, asymptomatic VTE, and safety outcomes such as bleeding. We categorized interventions into education, alerts, and multifaceted interventions. We meta-analyzed RCTs and non-randomized studies (NRS) separately by random effects meta-analysis, and assessed heterogeneity using the I(2) statistic and subgroup analyses.

Before analysis, we decided that results would be pooled if three or more studies were available for a particular intervention. We assessed publication bias using funnel plots and cumulative meta-analysis.

MAIN RESULTS: We included a total of 55 studies. One of these reported data in patient-days and could not be quantitatively analyzed with the others. The 54 remaining studies (8 RCTs and 46 NRS) eligible for inclusion in our quantitative synthesis enrolled a total of 78,343 participants. Among RCTs, there were sufficient data to pool results for one primary outcome (received prophylaxis) for the ‘alert’ intervention. Alerts, such as computerized reminders or stickers on patients’ charts, were associated with a risk difference (RD) of 13%, signifying an increase in the proportion of patients who received prophylaxis (95% confidence interval (CI) 1% to 25%). Among NRS, there were sufficient data to pool both primary outcomes for each intervention type. Pooled risk differences for received prophylaxis ranged from 8% to 17%, and for received appropriate prophylaxis ranged from 11% to 19%. Education and alerts were associated with statistically significant increases in prescription of appropriate prophylaxis, and multifaceted interventions were associated with statistically significant increases in prescription of any prophylaxis and appropriate prophylaxis. Multifaceted interventions had the largest pooled effects. I(2) results showed substantial statistical heterogeneity which was in part explained by patient types and type of hospital. A subgroup analysis showed that multifaceted interventions which included an alert may be more effective at improving rates of prophylaxis and appropriate prophylaxis than those without an alert. Results for VTE and safety outcomes did not show substantial benefits or harms, although most studies were underpowered to assess these outcomes.

AUTHORS’ CONCLUSIONS: We reviewed a large number of studies which implemented a variety of system-wide strategies aimed to improve thromboprophylaxis rates in many settings and patient populations. We found statistically significant improvements in prescription of prophylaxis associated with alerts (RCTs) and multifaceted interventions (RCTs and NRS), and improvements in prescription of appropriate prophylaxis in NRS with the use of education, alerts and multifaceted interventions. Multifaceted interventions with an alert component may be the most effective. Demonstrated sources of heterogeneity included patient types and type of hospital. The results of our review will help physicians, nurses, pharmacists, hospital administrators and policy makers make practical decisions about local adoption of specific system-wide measures to improve prevention of
VTE, an important public health issue. We did not find a significant benefit for VTE outcomes; however, earlier RCTs assessing the efficacy of thromboprophylaxis which were powered to address these outcomes have demonstrated the benefit of prophylactic therapies and a favourable balance of benefits versus the increased risk of bleeding events.

180

85

BACKGROUND: There is uncertainty about optimal strategies for venous thromboembolism (VTE) prophylaxis among select populations such as patients with renal insufficiency, obesity, or patients taking antiplatelet drugs including aspirin. Their physiologies make prophylaxis particularly challenging. PURPOSE: We performed a comparative effectiveness review of the literature on efficacy and safety of VTE prophylaxis in these populations. DATA SOURCES: We searched MEDLINE, EMBASE, SCOPUS, CINAHL, International Pharmaceutical Abstracts, clinicaltrial.gov, and the Cochrane Library through August 2012. Eligible studies included controlled trials and observational studies. DATA EXTRACTION: Two reviewers evaluated studies for eligibility, serially abstracted data, and independently evaluated the risk of bias and strength of evidence supporting interventions to prevent VTE in these populations. RESULTS: After a review of 30,902 citations, we identified 9 controlled studies, 5 of which were trials, and the other 4 were observational studies. Five articles addressed prophylaxis of patients with renal insufficiency, 2 addressed obese patients, and 2 addressed patients on antiplatelet agents. No study tested prophylaxis in underweight patients or those with liver disease. The majority of observational studies had a high risk of bias. The strength of evidence ranged from low to insufficient regarding the comparative effectiveness and safety of VTE prophylaxis among these patients. CONCLUSION: The current evidence is insufficient regarding optimal VTE prophylaxis for patients with renal insufficiency, obesity, or those who are on antiplatelet drugs including aspirin. High-quality studies are needed to inform clinicians about the best VTE prophylaxis for these patients. © 2013 Society of Hospital Medicine.

102

Background: Risks and benefits of venous thromboembolism (VTE) prophylaxis in hospitalised medical patients remains controversial with recent systematic reviews concluding that heparin prophylaxis resulted in little benefit if applied universally. Best practice suggests risk profiling of patients in order to appropriately prescribe prophylaxis. Methods: With this in mind we undertook a prospective audit assessing current LMWH prescription in inpatients. Standards of practice were based on current prescribing guidelines. Patient demographics were recorded. Statistical analyses were performed using non-parametric testing. Relative risks (RR) and odds ratios (OR) were calculated. p values<0.05 were deemed significant. Results: 88 patients were assessed, 44 female. Median age was 76. 45 % were on prophylactic LMWH. Of these, 70 % had an appropriate indication and dosage prescribed. The most common reason for inappropriate dosing was failure to dose adjust with renal impairment (25 %). In those not on treatment, 54 % actually met criteria for treatment according to guidelines, having 1 or more risk factor for VTE. 21 patients were appropriately not
treated. 12 patients in this group were on an oral anticoagulant. Renal impairment (Creatinine Clearance <30 ml/min) increased risk of inappropriate prescription did in both untreated and treated groups (p<0.0001) while age and gender did not. Conclusions: Clear guidelines on LMWH prescribing and the need for dose adjustment in vulnerable populations such as the elderly and renally impaired are required to ensure minimisation of the risks of bleeding, death and future venous thromboembolic disease in these cohorts.

53
Venous thromboembolism (VTE) is a major health problem among patients with cancer, its incidence in this particular population is widely increasing. Although VTE is associated with high rates of mortality and morbidity in cancer patients, its severity is still underestimated by many oncologists. Thromboprophylaxis of VTE now considered as a standard of care is still not prescribed in many institutions; the appropriate treatment of an established VTE is not yet well known by many physicians and nurses in the cancer field. Patients are also not well informed about VTE and its consequences. Many studies and meta-analyses have addressed this question so many guidelines that dedicated a whole chapter to clarify and expose different treatment strategies adapted to this particular population. There is a general belief that the prevention and treatment of VTE cannot be optimized without a complete awareness by oncologists and patients. The aim of this article is to make VTE a more clear and understood subject.

112
Introduction: Venous thromboembolism (VTE) is an important and potentially avoidable cause of morbidity and mortality in hospitalized patients. The management of deep vein thrombosis (DVT) prophylaxis in medical intensive care unit patients (MICU) is limited by the lack of studies specific to this patient population. Objectives: To review clinical trials of efficacy of thromboprophylaxis in MICU patients and to provide summary recommendations. Methods: Systemic review of an online search of PubMed, Medline, Cochrane Library, Google Scholar, and selected studies. Results: Randomized placebo-controlled trials reported the incidence of DVT in MICU patients is approximately 30%. Thromboprophylaxis significantly decreased the rate of DVT by more than 50% to approximately 11%-15%. The prevalence of asymptomatic proximal DVT on admission to MICU is 2%-3%. The incidence of objectively documented DVT in MICU patients receiving thromboprophylaxis varied from 10%-33%, while the incidence of proximal DVT varied from 7% to 16%. Most clinical trials examined low dose unfractionated heparin twice daily for DVT prophylaxis while low molecular weight heparin was used in one randomized clinical trial in MICU patients. Several trials included mixed medical and surgical ICU patients. Data regarding the efficacy of mechanical thromboprophylaxis in MICU patients is limited. Doppler ultrasonography is the most commonly used screening method to detect DVT in MICU patients, while the use of venography to detect or confirm DVT is uncommon. Conclusion: There is limited data assessing risk and efficacy of DVT prophylaxis in the MICU. Current pharmacoprophylaxis is effective in reducing the incidence of DVT in MICU patients although these events continue to occur in patients receiving prophylaxis. Further randomized, blinded studies to assess VTE risk and most effective prophylactic regimen are needed.

It was the aim of this review to assess the incidence of venous thromboembolism (VTE) and current practice patterns for VTE prophylaxis among medical patients with acute illness in Europe. A literature search was conducted on the epidemiology and prophylaxis practices of VTE prevention among adult patients treated in-hospital for major medical conditions. A total of 21 studies with European information published between 1999 and April 2010 were retrieved. Among patients hospitalised for an acute medical illness, the incidence of VTE varied between 3.65% (symptomatic only over 10.9 days) and 14.9% (asymptomatic and symptomatic over 14 days). While clinical guidelines recommend pharmacologic VTE prophylaxis for patients admitted to hospital with an acute medical illness who are bedridden, clear identification of specific risk groups who would benefit from VTE prophylaxis is lacking. In the majority of studies retrieved, prophylaxis was underused among medical inpatients; 21% to 62% of all patients admitted to the hospital for acute medical illnesses did not receive VTE prophylaxis. Furthermore, among patients who did receive prophylaxis, a considerable proportion received medication that was not in accord with guidelines due to short duration, suboptimal dose, or inappropriate type of prophylaxis. In most cases, the duration of VTE prophylaxis did not exceed hospital stay, the mean duration of which varied between 5 and 11 days. In conclusion, despite demonstrated efficacy and established guidelines supporting VTE prophylaxis, utilisation rates and treatment duration remain suboptimal, leaving medical patients at continued risk for VTE. Improved guideline adherence and effective care delivery among the medically ill are stressed.

6


We performed a systematic review of published studies that evaluated the potential risk factors and outcomes of venous thromboembolism (VTE) in hospitalized children. A total of 761 VTE patients from six published studies were identified. The mean prevalence of VTE in children admitted to the hospital was 9.7/10 000 admissions. The presence of a central venous catheter was found to be the single most important predisposing cause of VTE, with a pooled percentage of 29%. Infection was the second most common cause of the disease (20%). Pulmonary embolism occurred in 15% (113/745) of the patients. The overall recurrence rate of VTE was 16% (74/464) and the mortality rate was 8% (59/704). Although uncommon, orthopedic surgeons need to be aware of the unique risk factors for VTE among pediatric inpatients. Hospitalized children and adolescents with known risk factors for VTE should be considered candidates for VTE screening or prophylaxis.

61


Background: The use of immunomodulatory drugs (IMiDs), especially thalidomide, in combination with dexamethasone (Dex) in multiple myeloma (MM) patients has been shown to significantly increase the incidence of venous thromboembolism (VTE). Clinical practice guidelines recommend the use of thromboprophylaxis in patients receiving IMiDs for MM. However, the best type of thromboprophylaxis, especially in patients receiving more recent IMiDs (e.g. lenalidomide (LEN), pomalidomide (POM)), remains unknown. Aims: The aim of this review was to determine the rates of VTE in MM patients receiving LEN or POM and thromboprophylaxis. The pooled rates of VTE was further characterized based on the disease status (newly diagnosed (ND) or relapsed/refractory (RR)), as well as the type of IMiD. Methods: A systematic literature search was done using MEDLINE,
EMBASE and Cochrane Library. Two reviewers independently assessed all articles identified from the initial literature search to determine their eligibility. Both reviewers independently extracted the required information from each selected study. Any discrepancies were resolved through consensus.

Results: A total of 917 patients were included in the analyses (ND MM + LEN (n = 327); RR MM + LEN (n = 324); RR MM + POM (n = 266)). In patients with RR MM being treated with POM and DEX, the rate of VTE while on aspirin (ASA) was 3.5 per 100 patient-years (95% CI: 1.5 - 6.2). In patients with ND MM treated with LEN and DEX or Prednisone (PRED), the rate of VTE while on ASA was 8.0 per 100 patient-years (95% CI: 1.3 - 19.6). This rate fell to 3.9 per 100 patient-years (95% CI: 2.4 - 5.8) when patients with RR MM were treated with this same regimen. Conclusion: The rates of VTE in RR MM patients receiving LEN or POM are low, and thromboprophylaxis with ASA seems adequate. Rates of VTE are higher in patients with ND MM receiving LEN and DEX or PRED. Further trials assessing risks and benefits of other thromboprophylactic regimens in this patient population are warranted.

PURPOSE: Published evidence on the incidence and predictors of venous thromboembolism (VTE) in patients with cirrhosis of the liver is reviewed.
SUMMARY: The frequently observed phenomenon of elevated International Normalized Ratio (INR) values in patients with cirrhosis has led to a theory of "autoanticoagulation" and the assertion that such patients may not benefit from the VTE risk-reduction therapies routinely used in other groups of hospitalized patients. A literature search identified six reports specifically addressing the issue of VTE risk in patients with cirrhosis. Reported rates of VTE development in such patients vary widely (0.5 - 8.2%) as a result of investigators’ use of varying study methods and endpoints. The results of three studies (including two studies of longitudinal data on about 100,000 and nearly 450,000 patients) found no significant correlation of INR values and VTE risk. With regard to potential clinical markers of VTE risk in the context of cirrhosis, data from two studies suggested that serum albumin might serve as a reliable marker of coagulation status and, therefore, VTE risk. The results of other studies indicated that independent predictors of VTE in patients with cirrhosis include malnutrition and significant comorbidities such as chronic kidney disease and congestive heart failure. In aggregate, the available evidence does not support the autoanticoagulation theory.
CONCLUSION: In hospitalized patients with cirrhosis who have elevated INR values, pharmacologic VTE prophylaxis should be strongly considered if there is no active or recent bleeding and if more than one risk factor for VTE is present.

Objectives: To systematically review the humanistic and economic burden of cancer-related venous thromboembolism (VTE). Methods: A literature search was carried out on Pubmed, Cochrane Central Register of Controlled Trials, Econlit, Science Direct, JSTOR, Oxford Journals and Cambridge Journals. The search was limited to humanistic studies published from January 2000 to December 2012. Additional studies were also identified by searching reference lists of relevant published reviews and included studies. The identified studies were independently reviewed by two reviewers against predetermined inclusion and exclusion criteria. A quality assessment of the selected studies was also conducted by using standard methods. The data of selected studies were extracted onto a data extraction form and consequently synthesized. Results: Fifty five studies were included in our review. It was found that cancer patients experience between 2-fold and 20-fold higher risk of developing VTE in comparison to non-cancer patients. Cancer patients are more likely to experience
a VTE event in the first 3 or 6 months after cancer diagnosis and the onset of chemotherapy. Additionally, an increased risk of VTE in patients with distant metastases and certain types of cancer (i.e. pancreatic or lung) was identified. VTE strongly affects the prognosis of cancer patients as it has been found that it is a leading cause of death in this group of patients. The annual average total cost for cancer patients with VTE was found to be almost 50% higher compared to that of cancer patients without VTE treatin the USA in 2002. Inpatient care costs accounted for more than 60% of total cost.

Conclusions: Although the economic impact of the VTE in cancer patients as well as the impact of VTE on patients’ quality of life is not well studied, the present review demonstrate that there is a substantial humanistic and economic burden associated with VTE in cancer patients.


The association between cancer and thrombosis has been recognized for more than 150 years. Not only are patients with cancer at a substantially increased risk of developing venous thromboembolism (VTE), the link between several coagulation factors and tumor growth, invasion, and the development of metastases has been established. Reported rates of VTE in patients with cancer have increased in recent years likely reflecting, in part, improved diagnosis with sophisticated imaging techniques as well as the impact of more aggressive cancer diagnosis, staging, and treatment. Various therapeutic interventions, such as surgery, chemotherapy, hormonal therapy, targeted therapeutic strategies as well as the frequent use of indwelling catheters and other invasive procedures also place cancer patients at increased risk of VTE. The increasing risk of VTE, the multitude of risk factors, and the greater risk of VTE recurrence and death among patients with cancer represent considerable challenges in modern clinical oncology. The American Society of Clinical Oncology (ASCO) originally developed guidelines for VTE in patients with cancer in 2007. ASCO recently updated clinical practice guidelines on the treatment and prevention of VTE in patients with cancer following an extensive systematic review of the literature. Revised 2013 guidelines have now been presented and will be discussed in this review. Although several new studies were identified and considered, many important questions remain regarding the relationship between thrombosis and cancer and the optimal care of patients at risk for VTE. © 2014 Elsevier Ltd. All rights reserved. © 2014 Elsevier Ltd.


BACKGROUND: Venous thromboembolism (VTE) is a common cause of preventable harm for hospitalised patients. Over the past decade, numerous intervention types have been implemented in attempts to improve the prescription of VTE prophylaxis in hospitals, with varying degrees of success. We reviewed key articles to assess the efficacy of different types of interventions to improve prescription of VTE prophylaxis for hospitalised patients.

METHODS: We conducted a search of MEDLINE for key studies published between 2001 and 2012 of interventions employing education, paper based tools, computerised tools, real time audit and feedback, or combinations of intervention types to improve prescription of VTE prophylaxis for patients in hospital settings. Process outcomes of interest were prescription of any VTE prophylaxis and best practice VTE prophylaxis. Clinical outcomes of interest were any VTE and potentially preventable VTE, defined as VTE occurring in patients not prescribed appropriate prophylaxis.
RESULTS: 16 articles were included in this review. Two studies employed education only, four implemented paper based tools, four used computerised tools, two evaluated audit and feedback strategies, and four studies used combinations of intervention types. Individual modalities result in improved prescription of VTE prophylaxis; however, the greatest and most sustained improvements were those that combined education with computerised tools.

CONCLUSIONS: Many intervention types have proven effective to different degrees in improving VTE prevention. Provider education is likely a required additional component and should be combined with other intervention types. Active mandatory tools are likely more effective than passive ones. Information technology tools that are well integrated into provider workflow, such as alerts and computerised clinical decision support, can improve best practice prophylaxis use and prevent patient harm resulting from VTE.

40

BACKGROUND: Venous thromboembolism prophylaxis has been recommended for nonsurgical patients, but its effectiveness remains uncertain.

PURPOSE: To assess the benefits and harms of prophylaxis in hospitalized adult medical patients and those with acute stroke.

DATA SOURCES: MEDLINE and the Cochrane Library from 1950 through April 2011, reference lists, and study authors.

STUDY SELECTION: English-language randomized trials were included if they provided clinical outcomes and evaluated therapy with low-dose heparin or related agents or mechanical measures compared with placebo, no treatment, or other active prophylaxis in the target population.

DATA EXTRACTION: Two independent investigators extracted data on study characteristics and clinical outcomes up to 120 days after randomization. The primary outcome was total mortality.

DATA SYNTHESIS: In medical patients, heparin prophylaxis did not reduce total mortality but did result in fewer pulmonary embolisms (PES) (odds ratio [OR], 0.69 [95% CI, 0.52 to 0.90], but with evidence of publication bias) and an increase in all bleeding events (risk ratio [RR], 1.34 [CI, 1.08 to 1.66]). Heparin prophylaxis had no statistically significant effect on any outcome in patients with acute stroke except for an increase in major bleeding events (OR, 1.66 [CI, 1.20 to 2.28]). When trials of medical patients and those with stroke were considered together (18 studies; 36,122 patients), heparin prophylaxis reduced the incidence of PE (OR, 0.70 [CI, 0.56 to 0.87]; absolute reduction, 3 events per 1000 patients treated [CI, 1 to 5 events]) but increased the incidence of all bleeding (RR, 1.28 [CI, 1.05 to 1.56]) and major bleeding events (OR, 1.61 [CI, 1.23 to 2.10]), with an absolute increase of 9 bleeding events per 1000 patients treated (CI, 2 to 18 events), 4 of which were major (CI, 1 to 7 events). A reduction in total mortality approached statistical significance (RR, 0.93 [CI, 0.86 to 1.00]; P = 0.056; absolute decrease, 6 deaths per 1000 patients treated [CI, 0 to 11 deaths]). No statistically significant differences in clinical outcomes were observed in the 14 trials that compared unfractionated heparin with low-molecular-weight heparin. No improvements in clinical outcomes were seen in the 3 studies of mechanical prophylaxis in patients with stroke, but more patients had lower-extremity skin damage (RR, 4.02 [CI, 2.34 to 6.91]) - an increase of 39 events per 1000 patients treated (CI, 17 to 77 events).

LIMITATION: Non-English-language studies were not included, but these were few and small.

CONCLUSION: Heparin prophylaxis had no significant effect on mortality, may have reduced PE in medical patients and all patients combined, and led to more bleeding and major bleeding events, thus resulting in little or no net benefit. No differences in benefits or harms were found according to type of heparin used. Mechanical prophylaxis provided no benefit and resulted in clinically important harm to patients with stroke.

PRIMARY FUNDING SOURCE: American College of Physicians.

Objective: To provide an overview of venous thromboembolism (VTE) prevention strategies, including a review of current quality initiatives. Methods: A review of relevant journal articles and web sites related to VTE prevention and risk assessment was conducted. Results: VTE is a major source of morbidity and mortality world-wide and considered to be the most common preventable cause of hospital death. Evidence-based consensus guidelines on thromboembolic prophylaxis have been available internationally for decades, yet VTE prophylaxis is often underutilized or inappropriately used. Recommendations for VTE prophylaxis include early ambulation or education for low-risk patients and pharmacologic prophylaxis using anticoagulants for moderate-or high-risk patients. Mechanical prophylaxis measures are recommended for patients at high risk of bleeding as they are not eligible for pharmacologic prophylaxis. Systems approaches to improving VTE prophylaxis have been developed, and agencies have established quality measures to improve care of this condition. Conclusion: Health care organizations should ensure that all hospitalized patients receive VTE risk assessment upon admission and after a major event and that appropriate interventions for VTE prevention are taken. An evaluation of processes used in the assessment and prevention of VTE and subsequent clinical outcomes should be integrated with quality improvement and patient safety measures.


Prevention of venous thromboembolism (VTE) is often overlooked in clinical practice, despite being a frequent and serious complication of various medical conditions and surgical procedures. The need to reduce hospital-acquired VTE is becoming increasingly recognized in the United States, and various quality-improvement initiatives have been developed. Prevention of VTE through evidence-based, practice-informed pathways includes assessing the patient’s risk of VTE and provision of VTE at different stages: at admission, during hospitalization, and after hospital discharge. A multidisciplinary approach, involving physicians working with pharmacists, nurses, and other staff, can ensure that VTE prevention is routinely addressed. Patients admitted to hospitals should undergo VTE risk assessment, and the appropriate dose, type, and duration of medication should be administered with regular monitoring for VTE events and bleeding complications. Venous thromboembolism risk assessment should continue throughout hospitalization with appropriate prophylaxis when necessary. Patients may need to continue anticoagulation into the outpatient setting to achieve adequate prophylaxis duration. Useful approaches to ensure successful transition of care include patient education and support, with the accurate and timely transfer of information from the hospital to the primary care physician. Various strategies and tools are available to help physicians establish good VTE practices at each stage, including risk assessment models, reminders, clinical decision support systems, educational programs, and online resources, such as those from the Society of Hospital Medicine. Effective use of these strategies by physicians, with the engagement and support of nurses and pharmacists, should help to improve current practices and to reduce the considerable burden of VTE.

Background Quality improvement (QI) initiatives characterised by iterative cycles of quantitative data analysis do not readily explain the organisational determinants of change. However, the integration of sociotechnical theory can inform more effective strategies. Our specific aims were to (1) describe a computerised decision support intervention intended to improve adherence with deep venous thrombosis (DVT) prophylaxis recommendations; and (2) show how sociotechnical theory expressed in ‘Fit between Individuals, Task and Technology’ framework (FITT) can identify and clarify the facilitators and barriers to QI work.

Methods A multidisciplinary team developed and implemented electronic menus with DVT prophylaxis recommendations. Stakeholders were interviewed and human factors were analysed to optimise integration. Menu exposure, order placement and clinical performance were measured. Vista tool extraction and chart review were used. Performance compliance pre-implementation was 77%. Results There were 80–110 eligible cases per month. Initial menu use rate was 20%. After barriers were classified and addressed using the FITT framework, use improved 50% to 90%. Tasks, users and technology issues in the FITT model and their interfaces were identified and addressed. Workflow styles, concerns about validity of guidelines, cycle times and perceived ambiguity of risk were issues identified.

Conclusions DVT prophylaxis in a surgical setting is fraught with socio-political agendas, cognitive dissonance and misaligned expectations. These must be sought and articulated if organisations are to respond to internal resistance to change. This case study demonstrates that QI teams using information technology must understand the clinical context, even in mature electronic health record environments, in order to implement sustainable systems.


Venous thromboembolism (VTE) prophylaxis is under-utilized in Asia because of the misconception that its incidence is lower in Asians as compared to the Caucasians. The available data on VTE in Asia is limited due to the lack of well-designed multicenter randomized controlled trials as well as non-standardized research designs, making data comparison difficult. Emerging data indicates that the VTE incidence is not low in Asia, and is comparable to that reported in the Western literature in some instances. There is also a trend towards increasing incidence of VTE, as demonstrated by a number of hospital-based studies in Asia. This could be attributed to lifestyle changes, ageing population, increasing awareness of VTE and wider availability of Duplex ultrasound. The risk of VTE in hospitalized patients remain the same in Asians and Caucasians, even though there may be factors that are inherent to patients in Asia that influence the slight variation in incidence. The utilization rate of VTE prophylaxis remains suboptimal in Asia. The Asian Venous Thrombosis Forum (AVTF) comprises participants from various countries such as China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand and experts from Australia and Europe. The forum evaluated the available data on VTE from the Asian region and formulated guidelines tailored to meet the needs of the region. We recommend that serious considerations are given to VTE prophylaxis especially in the at-risk group and a formal hospital policy be established to facilitate the implementation. On admission to the hospital, we recommend assessing the patients for both VTE and bleeding risk. We recommend mechanical prophylaxis for patients at increased risk of bleeding and utilizing it as an adjunctive measure in combination with pharmacological prophylaxis in patients with high risk of VTE. For patients undergoing general or gynecological surgery and with moderate risk for VTE, we recommend prophylaxis with one of the following: low dose unfractionated heparin (LDUH), low molecular weight heparin (LMWH), fondaparinux or intermittent pneumatic compression (IPC). For the same group of patients at high risk of VTE, we recommend pharmacological or combination of pharmacological and mechanical prophylaxis. For patients undergoing major orthopedic surgeries like total hip replacement, total knee replacement and
proximal hip fracture surgery, we recommend using one of the following: LMWH, fondaparinux, rivaroxaban, apixaban, edoxaban, dabigatran, warfarin or aspirin with IPC. For patients admitted to the hospital with acute medical illness and has moderate risk of VTE, we recommend prophylaxis with LDUH, LMWH or Fondaparinux. For the same group at high risk of VTE, we recommend combination of pharmacological and mechanical prophylaxis.

108

Introduction: Venous thromboembolism prevention during critical illness is a widely-used quality metric. The purpose of this systematic review was to evaluate the efficacy and safety of heparin thromboprophylaxis in medical-surgical patients in the intensive care unit (ICU). Hypothesis: Heparin will be effective at preventing DVT and PE in the ICU, as in other settings. LMWH will be more effective than UFH at preventing PE. Methods: We searched EMBASE, MEDLINE, the Cochrane Controlled Trials Register, clinicaltrials.gov and personal files to May 2012. We included randomized trials in adult medical-surgical ICU patients comparing any heparin thromboprophylaxis to another approach, evaluating deep vein thrombosis (DVT), pulmonary embolism (PE), major bleeding or mortality. In triplicate we abstracted trial characteristics, outcomes and risk of bias. Results: Seven trials involved 7226 patients. Any heparin thromboprophylaxis compared to placebo reduced rates of DVT (pooled risk ratio [RR] 0.51; 95% CI, 0.41, 0.63; P<0.0001; I²=77%) and PE (RR 0.52; 95% CI 0.28, 0.97; P=0.04; I²=0%), but not symptomatic DVT (RR 0.86; 95% CI 0.59, 1.25; P=0.43). Major bleeding (RR 0.82; 95% CI 0.56, 1.21; P=0.32; I²=50%) and mortality (RR 0.89; 95% CI 0.78, 1.02; P=0.09, I²=0%) rates were similar. Compared to unfractionated heparin (UFH), low molecular weight heparin (LMWH) reduced rates of PE (RR 0.62; 95% CI 0.39, 1.00; P=0.05; I²=53%) and symptomatic PE (RR 0.58; 95% CI 0.34, 0.97; P=0.04) but not DVT (RR 0.90; 95% CI 0.74, 1.08; P=0.26; I²=0%), symptomatic DVT (RR 0.87; 95% CI 0.60, 1.25; P=0.44; I²=0%), major bleeding (RR 0.97; 95% CI 0.75, 1.26; P=0.83; I²=0%), or mortality (RR 0.93; 95% CI 0.82, 1.04; P=0.20; I²=31%). Some inferences are limited by heterogeneity and imprecision. Conclusions: In medical-surgical ICU patients, heparin thromboprophylaxis significantly decreases DVT and PE risk, and LMWH significantly decreases PE risk compared to UFH. Anticoagulant thromboprophylaxis does not affect bleeding or mortality rates.

30

Deep vein thrombosis may be a complication of extended length hospital stays. Immobilized patients, such as patients in the postoperative period, are at particularly high risk of developing a deep vein thrombosis, which can be associated with high levels of morbidity and mortality. Due to this, prevention of deep vein thrombosis is of great importance in the inpatient setting. Compression stockings have proven to play an important role in prophylaxis and may be used in their knee-length or thigh-length variety. Although randomized trials have studied the efficacy of both varieties in prevention of deep vein thrombosis, selection is often made without regard to evidence. This meta-analysis pools the findings of current studies comparing knee-length and thigh-length compression stockings for deep vein thrombosis prophylaxis. A fixed effects model was used for this study with a two-sided alpha-error less than 0.05 considered to be statistically significant. When both varieties of compression stockings are compared, thigh-length stockings offer a risk reduction in deep vein thrombosis development when compared with knee-length (odds ratio 1.197, confidence interval 0.983-1.458). This, however, is an insignificant finding. This analysis concludes that current data does
not favor either thigh-length or knee-length compression stockings when it comes to prophylaxis of deep vein thrombosis.


Purpose: To provide recommendations about prophylaxis and treatment of venous thromboembolism (VTE) in patients with cancer. Prophylaxis in the outpatient, inpatient, and perioperative settings was considered, as were treatment and use of anticoagulation as a cancer-directed therapy. Methods: A systematic review of the literature published from December 2007 to December 2012 was completed in MEDLINE and the Cochrane Collaboration Library. An Update Committee reviewed evidence to determine which recommendations required revision. Results: Forty-two publications met eligibility criteria, including 16 systematic reviews and 24 randomized controlled trials. Recommendations: Most hospitalized patients with cancer require thromboprophylaxis throughout hospitalization. Thromboprophylaxis is not routinely recommended for outpatients with cancer. It may be considered for selected high-risk patients. Patients with multiple myeloma receiving antiangiogenesis agents with chemotherapy and/or dexamethasone should receive prophylaxis with either low-molecular weight heparin (LMWH) or low-dose aspirin. Patients undergoing major cancer surgery should receive prophylaxis, starting before surgery and continuing for at least 7 to 10 days. Extending prophylaxis up to 4 weeks should be considered in those with high-risk features. LMWH is recommended for the initial 5 to 10 days of treatment for deep vein thrombosis and pulmonary embolism as well as for long-term (6 months) secondary prophylaxis. Use of novel oral anticoagulants is not currently recommended for patients with malignancy and VTE. Anticoagulation should not be used for cancer treatment in the absence of other indications. Patients with cancer should be periodically assessed for VTE risk. Oncology professionals should provide patient education about the signs and symptoms of VTE. © 2013 by American Society of Clinical Oncology.


Introduction.: Venous thromboembolism (VTE) is comprised of deep vein thrombosis (DVT) and pulmonary embolism (PE). VTE is a common cause of serious morbidity and mortality associated predominantly with hospitalization. The concept of "preventable" DVT has recently emerged in the medical literature. VTE remains the number one cause of preventable death in hospitalized patients. To date, VTE costs at a United States (US) national level for total costs, hospital-acquired costs, and "preventable" hospital-acquired costs have not yet been well-defined. Recently, investigators have defined US annual total, hospital-acquired, and preventable DVT costs ranged from $7.5 to $39.5 billion, $5 to $26.5 billion, and $2.5 to $19.5 billion, respectively, in 2010 US dollars. When a multi-way sensitivity analysis was applied, taking into consideration higher incidence rates and costs, annual US total, hospital-acquired, and "preventable" DVT costs ranged from $9.8 to $52 billion, $6.8 to $36 billion, and $3.4 to $27 billion, respectively. In addition, it was estimated that the US annual prophylaxis cost of at-risk patients is less than $600 million per year. PE costs have not yet been defined within the US. Defining PE costs would allow for definition of total US VTE costs on an annual basis. Methods.: The authors undertook a thorough research review to identify morbidities, incident rates of morbidities, costs of morbidities and incidences of death associated with PE. Identified references were then hand-searched to ensure no pertinent publications had been overlooked. A
A decision tree and cost model were developed to estimate the United States healthcare costs for PE, total hospital-acquired PE, and total “preventable” PE. The decision tree contains probability information on: PE's that are hospital-acquired or community-acquired; fatal vs. non-fatal; readmissions; VTE recurrence; minor bleed; major bleed; heparin induced thrombocytopenia; chronic thromboembolic pulmonary hypertension; and resolution of symptoms. Based on the decision tree, a cost model with calculations performed via Microsoft Office Excel was developed. The cost model contains all potential outcomes, representing all branches, to reflect all possible outcomes for a PE patient. The product of each outcome’s probabilities and costs yields the average cost of a patient going down that respective path of the PE decision tree. Similarly, each branch contains a sum that reflects the average cost of a patient in that branch. 

Results: Preliminary estimates of US annual direct total, hospital-acquired, and preventable PE costs are likely to range (at a minimum) from $5 to $27 billion, $2.5 to $18 billion, and $2.1 to $15.4 billion, respectively, in 2010 US dollars. Indirect costs, primarily from death due to PE, are estimated to be a minimum of $19.5 billion per year with approximately $11 billion per year of this being “preventable.” A multi-way sensitivity analysis will be applied which will take into consideration higher incidence rates and costs. Final results of the cost analysis, with the multi-way sensitivity analysis will be presented. Preliminary estimates suggest minimum total annualized, direct, VTE costs of approximately $12.5 to $66 billion per year with a minimum of $4.6 to $34.9 billion per year being “preventable.” When factoring in the indirect costs of $11 billion per year, minimum, “preventable” VTE costs within the US appear to range from $15.6 to $45.9 billion per year. Final results of the cost analysis with the multi-way sensitivity analysis will be presented. Conclusions: Considerable savings and reduced morbidity and mortality could be realized if improved prevention rates were achieved and systems were implemented throughout the US. To date, US VTE costs have been underestimated. The DVT and PE cost models may be applied to estimate costs in the European Union and other countries. VTE prophylaxis is cost effective and may be a good target for healthcare savings with healthcare reform on the horizon. Mandating VTE quality measures, such as those from the Joint Commission and National Quality Forum, would expedite reducing health care costs and reduce unnecessary morbidity and mortality.


Background: National costs for venous thromboembolism (VTE) have been defined for the United States (US). However, overall costs for the full 27 member European Union (EU-27) have not yet been derived. Aims: To calculate the direct medical costs and indirect costs of VTE within the EU-27 as a cost-of-illness model. To identify total, hospital-acquired and preventable costs associated with VTE within the EU-27. Methods: Investigators defined and conducted an a priori literature search to identify any diagnosis- or treatment-related costs for deep vein thrombosis (DVT), pulmonary embolism (PE), or VTE from 1994 to September 2012 within the EU-27. Identified publication references were also hand-searched to capture other applicable cost studies. Two investigators independently reviewed the literature search results. High and low inpatient, outpatient and recurrent DVT and PE costs were abstracted as well as high and low costs for minor and major bleeding, pulmonary hypertension, post-thrombotic syndrome, heparin-induced thrombocytopenia, VTE prophylaxis, and the cost of a premature death. Appropriate cost sources were available from 2006 to the end of the literature review. All costs were categorized and converted to 2012 Euros taking into consideration country-specific inflation and purchasing power parities. Costs were then input into previously published US decision-analytic cost models that were pre-populated with accepted probabilities. Naess’ et al. 2007 recent Norwegian PE and DVT incidence rates were used for lower estimates while the VTE Impact Assessment Group in Europe’s (VITAE) (Cohen et al. 2007) prevalence (long-term attack) rates were used for high estimates. The population utilized was 502.5
million focusing on the 424.11 million that were 15 years or older in the EU-27 as of January 1, 2011. Lower and higher median costs for each category were utilized to populate the base and sensitivity analysis. The average patient’s cost, the expected value of all decision tree pathways’, were multiplied by low and high annual PE and DVT incident events to determine cost ranges. Hospital-acquired costs were estimated at 67-75% of total costs, and preventable costs were estimated at 50-75% of the hospital-acquired costs based off of current literature. Results: In the base model, annual total, hospital-acquired, and preventable VTE costs ranged from 2.0 to 3.6, 1.4 to 2.4, and 0.7 to 1.8 billion, respectively. In the sensitivity analysis utilizing higher costs and probabilities, annual total, hospital acquired and preventable VTE costs ranged from 7.6 to 13.7, 5.5 to 10.0, and 2.8 to 7.5 billion, respectively. Results of additional sensitivity analyses will also be presented. Conclusions: VTE costs in the EU-27 are significant although these costs appear less than US costs primarily due to less expensive individual direct medical costs. Approximately 0.7 to 7.5 billion/year could be avoided if improved intervention systems were in place within the EU-27. The preventable costs compare to $4.5 to $39.3 Billion (2011 US$) in the US. Use of VTE prophylaxis for at-risk patients is cost-effective in both the EU-27 and US.


Background: Critically ill patients are at high risk of developing venous thromboembolism during their stay in the intensive care unit (ICU) because of premorbid medical and surgical conditions. Little is known about the clinical course of this disease in the ICU setting. We hypothesized that both undetected and clinically evident VTE would affect the prognosis of critically ill patients. Purpose: To systematically review whether a diagnosis of DVT in critically ill patients affects clinically important outcomes including length of stay, duration of mechanical ventilation and mortality. Material and Methods: MEDLINE and EMBASE databases were searched up to June 2010. Studies were selected if evaluate one or more of the following outcomes: hospital and ICU mortality, duration of patient stay in hospital and in ICU, and duration of mechanical ventilation. Pooled results are reported as relative risk (RR) and mean difference and are presented with 95% confidence interval (CI) and with 2-sided P values. Statistical heterogeneity was evaluated using the I² statistic. Results: Six studies for a total of 1518 patients were included in the systematic review. Patients diagnosed with DVT compared to those without DVT had increased ICU and hospital stay 7.3 days (95% CI 1.4-13.2; P = 0.02) and 16.5 days (95% CI 1.51-30.59; P = 0.03), respectively. Duration of mechanical ventilation appeared to be increased in patients with DVT although this difference was not statistically significant (weighted mean difference: 3.41 days 95% CI 1.12- 7.94; P = 0.14). Patients diagnosed with DVT also had a marginally significant increase in the RR of hospital mortality (RR 1.31 95%CI, 0.99-1.74, P = 0.06), and a non statistically significant increase in the RR of ICU mortality (RR 1.96; 95% CI 0.74-5.19; P = 0.17). (Table presented) Conclusions: A diagnosis of DVT upon ICU admission appears to affect clinically important outcomes including length of ICU and hospital stay and hospital mortality.


Background. Critically ill patients appear to be at high risk of developing deep vein thrombosis (DVT) and pulmonary embolism during their stay in the intensive care unit (ICU). However, little is known about the clinical course of venous thromboembolism in the ICU setting. We therefore evaluated, through a systematic review of the literature, the available data on the impact of a diagnosis of DVT on hospital and ICU stay, duration of mechanical ventilation and mortality in critically ill patients. We
also tried to determine whether currently adopted prophylactic measures need to be revised and improved in the ICU setting. Materials and methods. MEDLINE and EMBASE databases were searched up to week 4 of June 2012. Two reviewers selected studies and extracted data. Pooled results are reported as relative risks and weighted mean differences and are presented with 95% confidence intervals (CI). Results. Seven studies for a total of 1,783 patients were included. A diagnosis of DVT was frequent in these patients with a mean rate of 12.7% (95% CI: 8.7-17.5%). DVT patients had longer ICU and hospital stays compared to those without DVT (7.28 days; 95% CI: 1.4-13.15; and 11.2 days; 95% CI: 3.82-18.63 days, respectively). The duration of mechanical ventilation was significantly increased in DVT patients (weighted mean difference: 4.85 days; 95% CI: 2.07-7.63). DVT patients had a marginally significant increase in the risk of hospital mortality (relative risk 1.31; 95% CI: 0.99-1.74; p=0.06), and a not statistically significant increase in the risk of ICU mortality (RR 1.64; 95% CI: 0.91-2.93; p=0.10). Conclusions. A diagnosis of DVT upon ICU admission appears to affect clinically important outcomes including duration of ICU and hospital stay and hospital mortality. Larger, prospective studies are warranted.

Objective The evidence base supporting the use of graduated compression stockings (GCS) for venous thromboembolism (VTE) prevention has been challenged, and there appears to be a lack of evidence for the additional benefit of GCS to pharmacologic thromboprophylaxis. This study aimed to summarize and quality assess the existing evidence concerning whether GCS offer a significant benefit in addition to pharmacologic thromboprophylaxis in surgical inpatients. Methods A systematic review of published literature was performed. Inclusion criteria were (1) randomized controlled trials (RCTs), (2) surgical inpatients, (3) study arms examining prophylactic-dose pharmacologic thromboprophylaxis alone or in conjunction with GCS, and (4) outcome of VTE. Results In the review, 1025 articles were screened, of which 27 RCTs were included. Six RCT study arms included patients with GCS in conjunction with pharmacologic thromboprophylaxis, whereas 22 RCT study arms included patients treated with pharmacologic thromboprophylaxis alone. One RCT had both of its study arms included in the systematic review. The total number of patients that received pharmacologic thromboprophylaxis alone was 12,481. Of these patients, 1292 (10.4%) suffered VTE. The total number of patients that received GCS in conjunction with pharmacologic thromboprophylaxis was 1283. Of these patients, 75 had VTE (5.8%). Heterogeneity analysis demonstrated that the results of included study arms were significantly heterogeneous, precluding a valid summation analysis. Conclusions The additional benefit of GCS to pharmacologic thromboprophylaxis in surgical inpatients is not clear on the basis of existing data. Further clinical trials directly evaluating this clinical question are recommended.

Purpose: Vascular thrombosis(VT) and vascular thrombo-embolism (VTE) can occur in patients with inflammatory bowel disease (IBD). VT includes arterial thrombosis and venous thrombosis; VTE includes arterial thromboembolism and venous thromboembolism e.g pulmonary embolism. We evaluated the literature on VT and VTE in IBD cases and performed qualitative meta-analysis (QMA) in these cases. Methods: A PubMed search using the terms vascular thrombosis,vascular thrombo-embolism,arterial thrombosis,venous thrombosis arterial thromboembolism,venous thromboembolism,pulmonary embolism,inflammatory bowel disease, ulcerative colitis (UC) and
Crohn’s Disease (CD) was performed without time or language barrier. To facilitate QMA, summary sheets of all the papers were created. QMA was performed using the well-established methods of Qualitative Research e.g. Diagramming, Theme Repetition Without Serious Contradiction, Theme Saturation and Investigator Reflexivity (Eval Rev 1985;9:627-643, The Lancet 2001;385:483-488). Quantitative data can be used to perform QMA. Results: The search yielded 52,855 cases of IBD who had VT and/or VTE. There were 26,777 cases of UC (50.9%) and 26,078 cases of CD (49.1%). There were 24,608 (46.5%) men and 28,247 (53.5%) women. The mean age was 28.4 (range 14-80) years. The incidence of VT and VTE in IBD was 3.0% (range 0.8-10.5), which is higher than that found in control population (1.1%). The incidence of VT and VTE in UC was 4.2% (range 3.3-10.5); it was 1.8% (range 0.8-2.8) in CD patients. The sites of VT and VTE included deep veins in extremity, iliac, femoral, renal, mesenteric, jugular, retinal, portal, hepatic (Budd-Chiari) veins and intracranial sinuses. The arteries involved were peripheral, renal, mesenteric, coronary, aorta (including Takayasu Disease), external and int carotids, retinal and cerebral. The conditions which predisposed to VT and VTE were active disease, hospitalization, operations, as obstetric complications (in women), use of steroids, malnutrition, concurrent cancer, liver diseases and dyslipidemia. The possible mechanism for increased VT and VTE in IBD are thrombocytosis, inherited thrombophilia (due to factor V leiden, prothrombin gene mutation), malnutrition-induced homocysteinemia, increased factor VIII, fibrinogen, decreases in anti-thrombin III, role of protein C, protein S, tpa and lupus anticoagulant. There may be mutual interaction between inflammation and coagulation. VT and VTE may be a disease-specific extraintestinal manifestation of IBD. Conclusion: VT and VTE are more common in IBD compared to the control population; this is especially true in cases of UC. In IBD patients, unusual sites of VT and VTE should be recognized for early intervention. A program of prophylaxis in these cases needs to be evaluated.


BACKGROUND: Hospital-associated nonsurgical venous thromboembolism (VTE) is an important problem addressed by new guidelines from the American College of Physicians (ACP) and American College of Chest Physicians (AT9).

METHODS: Narrative review and critique.

RESULTS: Both guidelines discount asymptomatic VTE outcomes and caution against overprophylaxis, but have different methodologies and estimates of risk/benefit. Guideline complexity and lack of consensus on VTE risk assessment contribute to an implementation gap. Methods to estimate prophylaxis benefit have significant limitations because major trials included mostly screening-detected events. AT9 relies on a single Italian cohort study to conclude that those with a Padua score >4 have a very high VTE risk, whereas patients with a score <4 (60% of patients) have a very small risk. However, the cohort population has less comorbidity than US inpatients, and over 1% of patients with a score of 3 suffered pulmonary emboli. The ACP guideline does not endorse any risk-assessment model. AT9 includes the Padua model and Caprini point-based system for nonsurgical inpatients and surgical inpatients, respectively, but there is no evidence they are more effective than simpler risk-assessment models.

CONCLUSIONS: New VTE prevention guidelines provide varied guidance on important issues including risk assessment. If Padua is used, a threshold of 3, as well as 4, should be considered. Simpler VTE risk-assessment models may be superior to complicated point-based models in environments without sophisticated clinical decision support. Copyright © 2013 Society of Hospital Medicine.
Pregnancy is a risk factor for venous thromboembolism (VTE), an important cause of maternal morbidity and mortality. Although there is a 4–5-fold increased risk compared to that of nonpregnant women of the same age, the absolute risk is low at no more than two episodes of VTE per 1000 pregnancies. There is uncertainty about which women require thromboprophylaxis during pregnancy or postpartum because of a lack of data from appropriate clinical trials. For this reason, recommendations for prophylaxis should be made only after explaining the available evidence to the patient and taking into account her perception of the balance of risk and benefit in thromboprophylaxis. The aim of these recommendations is to provide clinicians with practical advice to assist in decisions regarding thromboprophylaxis in women considered to be at risk of VTE during pregnancy and the postpartum. The authors are clinicians from across New Zealand and Australia representing the fields of haematology, obstetric medicine, anaesthesiology, maternal–fetal medicine and obstetrics. Authors were invited to review the relevant literature and then worked collaboratively to devise recommendations and resolve areas of controversy. The recommendations contained herein were reached by consensus and represent the opinion of the panel. The absence of randomised clinical trials in this area limits the strength of evidence that can be used, and it is acknowledged that they represent level C evidence. The panel advocates for appropriate clinical studies to be carried out in this patient population to address the inadequacy of present evidence.
BACKGROUND Despite safe and cost-effective venous thromboembolism (VTE) prevention measures, VTE prophylaxis rates are often suboptimal. Healthcare reform efforts emphasize transparency through programs to report performance and payment incentives through pay-for-performance programs. OBJECTIVE To sequentially examine an individualized physician dashboard and pay-for-performance program to improve VTE prophylaxis rates among hospitalists. DESIGN Retrospective analysis of 3144 inpatient admissions. After a baseline observation period, VTE prophylaxis compliance was compared during both interventions. SETTING A 1060-bed tertiary care medical center. PARTICIPANTS Thirty-eight part-time and full-time academic hospitalists. INTERVENTIONS A Web-based hospitalist dashboard provided VTE prophylaxis feedback. After 6 months of feedback only, a pay-for-performance program was incorporated, with graduated payouts for compliance rates of 80% to 100%. MEASUREMENTS Prescription of American College of Chest Physicians’ guideline-compliant VTE prophylaxis and subsequent pay-for-performance payments. RESULTS Monthly VTE prophylaxis compliance rates were 86% (95% confidence interval [CI]: 85–88), 90% (95% CI: 88–93), and 94% (95% CI: 93–96) during the baseline, dashboard, and combined dashboard/pay-for-performance periods, respectively. Compliance significantly improved with the use of the dashboard (P = 0.01) and addition of the pay-for-performance program (P = 0.01). The highest rate of improvement occurred with the dashboard (1.58%/month; P = 0.01). Annual individual physician performance payments ranged from $53 to $1244 (mean $633; standard deviation ±$350). CONCLUSIONS Direct feedback using dashboards was associated with significantly improved compliance, with further improvement after incorporating an individual physician pay-for-performance program. Real-time dashboards and physician-level incentives may assist hospitals in achieving higher safety and quality benchmarks. Journal of Hospital Medicine 2015;10:172–178. © 2014 Society of Hospital Medicine

Moretto P, Park J, Rodger M, Gal G and Carrier M. A survey of thrombosis experts evaluating practices and opinions regarding venous thromboprophylaxis in patients with active cancer hospitalized with an acute medical illness. Thrombosis Journal. 2015;13 (1) (no pagination)(10) Background: Current clinical practice guidelines recommend the use of prophylactic doses of low molecular weight heparins for cancer patients requiring hospitalization for acute medical illness. However, a recently published meta-analysis suggested that the risk-benefit ratio of current thromboprophylaxis regimens administered to all cancer patients admitted for medical illness is unclear. We sought to assess the clinical equipoise in using thromboprophylaxis for hospitalized medically ill cancer patients. Methods: An electronic survey was conducted. The target sample included Thrombosis experts and members of Thrombosis Canada or the VECTOR research group. Results: The survey was distributed 54 participants. The final response rate was 67% (36/54). The majority (75%; 95% CI: 60.3 to 85%) of responders indicated that the benefits of pharmacological parenteral thromboprophylaxis outweigh the risks. However, 63.9% (95% CI: 50.6 to 77.3%) believe that there is still clinical equipoise around the use of thromboprophylaxis in this patient population, and 88.9% (95% CI: 77.3 to 95.8%) would consider participating in a randomized trial-30.6% and 58.3% in a placebo-controlled or comparison of different agents/dosing-controlled randomized trial, respectively. For participants who would consider a randomized-controlled trial comparing different doses of thromboprophylaxis agents, the MCID was 2% between the two arms. The most common drug to be compared was enoxaparin (26%), and the two suggested doses were 30 mg and 40 mg SC twice daily. Conclusions: Our clinical survey of thrombosis experts confirms that there is equipoise regarding the use of current regimens of parenteral pharmacological thromboprophylaxis in medically ill cancer patients. A majority of physicians would participate in a randomized-controlled trial comparing different dose of LMWH. The MCID in the risk of VTE identified was 2%.

OBJECTIVES: Orthopedic surgery has been associated with significant risk of developing deep vein thrombosis (DVT). The objective of this study was to estimate the cost-effectiveness of thromboprophylaxis therapies for prevention of DVT associated in patients undergoing hip surgery from an institutional perspective (Mexican Social Security Institute, IMSS). METHODS: Economic and health consequences of thromboprophylaxis were assessed through a six-state Markov model (one-year time horizon, one-week cycles). Effectiveness measure was reduction in DVT (per 1000 patients). Effectiveness was estimated by local meta-analysis. Doses of alternatives compared were: warfarin (basecase, 5 mg/30d); dalteparin (not listed in Mexican formulary, 5000 IU/day/30d); acenocoumarol (4 mg/day/30d); enoxaparin (40 mg/day/30d); nadroparin (5700 IU/day/30d) and unfractionated heparin (UFH) plus warfarin (10 000 IU/day/10d+warfarin 5 mg/day/20d). No prophylaxis was assessed too. Resource use and unit costs were extracted from IMSS databases (dalteparin cost was provided by the manufacturer). Costs included outpatient and inpatient services, medication costs, imaging and laboratory tests. Univariate sensitivity analysis was performed. Acceptability curves were constructed. RESULTS: DVT cases per alternative were: warfarin 61 (95% CI 60-62); dalteparin 33 (32-34); acenocoumarol 80 (78-82); enoxaparin 57 (56-58); nadroparin 67 (66-68); no prophylaxis 212 (205-219) and UFH 229 (223-235). Per patient annual cost (2011 US$) were: warfarin $3071.34 ($3049.23-$3093.44); dalteparin $2980.42 ($2958.14-$3002.71); acenocoumarol $2966.93 ($2940.92-$2992.94); enoxaparin $3668.54 ($3631.18-$3705.90); nadroparin $3291.15 ($3260.60-$3321.70); no prophylaxis $3466.68 ($3407.63-$3525.73) and UFH $3356.00 ($3311.59-$3400.41). Warfarin was dominated by dalteparin, Dalteparin is cost-saving, compared to enoxaparin, nadroparin, UFH and no prophylaxis. Regarding warfarin, ICER (per DVT case avoided) of enoxaparin and acenocoumarol resulted in $149.30 ($146.24-$152.36) and $5.49 ($5.38-$5.61), respectively. Acceptability curves showed that results were robust. CONCLUSIONS: At IMSS, dalteparin would be a cost-saving or cost-effective therapy for thromboprophylaxis in patients undergoing hip surgery.

46


OBJECTIVES: This article aims to review the evidence implicating inflammatory bowel disease (IBD) as a risk factor for the development of venous thromboembolic events (VTEs), as well as to highlight additional risk factors and preventative and treatment strategies relating to the VTEs in IBD patients. METHODS: Medline and Embase databases were systematically searched and all original articles pertaining to VTEs in IBD patients were evaluated for suitability of content and methodology. RESULTS: Multiple large studies have demonstrated that IBD patients have a 1.5- to 3.5-fold higher risk of incurring VTEs when compared with non-IBD patients. A large population-based study showed that IBD activity is associated with the development of VTEs. Although the greatest relative increase in the risk of VTEs with disease activity was observed in ambulatory IBD patients, hospitalized IBD patients had a markedly higher baseline risk of VTEs than ambulatory patients. Among VTE-related hospitalizations, the presence of IBD was associated with a 2.5-fold increased risk of mortality in one population-based study. No studies have specifically evaluated the potential benefit of VTE prophylaxis in hospitalized or ambulatory IBD patients. Studies to date do not support an increased bleeding risk with moderate doses of anticoagulant medications in IBD patients with active disease. CONCLUSIONS: IBD patients are at an increased risk of sustaining VTEs and may be at an increased risk of VTE-related mortality when compared with non-IBD patients. IBD activity is an independent risk factor for VTE development. Future large prospective studies are required to better assess risk factors, health outcomes, and prevention strategies associated with the development of VTEs in IBD patients.


INTRODUCTION: Studies have established a relationship between inflammation and venous thromboembolism (VTE). Though statins modulate inflammation, it is uncertain if they prevent VTE in heterogeneous populations. A recent randomized trial demonstrated that statins prevent VTE in healthy older adults, yet this has not been well established in other groups, including younger individuals and individuals with comorbidities. The objective of this meta-analysis was to estimate the effect of statins on VTE in a heterogeneous group of adults.

METHODS: We systematically reviewed the effect of statins in preventing VTE in adult inpatients and outpatients. We systematically searched MEDLINE (1966-Jan 2010), EMBASE (1980-Jan 2010), Google Scholar, Cochrane Library, PapersFirst, ProceedingsFirst, and ISI Web of Science, manually reviewed references, and contacted experts. Observational studies that compared any dose of statin to no statin or placebo, examined inpatients or outpatients, and assessed VTE, pulmonary embolism, and/or deep vein thrombosis were included. Study selection, data abstraction and study quality evaluation (using the Newcastle-Ottawa Scale) were independently conducted in duplicate.

RESULTS: Four cohort studies and four case-control studies met criteria. Comparing statins to control, the odds ratio for VTE was 0.67 (95% confidence interval 0.53, 0.84), and for deep vein thrombosis was 0.53 (95% confidence interval 0.22, 1.29). The association was attenuated in lower-quality studies and studies enrolling older individuals.

CONCLUSIONS: Further well-designed trials are needed to evaluate the risks and benefits of statins in preventing VTE in heterogeneous populations of adults, identify high-risk subgroups, and analyze cost-effectiveness of statin use for this indication. Copyright © 2011 Elsevier Ltd. All rights reserved.


Extended venous thromboembolism prophylaxis (EVTEP) with low-molecular weight heparin such as enoxaparin for 28 days following surgery for cancer significantly reduces venous thromboembolic events compared to a standard 6-10 day course. National Institute of Clinical Excellence (NICE) guidelines suggest EVTEP should be offered to patients undergoing colorectal cancer surgery. Local EVTEP prescribing and monitoring guidelines in a busy inner city teaching hospital colorectal surgery
unit, were devised to ensure NICE guidelines are followed. Adherence to local EVTEP guidelines was recorded through a retrospective audit of patients undergoing elective colorectal cancer surgery during February 2011 (n=19). Prospective re-audit cycles were undertaken during April-May (n=17) and September-December 2012 (n=17). The first audit cycle revealed that overall standards were not being met with just 11% of ‘at risk’ patients being correctly identified in pre-operative assessment clinic and continued low adherence to guidelines on the ward with only 44% of patients being prescribed EVTEP at discharge. Following each audit cycle, educational interventions were directed towards the multi-disciplinary team involved in the care of patients undergoing colorectal cancer surgery. This involved education of the team members regarding EVTEP, presentation of the audit results with instruction for improvement. Results of the second and third audit cycles showed improvements in guideline adherence with 100% of patients in these cohorts having been prescribed EVTEP at discharge. Marked improvements were also seen in the correct identification of ‘at risk’ patients, patient education in pre-operative assessment clinic, and warning of potential side-effects. This project has shown a significant global improvement in EVTEP-related patient care and adherence to local guidelines following education of the multi-disciplinary team involved, which consequently reduced the risk of venous thromboembolism within this patient cohort.


Introduction: The American College of Physician recommends pharmacologic prophylaxis with heparin or a related drug for venous thromboembolism (VTE) in hospitalized patients unless the assessed risk for bleeding outweighs benefits. Apixaban is an orally active, selective, and direct inhibitor of factor Xa, approved for VTE prevention outside United States. The purpose of this meta-analysis was to compare the efficacy and safety of apixaban versus enoxaparin. Hypothesis: The rate of bleeding events in patients receiving apixaban is lower than those receiving LMWH for VTE prophylaxis. Methods: We performed a comprehensive search in PubMed, Cochrane Library, MEDLINE, EMBASE, and abstracts presented at national meetings. Two reviewers abstracted all the information and a tie breaker resolved discrepancies. We used R (R Meta package v 0.8-2) for analysis. The odds ratio (OR) with 95% confidence intervals (CI) were calculated using random effect model by DerSimonian and Laird. Results: We reviewed a total of 406 abstracts of which 148 studies were selected for full review. We abstracted for analysis 5 studies involving 12,867 patients (apixaban, n=6,448; LMWH, n=6,419). VTE prophylaxis was given after total knee replacement in 3 studies, total hip replacement in 1 study, and to acutely ill medical patients in 1 study. Heterogeneity among the studies precluded a pooled analysis of bleeding likelihood; however, apixaban was associated with lower bleeding events than LMWH when used after total knee replacement (OR=0.55, 95% CI 0.31-0.95;I²=0; p=0.58). Based on pooled estimate across the studies, apixaban was not better than LMWH in preventing pulmonary embolism (OR=1.19, 95% CI 0.51-2.76; I²=38.8%; p=0.16). Conclusion: In the setting of total knee replacement, apixaban is associated with a lower incidence of bleeding. The superiority of apixaban in primary prevention of PE is not yet proven. (Figure Presented).


Background: Venous thromboembolism [VTE] is the second highest cause of mortality among patients with cancer. However, pharmacological thromboprophylaxis for patients with solid tumor is only recommended during hospitalization. Primary outpatient thromboprophylaxis is not a widely accepted practice. Objective: Determine safety and efficacy of outpatient primary VTE prophylaxis in
patients with solid tumors. Data sources: A systematic review was conducted using MEDLINE and EMBASE up to June 2012. Key search words included venous thromboembolism, malignancy, anticoagulants, and chemotherapy. Studies were considered for our meta-analysis if they included outpatient primary pharmacological thromboprophylaxis in adult patients with active solid cancer. All the information was independently reviewed by 2 of the authors [MP, SJ] and a third reviewer resolved discrepancies. The measure of association was calculated with R (R: A Language and Environment for Statistical, R Development Core Team, www.R-project.org), R META package (Version 0.8-2, Author: Guido Schwarzer). The Q statistic was calculated and a formal test of homogeneity was conducted. Random-effects model was preferred in case of heterogeneity.

Results: A total of 1371 abstracts were reviewed and 29 manuscripts were fully abstracted. Eight randomized controlled trials including 6706 patients were analyzed. There were less VTE events with outpatient prophylaxis: odds ratio [OR] of 0.53 (95% CI, 0.40-0.70). Six studies used low or ultra-low molecular weight heparin and two studies used warfarin. In the subgroup analysis of heparin based primary prophylaxis, there was a significant reduction in VTE events [OR 0.47, 95% CI, 0.34-0.64], no significant heterogeneity [FIG 1]. In addition, there was no difference in major bleeding events between groups [OR 1.48, 95% CI, 0.89-2.46]. Five studies reported mortality data; there was significant heterogeneity between studies. Conclusions: Heparin based outpatient VTE prophylaxis in patients with solid tumors reduced by half the risk of VTE with no significant differences in major bleeding events. The current publications do not allow a meaningful grouped analysis of survival data, improved patient selection is necessary in order to adequately target VTE prevention strategies. (Figure presented).

29

OBJECTIVE: To review the current literature on the risk of venous thromboembolism (VTE) in patients with chronic liver disease (CLD).

DATA SOURCES: Literature was accessed through MEDLINE/PubMed (1996-December 2011) using the search terms liver disease, cirrhosis, venous thromboembolism, deep vein thrombosis, and pulmonary embolism.

STUDY SELECTION AND DATA EXTRACTION: Relevant observational and population-based studies were included to present background information. Bibliographies of all relevant articles were reviewed for additional citations.

DATA SYNTHESIS: Liver disease affects the synthesis of procoagulants and anticoagulants, resulting in hemostatic alterations and abnormal laboratory values. Retrospective studies characterized the VTE incidence to be 0.5-6.3%. Population-based studies reported VTE relative risks of 1.74-2.10 in patients with CLD compared with population controls and VTE odds ratios of 0.9-1.39 for hospitalized patients with CLD compared with controls without liver disease. There is a paucity of data on the use of pharmacologic prophylaxis in patients with CLD.

CONCLUSIONS: Patients with CLD should be assessed for VTE risk and given VTE prophylaxis when the benefits outweigh the risks. Diagnoses of CLD or elevated international normalized ratio do not confer protection against development of VTE and do not justify withholding pharmacologic prophylaxis based on this diagnosis.

10

Venous thromboembolism is a major source of morbidity and mortality in the United States. The American College of Chest Physicians Antithrombotic Guidelines, 9th edition, includes a large number of clinical practice recommendations regarding the diagnosis, treatment, and prevention of
Venous thromboembolism (VTE) has a significant clinical and social impact due to its high incidence and significant rate of recurrence. Due to these aspects, the approach to VTE should include an accurate primary prevention of events and, on the other hand, an effective treatment, based on the stratification of patients according to their thrombotic risk. To this purpose, researches have been prompted to create clinically-relevant risk assessment models (RAMs) for hospitalized patients which include the main thrombotic risk factors and should provide a guidance to physicians to identify those patients at higher risk who may benefit from mechanical and/or pharmacological prophylaxis. The evaluation of the thrombotic risk is crucial also in the field of secondary VTE prevention, in order to identify patients who need long-term anticoagulation, after the three-month standard treatment. Over the last years, clinical trials and meta-analyses have identified male sex, site of VTE, residual vein obstruction and D-dimer levels after anticoagulation withdrawal as the main risk factors for VTE recurrence so this items were included, at varying extents, in the currently available prediction algorithms.


Description: The American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on prophylaxis of venous thromboembolism for hospitalized nonsurgical patients (medical patients and patients with acute stroke). Methods: This guideline is based on published literature on the topic from 1950 through April 2011 that was identified by using MEDLINE, the Cochrane Library, and reference lists of pertinent randomized trials and systematic reviews to identify additional reports. Searches were limited to randomized trials and English-language publications. The primary outcome for this guideline was total mortality up to 120 days after randomization. Secondary outcomes included symptomatic deep venous thrombosis; all pulmonary embolisms; fatal pulmonary embolism; all bleeding events; major bleeding events; and, for mechanical prophylaxis, effects on skin. This guideline grades the evidence and recommendations by using the ACP's clinical practice guidelines grading system. Recommendation 1: ACP recommends assessment of the risk for thromboembolism and bleeding in medical (including stroke) patients prior to initiation of prophylaxis of venous thromboembolism (Grade: strong recommendation, moderate-quality evidence). Recommendation 2: ACP recommends pharmacologic prophylaxis with heparin or a related drug for venous thromboembolism in medical (including stroke) patients unless the assessed risk for bleeding outweighs the likely benefits (Grade: strong recommendation, moderate-quality evidence). Recommendation 3: ACP recommends against the use of mechanical prophylaxis with graduated compression stockings for prevention of venous thromboembolism (Grade: strong recommendation, moderate-quality evidence). Policy Implication: ACP does not support the application of performance measures in medical (including stroke) patients that promotes universal venous thromboembolism prophylaxis regardless of risk. © 2011 American College of Physicians.
Background-Thrombosis is the common pathology underlying ischemic heart disease, ischemic stroke, and venous thromboembolism (VTE). The Global Burden of Disease Study 2010 (GBD 2010) documented that ischemic heart disease and stroke collectively caused 1 in 4 deaths worldwide. GBD 2010 did not report data for VTE as a cause of death and disability. Objective. To review the literature on the global burden of disease caused by VTE. Approach and Results - We performed a systematic review of the literature on the global disease burden because of VTE in low-, middle-, and high-income countries. Studies from Western Europe, North America, Australia, and Southern Latin America (Argentina) yielded consistent results with annual incidences ranging from 0.75 to 2.69 per 1000 individuals in the population. The incidence increased to between 2 and 7 per 1000 among those aged >70 years. Although the incidence is lower in individuals of Chinese and Korean ethnicity, their disease burden is not low because of population aging. VTE associated with hospitalization was the leading cause of disability-adjusted life-years lost in low- and middle-income countries, and second in high-income countries, responsible for more disability-adjusted life-years lost than nosocomial pneumonia, catheter-related blood stream infections, and adverse drug events. Conclusions - VTE causes a major burden of disease across low-, middle-, and high-income countries. More detailed data on the global burden of VTE should be obtained to inform policy and resource allocation in health systems and to evaluate whether improved use of preventive measures will reduce the burden.

Background: Patients undergoing major abdominal surgery are at high risk of postoperative venous thromboembolism (VTE). The efficacy and safety of thromboprophylaxis (TP) with low molecular weight heparin (LMWH) administered during the in-hospital period has been proven in several clinical studies. Accordingly, LMWHs are recommended during the in-hospital period. However, clinical studies have shown that patients remain at risk of VTE complications even after hospital discharge. Aims: In order to clarify the role of prolonged TP with LMWH after abdominal surgery, we performed a systematic review of all randomized clinical trials, assessing the efficacy and safety of prolonged TP with LMWH after abdominal surgery. Methods: Electronic searches were performed in the Medline, Embase, Lilacs and the Cochrane Library databases. The most recent search was performed in November 2012. We assessed both randomized and non-randomized controlled clinical trials comparing prolonged LMWH prophylaxis with TP during the in-hospital period only. The patient population in the trials included patients undergoing major abdominal or pelvic surgery for malignant diseases. The outcome measures included symptomatic and asymptomatic cases of VTE, as assessed by objective tests. Safety outcomes were defined as bleeding complications and mortality within 3 months after surgery. Results: Our search revealed five studies which met the inclusion criteria and were included in the meta-analysis. The total number of patients undergoing curative or palliative surgery for malignant disease was 1210. All studies used bilateral ascending venography to evaluate the VTE end-point. All patients received LMWH during the in-hospital period usually for 1 week, and were then randomized.
to receive an additional 3-week treatment with LMWH or placebo/control. The venography was performed 30 +/- 5 days after surgery. The administration of prolonged TP significantly reduced the incidence of overall VTE compared to in-hospital administration of TP by 50% (14.0% vs. 7.0%), leading to an OR of 0.46 (95% CI, 0.31-0.68; P < 0.0001). Also the incidence of proximal DVT was significantly reduced from 4.4% to 0.8% (OR 0.20; 95% CI 0.08-0.50; P = 0.0006). There was no significant difference in the incidence of major bleeding complications (OR 1.3; 95% CI, 0.69-2.50). The number needed to treat in order to prevent one episode of the end points was 14 patients for all VTE and 28 for proximal DVT. The overall mortality was comparable in the two groups (4.7% in the treatment group and 4.1% in the control group), with OR 1.21 (95% CI, 0.73 - 1.99; P = 0.46).

Summary/Conclusions: This meta-analysis provides further compelling evidence in support of extending the administration of LMWH for up to 4 weeks after operation in patients undergoing major abdominal or pelvic surgery for malignant diseases. The strong reduction in both asymptomatic and clinically relevant major VTE events, which can be achieved by prolonging LMWH in low doses for a few additional weeks beyond the hospital stay, is not offset by bleeding complications.


Background: VTE is a common complication of hospitalization and is associated with significant morbidity and mortality. The use of appropriate thromboprophylaxis can significantly reduce the risk of VTE but remains underutilized. In England, a comprehensive approach to VTE prevention was launched in 2010. This study aimed to evaluate the impact of the implementation of the national program in a single center.

Methods: A prospective quality improvement program was established at King’s College Hospital NHS Foundation Trust in 2010. The multidisciplinary thrombosis team launched mandatory documented VTE risk assessment and updated thromboprophylaxis guidance. Root cause analysis of hospital-associated thrombosis (HAT) was implemented to identify system failures, enable outcome measurement, and facilitate learning to improve VTE prevention practice. The key outcomes were the incidence of HAT and the proportion of events preventable with appropriate thromboprophylaxis.

Results: Documented VTE risk assessment improved from <40% to >90% in the first 9 months. Four hundred twenty-five episodes of HAT were identified over 2 years. A significant reduction in the incidence of HAT was observed following sustained achievement of 90% risk assessment (risk ratio, 0.88; 95% CI, 0.74-0.98; P = .014). The proportion of HAT attributable to inadequate thromboprophylaxis fell significantly from 37.5% to 22.4% (P = .005).

Conclusions: Mandatory VTE risk assessment can significantly reduce preventable HAT and thereby improve patient safety.


Background: Studies previously reported the prevalence of incidental pulmonary embolism (PE) in patients having CT scans for reasons other than PE investigation. A subsequent meta-analysis of these studies found a mean prevalence of incidental PE of 2.6% (CI 1.9-3.4). Further retrospective review has elucidated the mean prevalence of abdominal vein Deep vein thrombosis as 1.74% (CI 1.29-2.34). We recently reported incidental VTE events from a 900 bed teaching hospital, with numerous tertiary services, as 1.64% (55 of 3358 scans) over 2011. The three most common VTE risk factors were Age, > 60 year (85%), active cancer (76%) and significant medical co morbidity (36%). Other associated information was the prevalence of Hospital Acquired Thrombosis (HAT) and the reason for CT scanning. The mortality associated with these diagnoses was 39 of 55 (71%), occurring
a mean of 120 days after diagnosis, with 12 month mortality of 36 of 55 (65%). Aims: Data has been collected for the last 3 years on incidental VTE events, to see if the prevalence, risk factors and association with HAT changed over that time. Also, to compare incidental findings pick-up rate with those scans that were targeted to investigation for VTE and to compare mortality. Methods: The hospital radiology reporting system (CRIS) has been reviewed retrospectively, to determine incidental VTE diagnoses in CT scans of chest, abdomen and pelvis (or combination there of). This information was cross-checked with the hospital patient administration system (PIMS) to identify whether the patient event qualified as HAT. Results: The incidental VTE prevalence rates for 2010, 2011 and 2012 were 76 of 6079 (1.25%), 55/3358 (1.64%) and 57/4914 (1.16%), for non-VTE targeted CT scans. HAT events were 28%, 20% and 33% respectively, yielding prevalence for HAT incidental findings of 0.34%, 0.33% and 0.39%. The pick-up rates for all VTE targeted investigations for the same periods were: 640/3819 (16.8%), 751/4660 (16.1%) and 738/4818 (15.3%). For HAT events, the targeted CT scan pick-up rates were: 31%, 31% and 27%. The most prevalent risk factors for incidental findings in 2010, 2011 & 2012 are: age > 60 years: 78%, 85% and 91% respectively, Cancer: 68%, 76%, 67% and serious medical comorbidity: 32%, 36%, 30%. The overall mortality for incidental VTE events is: 57/76 (75%) from 2010, 39/55 (71%) from 2011 and 29/57 (51%) for 2012, giving 12 month mortality rates of 63% for 2010 and 65% for 2011. The three most common reasons for CT scanning, in order were: staging for cancer, further investigation for abnormal findings on previous scans and unexplained weight loss, for all 3 years. Summary: As expected, this radiology outcome data identifies incidental VTE to be relatively low prevalence, when compared to targeted scans for VTE. Twelve month mortality associated with incidental VTE (63% and 65%) is significantly greater than published data related to all cause VTE events (15%). This is not surprising, acknowledging the high mortality associated with cancer the second most common risk factor.

82

Background: Shoulder arthroplasty (SA) is a common orthopaedic procedure that is being performed on a more and more frequent basis. Venous thromboembolism (VTE) as a complication has received little attention when it occurs after SA. The literature lacks a comprehensive summary of the incidence, risk factors, and prophylaxis of VTE in this population of patients. Methods: Literature on VTE after SA has been identified from 5 scientific databases: EMBASE, MEDLINE, Web of Science, CINAHL, and Cochrane. All primary full-text articles reporting at least 1 case of deep vein thrombosis or pulmonary embolism after SA were included. Articles were critically appraised and systematically analyzed to determine the incidence, risk factors, thromboprophylaxis, diagnosis, and management of VTE after SA. Results: This study included 14 articles. The reported incidence of VTE after SA was 0.2% to 16.0%. The most serious risk factors for development of VTE included history of VTE, thrombophilia, major surgery, advanced age, current malignant disease, immobility, and bed confinement. Diagnosis was typically determined by duplex scan and chest computed tomography scan. VTE prophylaxis was used in 6 (43%) of the included studies, with the ideal method of prophylaxis unknown. Conclusions: Although variability exists in the reported incidence of VTE, surgeons should still be aware of the potential for this serious complication after SA. We recommend assessing the risk factors and estimating the VTE risk status for all patients undergoing SA. The ideal method of prophylaxis for this population of patients remains unknown and should be investigated in future high-quality clinical studies. © 2013 Journal of Shoulder and Elbow Surgery Board of Trustees.

157
This study’s purpose was to describe compliance with established venous thromboembolism (VTE) prophylaxis guidelines in medical and surgical inpatients at US academic medical centers (AMCs). Data were collected for a 2007 University HealthSystem Consortium Deep Vein Thrombosis/Pulmonary Embolism (DVT/PE) Benchmarking Project that explored VTE in AMCs. Prophylaxis was considered appropriate based on 2004 American College of Chest Physicians guidelines. A total of 33 AMCs from 30 states participated. In all, 48% of patients received guideline-directed prophylaxis—59% were medical and 41% were surgical patients. VTE history was more common among medical patients with guideline-directed prophylaxis. Surgical patients admitted from the emergency department and with higher illness severity were more likely to receive appropriate prophylaxis. Despite guidelines, VTE prophylaxis remains underutilized in these US AMCs, particularly among surgical patients. Because AMCs provide the majority of physician training and should reflect and set care standards, this appears to be an opportunity for practice and quality improvement and for education.


BACKGROUND: Duration of thromboprophylaxis beyond hospital discharge for medically ill patients has been controversial. Therefore an evaluation was made of the evidence currently available. METHODS: A search was made of the Pub Med, CENTRAL and EMBASE databases for randomized controlled trials from 1966 through to 2011. Interventions included thromboprophylaxis administered over an extended period in patients hospitalized for acute medical illness with decreased level of mobility. No differentiation was made for the medication used for individual
studies. The comparator included standard medical therapy and/or placebo. The efficacy outcomes assessed were a composite of asymptomatic and symptomatic deep vein thromboses (DVT), pulmonary emboli (PE) and venous thromboembolism (VTE)-related deaths in the intervention group vs. the comparator group, as well as the safety outcomes evaluated with rates of bleeding events at the end of at least 30 days of follow-up. The methodological quality of the studies was assessed, as was publication bias. Event rates were compared using a forest plot of relative risk (RR; 95% confidence interval (CI)) using a random effects model (Mantel-Haenszel) between the active thromboprophylaxis and controls. Statistical analysis was carried out with Review Manager V5.1.

RESULTS: Three recent studies were included. Extended duration thromboprophylaxis reduced the combined composite event rate, RR 0.75 (0.64, 0.88). However, individual clinical endpoints were not significantly improved with extended prophylaxis: asymptomatic proximal DVT, RR 0.85 (0.68, 1.05); symptomatic DVT, RR 0.44 (0.19, 1.00); symptomatic non-fatal PE, RR 0.80 (0.43, 1.48); VTE-related death, RR 0.64 (0.38, 1.10). However, bleeding events were far more prevalent with extended thromboprophylaxis with major bleeds, RR 2.68 (1.78, 4.05), with a number needed to harm of 194.

CONCLUSION: Currently available evidence does not indicate that routine administration of post-discharge prophylaxis will be beneficial to the patients admitted for medical illness.


Venous thromboembolism (vte) is a serious, life-threatening complication of cancer. Anticoagulation therapy such as low molecular weight heparin (lmwh) has been shown to treat and prevent vte. Cancer therapy is often complex and ongoing, making the management of vte less straightforward in patients with cancer. There are no published Canadian guidelines available to suggest appropriate strategies for the management of vte in patients with solid tumours. We therefore aimed to develop a clear, evidence-based guideline on this topic. A systematic review of clinical trials and meta-analyses published between 2002 and 2013 in PubMed was conducted. Reference lists were hand-searched for additional publications. The National Guidelines Clearinghouse was searched for relevant guidelines. Recommendations were developed based on the best available evidence. In patients with solid tumours, lmwh is recommended for those with established vte and for those without established vte but with a high risk for developing vte. Options for lmwh include dalteparin, enoxaparin, and tinzaparin. No one agent can be recommended over another, but in the setting of renal insufficiency, tinzaparin is preferred. Unfractionated heparin can be used under select circumstances only (that is, when rapid clearance of the anticoagulant is desired). The most common adverse event is bleeding, but major events are rare, and with appropriate follow-up care, bleeding can be monitored and appropriately managed. © 2014 Multimed Inc.


Background: Venous thromboembolism is a prevalent and avoidable complication of hospitalization among patients hospitalized with trauma, traumatic brain injury, burns, or liver disease; patients on antiplatelet therapy, obese or underweight patients, those having obesity surgery, or with acute or chronic renal failure. Objectives: To systematically review the comparative effectiveness and safety of pharmacological and mechanical methods of prophylaxis of VTE in these special populations. Methods: We conducted a systematic review and metaanalysis. We searched MEDLINE, EMBASE, SCOPUS, CINAHL, www.clinicaltrials.gov, International Pharmaceutical Abstracts (IPA), and the Cochrane Library in July 2012. Two reviewers evaluated studies for eligibility, serially abstracted data
using standardized forms, and independently evaluated the risk of bias in the studies and strength of evidence for major outcomes and comparisons. We qualitatively synthesized the evidence and also pooled the relative risks from the controlled studies. We included RCTs and controlled observational studies of pharmacologic agents, and uncontrolled observational studies and case series of inferior vena cava filter use. Results: After a review of 30,902 unique citations, we included 102 studies of which just eight were trials. The majority of observational studies had a high risk of bias. The strength of evidence is low that IVC filter placement is associated with a lower incidence of PE and fatal PE in hospitalized patients with trauma compared to no IVC filter placement. The strength of evidence is low that enoxaparin reduces DVT and that UFH reduces mortality in patients with TBI when compared to patients without anticoagulation. Low grade evidence supports that IVC filters with usual care are associated with increased mortality and do not decrease the risk of PE in patients undergoing bariatric surgery compared to usual care alone. All other comparisons had insufficient evidence to permit conclusions. Conclusions: Our comparative effectiveness review demonstrates that there is a paucity of high quality evidence to inform treatment of these special populations.


Neck of femur (NOF) fractures are a major public health concern because of the ageing population and higher incidence of fragility fractures. NOF fractures are associated with high mortality and morbidity rates, and there is a high risk of venous thromboembolism (VTE) after hip fractures (Ref 1). Therefore thromboprophylaxis is vital. Current NICE guidelines advocate 28 – 35 days of thromboprophylaxis after NOF fractures (Ref 1, 2). It came to our attention that patients post NOF fixation were getting variable prescriptions in regards to their thromboprophylaxis. Therefore a retrospective study on prescription of thromboprophylaxis was conducted from October 2012 to February 2013 within the trauma and orthopaedics department at Queens Hospital, Romford. Data was collected on all NOF fractures from electronic discharge summaries. Basic descriptive statistics were used to analysis the data. There were 110 cases of NOF fractures during this period. 100 patients were included since two were discounted as they were already on long term anticoagulants and eight patients died in hospital. No thromboprophylaxis was prescribed for 15 patients (15%). Three patients (3%) were prescribed less than 28 days (mean 14 days, range (14 – 14 days)). 69 patients (69%) received 28 - 35 days of thromboprophylaxis, whilst five patients (5%) received more than 35 days (mean 42 days, range 40 – 42 days). Formal departmental teaching and presentation of the findings was given after the initial study and a small label with the message, ‘POST NOF #: 28-35 days Enoxaparin’, was attached to the back of all the junior doctor work phones. After the intervention, data was collected from the period of 7th of January to 7th of February 2013. The second study showed that 50 patients were admitted with NOF fractures in this time period. Four patients died in hospital and three patients were discounted as they were on Warfarin. Two patients were not prescribed thromboprophylaxis (5%). 34 (79%) patients received 28 - 35 days, whereas seven patients (16%) received 42 days of thromboprophylaxis. The older patients with multiple comorbidities and reduced mobility are at high risk of developing thromboembolism post NOF fixation. Our initial study identified inadequate prescription of thromboprophylaxis post NOF fractures. After introduction of simple measures such as the reminder label attached to phones, our repeat study found that there was improvement in prescription rates. Our study highlights that simple measures can increase awareness and improve patient safety.


Background: Prevention of venous thromboembolism (VTE) in cancer patients remains controversial in most clinical settings. Purpose: The Italian Society for Haemostasis and Thrombosis (SISET) commissioned a project to develop clinical practice guidelines for the prevention of VTE in patients with malignancy. Methods: Key questions concerning the prevention of VTE in patients with malignancy were formulated by a multidisciplinary working group consisting of experts in clinical medicine and research. After a systematic review and discussion of the literature, recommendations were formulated and graded according to the supporting evidence. For those questions for which the literature search did not find any definitive answers (due to absence of evidence, low quality evidence and/or contradictory evidence), a formal consensus method was used instead to issue clinical recommendations. Results: The search for "VTE prevention" resulted in 1021 citations; 69 articles were selected and 24 were used for drafting clinical recommendations. Four areas were graded A to C: 1) Need of prevention (pharmacological and/or mechanical) in cancer patients undergoing major abdominal or pelvic surgery and in 2) those with an acute medical disease requiring hospitalization and who are bedridden. Avoid prevention in 3) cancer patients with a central venous catheter and 4) those on chemotherapy, radiotherapy or hormonal therapy, except patients with multiple myeloma treated with thalidomide/lenalidomide plus high-dose dexamethasone, and those with gastrointestinal or lung cancer. Six areas were considered to be clinically important, but lacked evidence from the literature and thus required a formal consensus (grade D): 1) need of prevention during chemotherapy or hormonal therapy in patients with previous VTE; 2) optimal duration of pharmacological prevention in patients who are hospitalized/bedridden for acute medical illness; 3) optimal duration of pharmacological prevention in patients undergoing major surgery other than abdominal and pelvic; 4) optimal duration of pharmacological prevention in myeloma patients receiving thalidomide plus dexamethasone; 5) presence of cerebral metastasis as a contraindication to pharmacological prevention; 6) prevention in cancer patients undergoing surgery by laparoscopic procedures lasting > 30 min. Conclusion: Results of the systematic literature review and an explicit approach to consensus techniques have led to recommendations for the most clinically important issues in the prevention of VTE in cancer patients. © 2012 Elsevier Ltd. All rights reserved.


2

Spencer A, Cawood T, Frampton C and Jardine D. Heparin-based treatment to prevent symptomatic deep venous thrombosis, pulmonary embolism or death in general medical inpatients is not supported by best evidence. Internal Medicine Journal. 2014;44(11):1054-65. Prevention of venous thromboembolism (VTE) in medical patients is controversial. In contrast to surgical patients, the evidence supporting the use of heparin-based treatment for prevention of VTE (HVTEp) may not justify current guidelines. This study aims to determine whether current clinical guidelines for HVTEp are appropriate for medical patients. We searched medical databases for original randomised placebo-controlled studies of HVTEp in medical patients, excluding those with stroke and in intensive care. From 401 potentially relevant studies, we selected eight, which included over 16000 patients. HVTEp decreased the incidence of all deep venous thromboses (DVT): 4.3% in the placebo group versus 2.3% in the treatment group, P = 0.002, number needed to treat, 50. However, this treatment effect was not seen for symptomatic DVT: 1.2% versus 0.9%, P = 0.18,
odds ratio (OR) 0.72 (0.45-1.16). Similarly, HVTEp did not decrease the incidence of pulmonary embolism (PE): 0.54% versus 0.27%, P = 0.3, OR 0.57 (0.21-1.53), or fatal PE: 0.1% versus 0.0%, P = 0.3, OR 0.2 (0.01-4.11). Furthermore, HVTEp did not decrease total mortality: 5.63% versus 5.39%, P = 0.92, OR 0.96 (0.78-1.18). The use of HVTEp in hospitalised general medical patients does not result in a significant reduction in symptomatic DVT, PE, fatal PE or total mortality. The best evidence does not support the recommendations of the current clinical guidelines. Copyright © 2014 The Authors; Internal Medicine Journal © 2014 Royal Australasian College of Physicians.


Formalised risk assessment models (RAMs) for venous thromboembolism (VTE) using weighted and scored variables have only recently been widely incorporated into international antithrombotic guidelines. Scored and weighted VTE RAMs have advantages over a simplified group-specific VTE risk approach, with the potential to allow more tailored strategies for thromboprophylaxis and an improved estimation of the risk/benefit profile for a particular patient. The derivation of VTE RAMs should be based on variables that are a priori defined or identified in a univariate analysis and the predictive capability of each variable should be rigorously assessed for both clinical and statistical significance and internal consistency and completeness. The assessment of the RAM should include the goodness of fit of the model and construction of a prognostic index score. Any VTE RAM which has been derived must undergo validation of that model before it can be used in clinical practice. Validation of the model should be performed in a "deliberate" prospective fashion across several diverse clinical sites using pre-defined criteria using basic standards for performing model validation. We discuss the basic concepts in the derivation of recent scored and weighted VTE RAMs in hospitalised surgical and medical patients and cancer outpatients, the mechanisms for accurate external validation of the models, and implications for their use in clinical practice.


Cancer is associated with a four to sevenfold increased risk of venous thromboembolism (VTE). This risk is influenced by the site and extent of cancer and its treatment. Despite its availability, effective VTE prophylaxis is used in less than 50% of oncology patients. Pharmacologic VTE prophylaxis should be administered to all hospitalized medical and surgical oncology patients for the duration of their hospitalization or up to 10-14 days, whichever is longer. Extended duration (up to 4 weeks post-operation) VTE prophylaxis is recommended for high-risk surgical oncology patients. Routine use of prophylaxis in ambulatory medical oncology patients awaits prospective testing of VTE risk assessment models. Routine prophylactic dose anticoagulation to prevent central venous catheter (CVC) thrombosis is ineffective and not indicated. Low molecular weight heparin is the first line choice for acute and chronic therapy of VTE in cancer patients. Therapy should continue for at least 3 months or the duration of the malignancy, whichever is longer. Anticoagulation is indicated for at least 3 months or the duration of the catheter for CVC thrombosis. Preliminary data indicate that some cancer patients with pulmonary embolism may be managed as outpatients. Prospective validation of these studies and testing of current risk assessment strategies in oncology patients is warranted. Management of recurrent VTE and unsuspected VTE in the cancer patient are also reviewed.

Venous thromboembolism (VTE) is a common cause of potentially preventable mortality, morbidity, and increased medical costs. Risk-appropriate prophylaxis can prevent most VTE events, but only a small fraction of patients at risk receive this treatment.

**Design**
Prospective quality improvement programme.

**Setting**
Johns Hopkins Hospital, Baltimore, Maryland, USA.

**Strategies for change**
A multidisciplinary team established a VTE Prevention Collaborative in 2005. The collaborative applied the four step TRIP (translating research into practice) model to develop and implement a mandatory clinical decision support tool for VTE risk stratification and risk-appropriate VTE prophylaxis for all hospitalised adult patients. Initially, paper based VTE order sets were implemented, which were then converted into 16 specialty-specific, mandatory, computerised, clinical decision support modules.

**Key measures for improvement**
VTE risk stratification within 24 hours of hospital admission and provision of risk-appropriate, evidence-based VTE prophylaxis.

**Effects of change**
The VTE team was able to increase VTE risk assessment and ordering of risk-appropriate prophylaxis with paper based order sets to a limited extent, but achieved higher compliance with a computerised clinical decision support tool and the data feedback which it enabled. Risk-appropriate VTE prophylaxis increased from 26% to 80% for surgical patients and from 25% to 92% for medical patients in 2011.

**Lessons learnt**
A computerised clinical decision support tool can increase VTE risk stratification and risk-appropriate VTE prophylaxis among hospitalised adult patients admitted to a large urban academic medical centre. It is important to ensure the tool is part of the clinician’s normal workflow, is mandatory (computerised forcing function), and offers the requisite modules needed for every clinical specialty.

159

186

Sheikh Khalifa Medical City (SKMC) in Abu Dhabi is the main tertiary care referral hospital in the United Arab Emirates (UAE) with 560 bed capacity that is fully occupied most of the time. SKMC senior management has made a commitment to make quality and patient safety a top priority. Venous thromboembolism (VTE) risk assessment has been identified as a critical patient safety measure and key performance indicator. The electronic VTE risk assessment form a computerized decision support tool was introduced to improve adherence with deep venous thrombosis (DVT) prophylaxis recommendations. A multidisciplinary task force team was formed and led this quality improvement project. The purpose of this publication is to indicate the quality improvement interventions implemented to enhance compliance with VTE risk assessment and the outcomes of those interventions. We chose to conduct the pilot study in General Medicine as it is the busiest department in the hospital. The study period was from April 2014 till August 2015. The lessons learned were disseminated throughout the hospital. Our aim was to improve VTE risk assessment compliance by using the electronic form in order to ensure patient safety and reduce preventable harm. VTE risk assessment compliance improved in general medicine from 4% to 98%, and overall SKMC compliance from 21% to above 90%.

48
Objective: To evaluate the risks and benefits of extended-duration thromboprophylaxis (EDT) beyond hospitalization in acutely ill medical patients. Data Sources: PubMed was searched from inception (1946) through February 2015 for the search terms venous thrombosis/prevention and control, venous thromboembolism/prevention and control, anticoagulants, and aspirin. Study Selection and Data Extraction: Relevant clinical trials evaluating pharmacologic strategies for EDT were screened for inclusion. Bibliographies of articles were extensively reviewed for additional sources. Data Synthesis: Three studies, and one additional subgroup analysis, were identified for inclusion. Enoxaparin and rivaroxaban demonstrated a significant reduction in venous thromboembolism (VTE) with EDT, but the benefit with enoxaparin was limited to the highest risk groups and women. The improved efficacy in both studies was accompanied by a ~2.5-fold increase in risk of major hemorrhage. Apixaban was unable to demonstrate a reduction of VTE and was also associated with a significant increase in bleeding. Conclusions: EDT should not be routinely provided to all medically ill patients. It may be considered in patients at the highest risk for VTE, but careful consideration must be used due to the increased risk of bleeding.

105  Thirugnanam S, Pinto R, Cook DJ, Geerts WH and Fowler RA. Economic analyses of venous thromboembolism prevention strategies in hospitalized patients: A systematic review. Critical Care. 2012;16 (2)

Introduction: Despite evidence-based guidelines for venous thromboembolism prevention, substantial variability is found in practice. Many economic evaluations of new drugs for thromboembolism prevention do not occur prospectively with efficacy studies and are sponsored by the manufacturers, raising the possibility of bias. We performed a systematic review of economic analyses of venous thromboembolism prevention in hospitalized patients to inform clinicians and policy makers about cost-effectiveness and the potential influence of sponsorship.

Methods: We searched MEDLINE, EMBASE, Cochrane Databases, ACP Journal Club, and Database of Abstracts of Reviews of Effects, from 1946 to September 2011. We extracted data on study characteristics, quality, costs, and efficacy. Results: From 5,180 identified studies, 39 met eligibility and quality criteria. Each addressed pharmacologic prevention: low-molecular-weight heparins versus placebo (five), unfractionated heparin (12), warfarin (eight), one or another agents (five); fondaparinux versus enoxaparin (11); and rivaroxaban and dabigatran versus enoxaparin (two). Low-molecular-weight heparins were most economically attractive among most medical and surgical patients, whereas fondaparinux was favored for orthopedic patients. Fondaparinux was associated with increased bleeding events. Newer agents rivaroxaban and dabigatran may offer additional value. Of all economic evaluations, 64% were supported by manufacturers of a "new" agent. The new agent had a favorable outcome in 38 (97.4%) of 39 evaluations [95% confidence interval [CI] (86.5 to 99.9)]. Among studies supported by a pharmaceutical company, the sponsored medication was economically attractive in 24 (96.0%) of 25 [95% CI, 80.0 to 99.9]. We could not detect a consistent bias in outcome based on sponsorship; however, only a minority of studies were unsponsored.

Conclusion: Low-molecular-weight heparins and fondaparinux are the most economically attractive drugs for venous thromboembolism prevention in hospitalized patients. Approximately two thirds of evaluations were supported by the manufacturer of the new agent; such drugs were likely to be reported as economically favorable. © 2012 Fowler et al.; licensee BioMed Central Ltd.


Objective: Rates of venous thromboembolism as high as 58% have been reported after trauma, but there is no widely accepted screening protocol. If Medicare adds venous thromboembolism to the
list of “preventable complications,” they will no longer reimburse for treatment, which could have devastating effects on many urban centers. We hypothesized that prescreening with a risk assessment profile followed by routine surveillance with venous duplex ultrasound that could identify asymptomatic venous thromboembolism in trauma patients. Design: Prospective, observational trial with waiver of consent. Setting: Level I trauma center intensive care unit. Patients: At admission, 534 patients were prescreened with a risk assessment profile. Interventions: Patients (n = 106) with risk assessment profile scores >10 were considered high risk and received routine screening venous duplex ultrasound within 24 hrs and weekly thereafter. Results: In prescreened high-risk patients, 20 asymptomatic deep vein thrombosis were detected with venous duplex ultrasound (19%). An additional ten venous thromboembolisms occurred, including six symptomatic deep vein thrombosis and four pulmonary emboli, resulting in an overall venous thromboembolism rate of 28%. The most common risk factors discriminating venous thromboembolism vs. no venous thromboembolism were femoral central venous catheter (23% vs. 8%), operative intervention >2 hrs (77% vs. 46%), complex lower extremity fracture (53% vs. 32%), and pelvic fracture (70% vs. 47%), respectively (all p < .05). Risk assessment profile scores were higher in patients with venous thromboembolism (19 ± 6 vs. 14 ± 4, p = .001). Risk assessment profile score (odds ratio 1.14) and the combination of pelvic fracture requiring operative intervention >2 hrs (odds ratio 5.75) were independent predictors for development of venous thromboembolism. The rates of venous thromboembolism for no chemical prophylaxis (33%), unfractionated heparin (29%), dalteparin (40%), or inferior vena cava filters (20%) were not statistically different (p = .764). Conclusions: Medicare’s inclusion of venous thromboembolism after trauma as a “never event” should be questioned. In trauma patients, high-risk assessment profile score and pelvic fracture with prolonged operative intervention are independent predictors for venous thromboembolism development, despite thromboprophylaxis. Although routine venous duplex ultrasound screening may not be cost-effective for all trauma patients, prescreening using risk assessment profile yielded a cohort of patients with a high prevalence of venous thromboembolism. In such high-risk patients, routine venous duplex ultrasound and/or more aggressive prophylactic regimens may be beneficial.


We performed this meta-analysis to assess venous thromboembolism risk in patients with rheumatoid arthritis. A comprehensive search was performed in MEDLINE, EMBASE, and the Cochrane databases. Nine observational studies met our inclusion criteria and were included in the data analysis. The pooled risk ratios of deep venous thrombosis, pulmonary embolism, and venous thromboembolism in patients with rheumatoid arthritis (RA) compared with non-RA participants were 2.08 (95 % CI 1.75-2.47), 2.17 (95 % CI 2.05-2.31), and 1.96 (95 % CI 1.81-2.11), respectively. Subgroup analysis demonstrated a consistent increased risk in every study design (cohort, case-control, and cross-sectional). Our results indicate a significant increased risk of venous thromboembolism among patients with rheumatoid arthritis. © 2014 Clinical Rheumatology.


A significant proportion of the outcomes reported in trials assessing venous thromboembolism (VTE) prophylaxis in medical patients are related to asymptomatic events found on routine imaging studies. The implications of these events are controversial. Moreover, such trials did not always reflect the patient mix in today’s internal medicine departments. We summarized the evidence...
assessing the rate of symptomatic VTE events and the benefit of pharmacological prophylaxis in unselected medical patients, and formally evaluated the benefit versus risk of this intervention. We searched MEDLINE, EMBASE and CENTRAL until June 2011 for studies that prospectively followed cohorts of medical patients and assessed the rates of VTE, and randomized controlled trials reporting the effect of prophylaxis on these events, at 3 weeks and 3 months. Eight trials were included. The rates of symptomatic VTE were 0.69 and 3.7 % for short term and long term follow-up periods, respectively. In the interventional meta-analysis, the odds ratio (OR) for overall mortality and for symptomatic VTE at 3 weeks were 0.93 and 0.59, favouring intervention. The OR for major bleeding at 3 weeks was 2.0, favouring no intervention. None of these results were statistically significant. The number needed to treat to prevent one overt VTE event was 292, while the number needed to treat for an additional major bleeding was 336. In unselected medical patients, the rate of symptomatic VTE is lower than the reported overall VTE rate, and the benefit to risk ratio of pharmacological intervention for alleviating this condition in at-risk medical inpatient is questionable. Further specifying the population at risk for an overt VTE, and the clinical significance of asymptomatic events, is warranted. © 2012 Springer Science+Business Media, LLC.


After reports from observational studies suggesting an association between acutely ill medical patients and venous thromboembolism (VTE), interventional trials with anticoagulants drugs have demonstrated a significant reduction of VTE during and immediately after hospitalisation. Although several guidelines suggest the clinical relevance of reducing this outcome, there is a low tendency to use anticoagulants in patients hospitalised for acute medical illness. We speculated that such underuse may be dependent on a low perception that patients included in the trials are actually at risk of thromboembolism. Therefore, the aim of this study was to analyse the clinical settings included in the interventional trials and their relationship with thrombotic risk. Analysis of interventional trials revealed that the majority of patients included in the trials (about 80%) were affected by heart failure, acute respiratory syndrome or infections. Among these three illnesses, literature data shows an association with venous thrombosis only in patients with acute infections; this finding was, however, supported only by retrospective study. On the contrary, there is scarce or no evidence that heart failure and acute respiratory syndrome are associated with venous thrombosis. These data underscore the need of better defining the thrombotic risk profile of acutely ill medical patients included in interventional trials with anticoagulants.


"Each year over 25,000 people die from Venous Thromboembolism (VTE) contracted in hospital. This is more than the combined total of deaths from breast cancer, AIDS and traffic accidents”. (1) Orthopaedic patients are at particular risk of VTE. In 2011, the project team carried out an audit into compliance with national VTE assessment guidelines on all acute trauma and orthopaedic admissions during a two week period at a District General Hospital. The study demonstrated that compliance was initially low, but showed a large improvement following the implementation of
simple measures. The measures included: asking consultants to remind junior doctors, putting posters up in the trauma doctors office, asking nursing staff to check for a VTE assessment on admission to the ward, and putting reminders on the patient name board. The project team subsequently recommended an alteration to the hospital’s computer system to incorporate a check of VTE assessment and prophylaxis. A second assessment using the same methodology sought to assess whether the previous improvements were sustained and the impact of this computer system alteration. Overall, compliance with national VTE guidance improved further.


IMPORTANCE: Venous thromboembolism (VTE), comprising deep vein thrombosis (DVT) and pulmonary embolism (PE), is a common, potentially lethal condition with acute morbidity. OBJECTIVE: To review the etiology of VTE and the 3 phases of VTE treatment: acute (first 5-10 days), long-term (from end of acute treatment to 3-6 months), and extended (beyond 3-6 months). EVIDENCE REVIEW: Cochrane reviews, meta-analyses, and randomized controlled trials, as well as other clinical trials for topics not covered by the former, were reviewed. Literature searches using broad terms were used to find meta-analyses published in the last 15 years. The ninth edition of the American College of Chest Physicians Antithrombotic Therapy Guidelines was used to supplement the literature search. Guidelines from specialty organizations were consulted when relevant. The Canadian Agency for Drugs and Technologies in Health was searched for relevant cost-effectiveness studies. We also searched our own literature database of 8386 articles for relevant research.

FINDINGS: Low-molecular-weight heparin (LMWH) along with vitamin K antagonists and the benefits and proven safety of ambulation have allowed for outpatient management of most cases of DVT in the acute phase. Development of new oral anticoagulants further simplifies acute-phase treatment and 2 oral agents can be used as monotherapy, avoiding the need for LMWH. Patients with PE can also be treated in the acute phase as outpatients, a decision dependent on prognosis and severity of PE. Thrombolysis is best reserved for severe VTE; inferior vena cava filters, ideally the retrievable variety, should be used when anticoagulation is contraindicated. In general, DVT and PE patients require 3 months of treatment with anticoagulants, with options including LMWH, vitamin K antagonists, or direct factor Xa or direct factor IIa inhibitors. After this time, decisions for further treatment are based on balancing the risk of VTE recurrence, determined by etiology of the VTE (transient risk factors, unprovoked or malignancy associated), against the risk of major hemorrhage from treatment. Better prediction tools for major hemorrhage are needed. Experience with new oral anticoagulants as acute, long-term, and extended therapy options is limited as yet, but as a class they appear to be safe and effective for all phases of treatment. CONCLUSIONS AND RELEVANCE: The mainstay of VTE treatment is anticoagulation, while interventions such as thrombolysis and inferior vena cava filters are reserved for limited circumstances. Multiple therapeutic modes and options exist for VTE treatment with small but nonetheless important differential effects to consider. Anticoagulants will probably always increase bleeding risk, necessitating tailored treatment strategies that must incorporate etiology, risk, benefit, cost, and patient preference. Although great progress has been made, further study to understand individual patient risks is needed to make ideal treatment decisions. Copyright 2014 American Medical Association. All rights reserved.


The new factor Xa inhibitors and direct thrombin inhibitors have offered alternatives to traditional anticoagulants, with benefits of no routine monitoring, less drug interactions, and oral administration. Current approved uses of these agents include prophylaxis of stroke in non-valvular
atrial fibrillation and prevention of venous thromboembolism (VTE) following hip and knee arthroplasty. However, concern over bleeding risk in the context of having no specific antidotes available is a topic of focus for many physicians in an acute care setting. This manuscript examines the recent literature in the management of acute bleeding and the various methods of reversing anticoagulation in this setting. Literature published over the last 18 months (2011/07/01-present) was gathered from PubMed, Ovid, and Medline under a combined search strategy covering bleeding, reversal, and new oral anticoagulants, both factor Xa and direct thrombin inhibitors. The use of prothrombin complex concentrate, fresh frozen plasma, activated recombinant factor VII, activated prothrombin complex concentrate, as well as adjuncts of charcoal, hemodialysis, and antifibrinolytics are discussed. Recommendations are based on the determination of the severity of the bleed and physiological markers of anticoagulation, and involve the use of prothrombin complex concentrate, activated recombinant factor VII, and adjunctive therapy as appropriate.

185

Wilson R. Improving VTE risk assessment at point of admission to a tertiary centre cardiology ward. BMJ Quality Improvement Reports. 2015;4(1)

Cardiology wards are generally high turnover units, which may receive primary PCI, high-risk NSTEMI patients, and other general cardiac admissions from a large geographical area. Many centres also provide national specialist services for rarer cardiac conditions for which admissions may be lengthy. Cardiac patients have significant risk factors for venous thromboembolism (VTE) as immobility may be due to systolic dysfunction, attachment to continuous monitoring and predisposition to chest pain, or cardiac syncope. It is recommended by NICE that an initial VTE risk assessment is undertaken at the time of patient admission, with reassessment within 24 hours. For this purpose a risk assessment tool is featured on the front of many Trust drug charts. It is noted that this risk assessment is electronic in other trusts. We undertook an audit into the drug chart documentation of VTE risk assessment on the cardiology ward and the Coronary Care Unit (CCU) at The Royal Free Hospital. It was evident that documentation of VTE risk assessment was poor. The audit interventions were; a teaching presentation to the cardiology department, an educational poster, several update emails to the department and the identification of a ‘VTE risk assessment champion’ to audit ongoing compliance. Following these measures the second audit round demonstrated that documentation of initial risk assessment was slightly improved, but significant improvement was seen in documentation of risk assessment at 24 hours post admission. Results from a third audit cycle indicated that the improvement in initial VTE risk assessment was sustained, and that there was a significant sustained improvement in risk assessment at 24 hours (p <0.05). Recommendations for sustained improvement included: redesigning the drug chart so that the VTE risk assessment tool was linked to the VTE prophylaxis prescription box, and designating the responsibility of the initial VTE risk assessment to the on call junior doctor who receives admissions on to the ward.

32


The aim of this review was to discuss the epidemiology, risk factors and sequelae of venous thromboembolism (VTE). VTE has an incidence of 1-2 per 1000 people annually. The risk of VTE increases with age and is highest in Caucasians and African Americans. Combined oral contraceptives (COC), especially the third-generation COCs, have been strongly implicated in VTE. Hospitalized patients, especially patients with underlying malignancy and undergoing surgery, have a host of risk factors for VTE. Thrombophilia can predispose an individual to VTE but indiscriminate testing for thrombophilia in patients presenting with VTE is not indicated. VTE can have serious chronic sequelae in the form of post-thrombotic syndrome (PTS) and chronic thromboembolic pulmonary hypertension (CTPH). The risk of PTS and CTPH is increased with recurrent deep vein thrombosis and pulmonary embolism, respectively. Mortality from VTE can be as high as 21.6% at one year. Patients
who had an episode of VTE have a high risk of subsequent VTE and this risk is highest in patients who had a first VTE event associated with malignancy. A good understanding of the epidemiology and risk factors of VTE will enable the treating medical practitioners to identify patients at risk and administer appropriate VTE prophylaxis to prevent the long-term consequences of VTE.


In the United Kingdom, the national guidance from Royal College of Obstetricians and Gynaecologists (RCOG) and National Institute for Health and Clinical Excellence (NICE) encourages the use of low molecular weight heparin thromboprophylaxis in high risk pregnancies. The recommendation, however, is based largely on expert opinion with almost no evidence from randomised controlled trials or meta-analyses. Here we examine the evidence for and against use of thromboprophylaxis and suggest that careful consideration is needed in implementing change in practice with follow-up of complications due to a real risk of unintended consequences. Therefore, large-scale and well-designed studies are urgently needed. We find that health economic assessments, which should be central to any major health policy change, appear entirely absent in this context. © 2013 Elsevier Ireland Ltd. All rights reserved.

Yong YP, Karangizi A and Banerjea A. A persuasive intervention: improving the compliance of extended venous thromboembolism prophylaxis following cancer resections in a tertiary colorectal and hepatobiliary unit. BMJ Quality Improvement Reports. 2014;3(1)

Extended venous thromboembolism (VTE) prophylaxis has been shown to reduce the incidence of VTE in patients following cancer resections.[1] However, ensuring patients are discharged with the prescription remains a challenge, with junior doctors frequently rotating throughout different specialties. We conducted an audit to assess the compliance rate in the colorectal and hepatobiliary (HPB) unit at the Queen’s Medical Centre in Nottingham. Extended VTE prophylaxis was considered compliant to the guideline if it was prescribed on discharge. The baseline measurement demonstrated compliance rates of 79% and 48% in the colorectal and HPB units respectively. Following discussion with the stakeholders, several interventions that include education and visual reminders were implemented to increase awareness of the importance of extended VTE prophylaxis among junior doctors. Results of the re-audit have shown a remarkable improvement; compliance rates were increased to 93% and 72% in the colorectal and HPB units respectively. We conclude that visual reminder is a simple yet effective tool to improve awareness among junior doctors on the importance of extended VTE prophylaxis in cancer patients. Nevertheless, education remains crucial to ensure the sustainability of any intervention.