VTE Prevention in Hospitalised Patients

Antifactor Xa monitoring in patients on IV unfractionated heparin, John S.M.; Lisi D
U.S. Pharmacist, 2015, vol./is. 40/3

Although the introduction of newer anticoagulants has revolutionized the treatment of venous thromboembolism, IV unfractionated heparin (UFH) continues to be widely prescribed in hospitalized patients because of its pharmacokinetic profile. The activated partial thromboplastin time (aPTT) test has been used to monitor outcomes in patients receiving UFH, but significant issues, such as varying aPTT reagents, instrumentation procedures, and interpatient variability, are associated with the test. Antifactor Xa monitoring of patients on continuous IV UFH may better correlate with heparin concentrations, determine therapeutic ranges for aPTT, and result in fewer testing procedures for patients and personnel. Despite the introduction of newer anticoagulants, IV unfractionated heparin (UFH) is one of the most commonly used parenteral anticoagulants for preventing and treating venous thromboembolism (VTE). The activated partial thromboplastin time (aPTT) test has been used to monitor outcomes in patients receiving UFH, but it has been associated with significant problems, such as varying aPTT reagents, instrumentation procedures, and interpatient variability. 1,2 Thrombosis monitoring of antifactor Xa in patients on continuous IV UFH is being considered by some institutions.

Infection type and severity are risk factors for hospital-acquired venous thromboembolism in medical inpatients, Merrill S.; Desarno M
Circulation, March 2015, vol./is. 131

Introduction: Hospital-acquired venous thromboembolism (HAVTE) leads to increased length of stay, cost, morbidity, and is a target of government quality measures. How infection relates to HAVTE risk is unknown. We wished to identify infection-related risk factors for HAVTE to help identify at-risk patients and to guide prevention efforts. Hypothesis: We hypothesized that increased infection severity, affected organ system, and positive microbiologic culture results were associated with HAVTE in medical inpatients. Methods: HAVTE between 2009-2012 were identified by ICD-9 codes with confirmatory imaging at a 500 bed teaching hospital. ICD-9 codes, microbiology results, lab and vital signs, and medication records were used to classify infections as presented in the Table. Logistic regression was used to determine odds ratios (OR) and 95% confidence intervals (CI) for HAVTE adjusting for known HAVTE risk factors in the MITH score, a previously developed HAVTE risk score for medical inpatients. Models incorporated known HAVTE risk factors and assessed each variable from the Table individually. Results: In 20,327 medical admissions there were 113 hospital-acquired HAVTE (incidence: 0.56%). The table presents the association between infection-related risk factors and HAVTE. Septic shock (OR 7.48), sepsis (OR 5.9), and MSSA culture isolate (OR 6.39) had the greatest point-estimates of HAVTE after adjusting for known HAVTE risk factors. Conclusions: Infection severity, affected organ system, and microbiologic etiology were risk factors for HAVTE after adjusting for known risk factors. The relationship between these risk factors and thrombosis is likely complex, but these risk factors are easily measurable using the electronic health record. These results may help facilitate HAVTE prevention by further identifying high risk patients.

New developments in pediatric venous thromboembolism and anticoagulation, including the target-specific oral anticoagulants, Lyle C.A.; Sidonio R.F
Current Opinion in Pediatrics, February 2015, vol./is. 27/1(18-25)

PURPOSE OF REVIEW: Pediatric venous thromboembolism (VTE) can affect children of all ages, requiring considerable pharmacologic intervention and is often associated with significant morbidity. Current research efforts are directed toward the development of risk-stratified VTE prevention strategies employing pharmacologic thromboprophylaxis, the optimization of conventional anticoagulation, and their investigation of the safety and efficacy of target-specific oral anticoagulants (TSOACs) in children. RECENT FINDINGS: Recent research has considerably improved the understanding of risk factors of hospital-acquired VTE and how these factors may be employed in risk-stratified paradigms for VTE prevention in children. Additional insight has been gained in the optimization of conventional anticoagulants in special populations such as neonates and children with inflammatory conditions, and in improving the overall safety and compliance with periprocedural anticoagulation and the use of home International Normalized Ratio monitoring. Furthermore, the use of TSOACs has been described in children and is the focus of numerous ongoing clinical trials that are evaluating the safety and efficacy of these agents in children with VTE. SUMMARY: Identification of hospital-acquired VTE risk factors may inform pediatric VTE prevention strategies. Although initial use of TSOACs may be promising, investigation of safety and efficacy in children is still underway.
New oral anticoagulants in the treatment of heparin-Induced thrombocytopenia, Bay C.; Vajo Z
Thrombosis Research, April 2015, vol./is. 135/4(607-609)
Heparin induced thrombocytopenia (HIT) is a potentially catastrophic syndrome with a high incidence of vascular thrombosis. There are little data on the efficacy of new oral anticoagulants (NOAC) in this setting. This study reports on the outcome of patients with HIT, treated with NOAC. Materials and Methods We retrospectively identified 22 patients with HIT who were treated by our group with a combination of NOAC and a short course of argatroban. These patients were evaluated in a prospective fashion for development of outcomes at a mean follow up of 19 +/- 3 months. Results There were a total of 5 deep and 2 superficial vein thromboses diagnosed at index hospitalization. No patient developed arterial thrombosis. All patients tolerated NOAC and their platelet count normalized before discharge. At 19 months of follow-up, 6 patients had died of non-thrombotic causes. There was no bleeding, limb loss or recurrent venous thromboembolism in any patient. Conclusions In patients with HIT, a short course of parenteral treatment with argatroban followed by administration of a NOAC is highly safe and effective in prevention of thrombosis and normalization of platelet count. Development of HIT however, portends a poor prognosis independent of vascular thrombosis.

Practical management of rivaroxaban for the treatment of venous thromboembolism, Imberti D
Clinical and Applied Thrombosis/Hemostasis, May 2015, vol./is. 21/4(309-318)
Traditional anticoagulants, such as low-molecular-weight heparin and vitamin K antagonists, have been the mainstay for the treatment of venous thromboembolism (VTE) in the hospital setting and after discharge. These anticoagulants are effective but are associated with some limitations that may lead to their underuse. Based on the results of the EINSTEIN clinical trial program, the oral, direct factor Xa inhibitor rivaroxaban is approved for the treatment of acute deep vein thrombosis (DVT) and pulmonary embolism (PE) and for the prevention of recurrent VTE. The single-drug approach with rivaroxaban is now available in both the hospital and the outpatient settings and may overcome some of the limitations of traditional agents. This review provides hospital physicians with an overview of the practical management of rivaroxaban and a critical evaluation of its use for the treatment of DVT and PE, including in specific clinical settings and special patient populations.

Rivaroxaban—a bleeding problem? Owen E.; Roberts A.
Anaesthesia, January 2015, vol./is. 70/(25)
Oral direct factor Xa inhibitors such as rivaroxaban are increasingly widely used. Rivaroxaban is approved by NICE for a variety of indications including the treatment and prevention of venous thromboembolism, and prevention of stroke in patients with atrial fibrillation (AF). In contrast to warfarin, dose adjustment and monitoring are not required, making anticoagulant treatment less disruptive for patients. However standard coagulation tests do not correlate with the degree of anticoagulation and there is to date little clinical experience in the reversal of anticoagulation if complications occur. Description An 82-year-old woman presented with an upper gastrointestinal bleed after recently starting rivaroxaban for stroke prevention in AF. Her past medical history included Parkinson’s disease, hypertension and heart failure, and she had been an inpatient in a rehabilitation hospital for the past month following falls. Following multiple episodes of haematemesis, she was in hypovolaemic shock with initial blood tests showing Hb 37 g/l, thrombocytopenia and deranged PT and APTT. Bleeding was profuse per rectum with oozing from all sites of venepuncture. Surgery was considered but not felt to be survivable with the degree of coagulopathy and patient comorbidities. Resuscitation and correction of coagulopathy was attempted, in order to allow endoscopy. The patient received 14 units RBC, 16 units FFP, two platelets, 4 g fibrinogen and 4000 units of prothrombin complex concentrate (PCC). Endoscopy was then performed which showed a large duodenal ulcer (D1), which was injected with adrenaline. Treatment continued with a proton pump inhibitor, but a fatal rebleed occurred 36 h later. The adverse drug reaction was reported to the Medicines and Healthcare products Regulatory Agency. Discussion This case demonstrates the complexity of treating a patient on rivaroxaban if a life threatening bleeding episode occurs. There is no specific antidote, but correction of PT with 50 units/kg PCC has been demonstrated in 20 healthy volunteers [1]. PCC, APC and rFVIIa should be considered for ongoing life-threatening bleeding [2]. Algorithms have recently been developed for patients bleeding on newer oral anticoagulants, and these may help guide the treatment of patients in the future [3]. Although rivaroxaban and other direct factor Xa inhibitors have many advantages for patients, reversal of anticoagulation for life-threatening bleeding or emergency surgery poses significant challenges for the anaesthetist.

Thromboprophylaxis: Striking a balance between under-treatment and over-treatment, Rajapakse S.
International Journal of Clinical Practice, January 2015, vol./is. 69/1(4-5)
Venous thromboembolism (VTE) is an important cause of morbidity and mortality among patients admitted to hospital. Pulmonary embolism results in 5-10% of deaths, and is the commonest cause of preventable deaths in hospitalised patients (1,2). In addition, considerable morbidity results from VTE, such as post-thrombotic syndrome and chronic thromboembolic pulmonary hypertension. The economic burden resulting from VTE and its complications is high.

Venous thromboembolism prophylaxis: Differences in practice patterns in two institutions within a single health system, Kulkarni N.; Koller S.
Annals of Surgical Oncology, February 2015, vol./is. 22/1 SUPPL. 1(S139)
INTRODUCTION: Venous thromboembolism (VTE) is a major cause of preventable death in hospitalized patients. The American College
of Chest Physicians (ACCP) and National Comprehensive Cancer Network (NCCN) guidelines for patients with major abdominopelvic surgery, especially with cancer recommend undergoing extended post discharge VTE prophylaxis for four weeks. We sought to look at practice patterns with the use of perioperative VTE prophylaxis in two institutions, an NCI designated cancer center (Hospital 1), and an academic hospital and level one trauma center (Hospital 2). METHODS: An IRB approved electronic survey was sent to surgeons of all specialties at both institutions querying the use of pre and post-operative thromboprophylaxis, concerns, awareness of the ACCP/NCCN guidelines and adherence to them in the post-operative setting, and results were compared. RESULTS: Surgeon response was 100% (26/26) in Hospital 1 and 41% (47/115) in Hospital 2. All surgeons in Hospital 1 were multispecialty oncologic surgeons, while hospital 2 consisted of surgeons from varied subspecialties. Post-operative DVT chemoprophylaxis was used by 96.1% surgeons at Hospital 1, which was significantly more than 78.2% surgeons at hospital 2 (p=0.04). Only 56% surgeons at Hospital 1 and 39% at Hospital 2 acknowledged using preoperative DVT chemoprophylaxis (p=0.2) with major concerns including intra and postoperative bleeding complications. When queried about their awareness of guidelines 96% surgeons in Hospital 1 expressed awareness, compared to only 60% in Hospital 2 (p=0.0012). Nonetheless, only 32% surgeons in Hospital 1 and 40% in Hospital 2 actually follow the guidelines (p=0.6). About 70% surgeons in hospital 1 and 75% in hospital 2 expressed the willingness to follow these guidelines in the future. CONCLUSIONS: Disparities between awareness of current guidelines and practice patterns can be explained in part by the difference in the population of patients and subspecialties in the two institutions. However there needs to be a concerted effort to adhere to national performance initiatives and standardize approaches for perioperative VTE prophylaxis (Table Presented).

Pharmacological Thromboprophylaxis


The prevalence of venous thromboembolism (VTE) is on the rise in critically sick hospitalized children. It is one of the most common hospital acquired complications (HAC) and Joint Commission for Accreditation for Hospitals (JCAHO) has mandated to develop institutional guidelines to prevent VTE. It is recommended to use pharmacologic thromboprophylaxis (PTP), the most effective intervention for VTE prevention, eligible adult population. Unfortunately this strategy is not systematically evaluated in children due to sample size and recruitment issues. Therefore the risks and benefits of universal PTP in critically sick children are unclear specifically in the context of exposure to acquired risk factors including central venous lines (CVLs), age, cancer, infection and trauma/surgery. We sought to understand expert clinical decision-making. Aims: To understand the current practice patterns of pharmacological thromboprophylaxis and the perceived risks of VTE in hospitalized children. Methods: This cross-sectional self-administered multiple-choice survey questionnaire was administered to pediatric hematologists who are members of Hemostasis Thrombosis Research Society (HTRS) with at least 5 years of experience. The survey designed to collect physicians' demographics, thromboprophylaxis policies and opinions about the use of PTP using 13 multiple choice questionnaire and 4 clinical scenarios. Results: The response rate was 47.3% [53/112]. Majority practiced at University affiliated hospitals (73%). Only 44% of respondents were in favor of adoption of universal PTP policy for children and 65% of them didn't support thromboprophylaxis for CVL. Only one third of the participants had established policy for PTP mainly for intensive care unit, orthopedic and trauma patients. Almost all respondents (98%) used PTP for a select patient population based on following risk factors: known inherited thromophilia, morbid obesity, chronic inflammatory condition, history of idiopathic deep venous thrombosis (DVT), CVL related DVT, detected antiphospholipid antibody and teenagers with DVT risk factors. The factors that were not important for thromboprophylaxis included: underlying malignancy, positive blood culture, diabetic ketoacidosis, immobilization and CVLs, whether being critically sick newborns or not. Four different adolescent, child, and infant scenarios were answered by 94% of respondents. Case (1) A newborn on mechanical ventilation with sepsis, thrombocytopenia and femoral line dysfunction without CVL-thrombosis. About 72% of respondents didn't consider AC, 68% of them didn't consider mechanical thromboprophylaxis. If developed MRSA sepsis and right hip osteomyelitis later on, only 42% of all respondents would consider AC. So, in the newborns, PTP may not benefit for CVL malfunction but may be beneficial in the setting of osteomyelitis. LMWH was the preferred choice of PTP. Case (2): A 10 years old boy with a fracture femur with 4 weeks immobilization, 66% of respondents were not in favor of AC, 69% of them would consider mechanical thromboprophylaxis. So, Mechanical thromboprophylaxis was preferred over PTP in orthopedic patients. Case (3): An overweight teenager girl with Down syndrome on mechanical ventilation for pneumonia and receiving mechanical thromboprophylaxis. 46% of all respondents considered AC and only 34% of them would continue AC post-discharge. If she has been on oral contraceptive pills (OCPs), 68% would prescribe TPT. So, PTP in critically ill teenagers is equipoise even with overweight and immobilization. OCPs were perceived as important risk factor for VTE. Case (4): A child with ALL who had an acute stroke following induction chemotherapy including Asparaginase. 82% of all respondents would consider AC for re-induction regimen containing Asparaginase. So, PTP is recommended in children with ALL and Asparaginase related strokes if re-exposed. Conclusions: The results of survey revealed that despite concerns about rising VTE prevalence, there is equipoise about the adoption of a universal PTP policy for children. Experts take into consideration multiple risk factors when deciding about primary thromboprophylaxis. The variability in clinical thromboprophylaxis practices highlights the need for rigorous prospective randomized trials so as to develop evidence-based VTE prevention strategies for children.
Journal of the American Heart Association, 2014, vol./is. 3/6

Background: Hospitalized medical patients are at risk for venous thromboembolism (VTE). Universal application of pharmacological thromboprophylaxis has the potential to place a large number of patients at increased bleeding risk. In this study, we aimed to externally validate the International Medical Prevention Registry on Venous Thromboembolism (IMPROVE) VTE risk assessment model in a hospitalized general medical population. Methods and Results: We identified medical discharges that met the IMPROVE protocol. Cases were defined as hospital-acquired VTE and confirmed by diagnostic study within 90 days of index hospitalization; matched controls were also identified. Risk factors for VTE were based on the IMPROVE risk assessment model (aged >60 years, prior VTE, intensive care unit or coronary care unit stay, lower limb paralysis, immobility, known thrombophilia, and cancer) and were measured and assessed. A total of 19,217 patients met the inclusion criteria. The overall VTE event rate was 0.7%. The IMPROVE risk assessment model identified 2 groups of the cohort by VTE incidence rate: The low-risk group had a VTE event rate of 0.42 (95% CI 0.31 to 0.53), corresponding to a score of 0 to 2, and the at-risk group had a VTE event rate of 1.29 (95% CI 1.01 to 1.57), corresponding to a score of >3. Low-risk status for VTE encompassed 68% of the patient cohort. The area under the receiver operating characteristic curve was 0.702, which was in line with the derivation cohort findings. Conclusions: The IMPROVE VTE risk assessment model validation cohort revealed good discrimination and calibration for both the overall VTE risk model and the identification of low-risk and at-risk medical patient groups, using a risk score of >3. More than two thirds of the entire cohort had a score <2.

Further evidence of the very low risk of subclinical deep venous thrombosis among patients with haemophilia undergoing major orthopedic surgery, Hermans C.; Hammer F
Haemophilia, May 2014, vol./is. 20/(62)
Introduction and Objectives: Deep venous thrombosis (DVT) is a common postoperative complication in patients undergoing major orthopedic surgery of the lower limbs, such as total hip replacement (THR), total knee replacement (TKR), or hip fracture surgery (HFS). In the absence of thromboprophylaxis, subclinical venous thrombosis rates as high as 60% have been reported when using systematic bilateral phlebography after orthopaedic surgery. As a result, routine pharmacological thromboprophylaxis with low-molecular-weight heparin (LMWH) or a new oral anticoagulant agent is strongly recommended in patients undergoing these procedures. With the availability of efficient and safe clotting factor concentrates, THR, TKR, as well as ankle arthrodesis are frequently performed in subjects with hemophilia suffering from chronic hemophilic arthropathy. Yet, pharmacological prophylaxis of venous thromboembolism (VTE) in this patient group remains controversial. With the exception of retrospective case reports and small series, the incidence of VTE disease in hemophilic patients after major orthopaedic surgery is still unclear. Materials and Methods: In 2002, we initiated a prospective study in order to evaluate by systematic US-Doppler imaging the incidence of subclinical deep venous thrombosis (DVT) in consecutive hemophilic patients referred to our centre for major orthopedic surgery. In 2010, we reported that three out of 22 patients undergoing 29 major orthopedic surgeries developed subclinical distal DVT. The overall incidence of DVT of 10% found in our study was significantly lower than that reported in nonhemophilic patients. The study has been prospectively continued and has until September, 2013 included 36 different patients (32 HA, 4 HB) undergoing 47 major orthopedic procedures of the lower limbs. Most were treated with continuous infusion of clotting concentrates and all did not receive antithrombotic pharmacological prophylaxis. Results: This follow-up study did not reveal any new case of clinical and subclinical of DVT screened by bilateral US-Doppler of the lower limbs. The overall incidence of DVT recalculated on the whole population is 6%. Conclusions: These data provide additional evidence that the risk of DVT following major orthopedic surgery among patients with hemophilia is very low and that systematic pharmacological thromboprophylaxis in this specific population is, for most patients, not required.

Improving the use of thromboprophylaxis in hospitalized medical patients: A retrospective-prospective assessment through the Padua Prediction Score, Marrone E.; Pagano A
Thrombosis Research, November 2014, vol./is. 134/(S67)
Introduction: Venous thromboembolism (VTE) occurs frequently in at risk hospitalized medical patients. Pharmacological thromboprophylaxis (PhT) in these patients is largely underused. Patients and methods: We evaluated the use of PhT in patients admitted to an Internal Medicine Department (Umberto I Hospital, Nocera Inferiore, Italy), comparing a retrospective cohort of 116 patients (64 men, 52 women; mean age 68.95+/−17.12 years), admitted between July and September 2012, and 180 patients (90 men, 90 women; mean age 68.4+/−15.1 years) prospectively evaluated between October 2012 and March 2013, who received PhT according to the Padua Prediction Score (PPS >4), unless exceeding bleeding risk. Exclusion criteria were current anticoagulant treatment, severe anemia (Hb <8g/dl) and glomerular flow rate <30 ml/min. Results: In the prospective cohort, 55/116 (47%) received PhT, including 4/20 (20%) of low-risk patients (PPS <4) and only 51/96 (53%) of those at high VTE risk (PPS >4). Among high VTE risk patients not receiving PhT, a concomitant high bleeding risk was detectable only in 19 (42%). In the prospective cohort, the average PPS was 4.65+/−2.19, being 128 patients (71%) classified at high VTE risk. Among the latter, PhT was adopted in 93 patients (73%), the remaining (35/128, 27%) being excluded because of bleeding risk. Three VTE complications (1 deep vein and 2 superficial vein thrombosis; 2 in patients not receiving PhT, of whom 1 with PPS >4) and 2 bleeding events (both in patients not receiving PhT) were reported in the retrospective cohort. One prospective patient (receiving PhT) experienced a superficial vein thrombosis while 5 bleeding events occurred (3 in patients not receiving...
Deep venous thrombosis (DVT) is a common postoperative complication in patients undergoing major orthopaedic surgery of the lower limbs, such as total hip replacement (THR), total knee replacement (TKR), or hip fracture surgery (HFS). In the absence of thromboprophylaxis, subclinical venous thrombosis rates as high as 60% have been reported when using systemic bilateral phlebography after orthopaedic surgery. As a result, routine pharmacological thromboprophylaxis with low-molecular-weight heparin (LMWH) or a new oral anticoagulant agent is strongly recommended in patients undergoing these procedures. With the availability of efficient and safe clotting factor concentrates, THR, TKR, as well as ankle arthrodesis are frequently performed in subjects with haemophilia suffering from chronic haemophilic arthropathy. Yet, pharmacological prophylaxis of venous thromboembolism (VTE) in this patient group remains controversial. With the exception of retrospective case reports and small series, the incidence of VTE disease in haemophilic patients after major orthopaedic surgery is still unclear. Surveys suggest that more than half of hemophilia treatment centers in the United States and Europe use thromboprophylaxis in patients with haemophilia (PWH) who require major orthopedic surgery. However, this is not supported by evidence or surgical practice guidelines, and simply increases the risk of bleeding in such patients. Given the aging nature of the haemophilia population and the incidence of joint disease, the question of the thrombotic risk associated with major orthopaedic surgery and joint replacement surgery in particular is highly relevant. Few studies have addressed this issue and more information is needed on which to base optimal preventive strategies for venous thrombosis in patients with haemophilia undergoing elective major orthopedic surgery. We here report the results of 2 parallel and independent prospective studies from Belgium and Norway currently evaluating by systematic US-Doppler imaging the incidence of subclinical deep venous thrombosis in consecutive haemophilic patients referred for major orthopaedic surgery. In Belgium, the study has so far included 36 different patients (32 HA, 4HB) undergoing 50 major orthopaedic procedures of the lower limbs. In Norway, the study has involved 29 patients (26 HA, 3 HB, all with severe haemophilia) undergoing 29 orthopaedic procedures, most of the lower limbs. In both countries, most patients were treated with continuous infusion of clotting factor concentrates and none of them did receive antithrombotic pharmacological prophylaxis. In the 2 studies that included in total 65 patients undergoing 79 major orthopaedic procedures, no case of clinically patent DVT or PE was detected (Table 1). In total there were 5 cases of DVT evidenced by US imaging which were all distal, not complicated by PE and treated with a short course of low-molecular weight heparin in most cases. The overall incidence of subclinical DVT calculated on the whole population was 6%. In conclusion, these data provide for the first time multicentric and imaging-based evidence that the risk of DVT following major orthopaedic surgery among patients with haemophilia undergoing major orthopaedic surgery is very low and that systematic pharmacological thromboprophylaxis in this specific population of patients is not required. The two studies are still ongoing and should include a larger number of participants in the future.

**Multicentric study evaluating venous thrombosis among patients with haemophilia undergoing major orthopaedic surgery, Hermans C.R.; Lambert C**

Blood, December 2014, vol./is. 124/21

Aims Prevalence of paediatric venous thromboembolism (VTE) is estimated at 5.3 per 10,000 hospital admissions. There is a bimodal distribution of incidences with peaks in the neonatal period and in adolescence. 90% of events are related to underlying risk factors, of which, central venous lines are the most important but surgery and trauma are also included. Adolescent VTE comprises 40% of all paediatric VTE event; they tend to be in the lower-limb and symptomatic. VTE is extremely rare from 1 month of age until the onset of puberty. A number of tertiary children's hospitals have implemented and published guidelines for structured risk assessment and prophylaxis of VTE in children. We aimed to assess whether routine assessment of all surgical admissions for VTE risk would benefit patient care. Methods All admissions (elective and emergency) to orthopaedic and general surgery paediatric wards at a tertiary children's hospital over 31 days were included. Neonatal admissions were excluded. All patients underwent a VTE risk assessment. The assessment used a structured pro-forma, based on existing published protocols. Data was collected on details of any VTE events, risk factors for thrombosis or bleeding, reason for admission and/or operation, and whether any VTE prophylaxis was given. Results Orthopaedics: 56/80 admissions (median 9 years); no VTE events during study period. 80% (45/56) had no risk factors for VTE. The remainder had on average 1 risk factor for thrombosis (‘Reduced mobility’ or ‘Lower limb orthopaedic surgery’). 2/56 (4%) exceptional cases received pharmacological thromboprophylaxis: both were >15-years old, one with bilateral femoral fractures; the other had a familial thrombophilia. General surgery: 24/80 admissions (median 7 years); no VTE events occurred. 88% (21/24) had no risk factors for VTE. The remaining 3/24 were considered low risk. No patients were prescribed VTE prophylaxis. All patients under 15-years (74/80) were ‘low-risk’, whereas 2/6 (33%) patients over 15-years required thromboprophylaxis. Conclusion We found that routine, structured assessment of VTE risk in children under 15-years is not necessary. There are selected adolescents who may benefit from prophylactic measures, thus VTE risk assessment is recommended in patients >15-years.

**Routine, structured assessment for venous thromboembolism risk in surgical admissions to a tertiary children’s hospital, Mann J.P.; Wong J.**

Archives of Disease in Childhood, April 2014, vol./is. 99/(A106)
Venous thromboembolism (VTE) is frequent in cancer patients and is one of the leading causes of death in this population. Hospitalized cancer patients and those receiving chemotherapy are at the greatest risk of developing VTE. Many randomized controlled trials in a variety of patient populations have demonstrated that primary prophylaxis is effective in reducing the risk of VTE among cancer patients. Pharmacological thromboprophylaxis is recommended in all hospitalized medically ill cancer patients without a contraindication to anticoagulant therapy. Thromboprophylaxis in ambulatory patients undergoing chemotherapy is only considered in those at high risk of VTE. In this article, we evaluate the different clinical practice guideline recommendations for primary VTE prophylaxis in hospitalized medically ill patients with cancer and ambulatory patients undergoing chemotherapy.

Venous thromboembolism after total joint arthroplasty: Results from a Japanese multicenter cohort study, Migita K.; Bito S. Arthritis Research and Therapy, July 2014, vol./is. 16/4, 1478-6354;

Introduction: Real-world evidence of the effectiveness of pharmacological thromboprophylaxis for venous thromboembolism (VTE) is limited. Our objective was to assess the effectiveness and safety of thromboprophylactic regimens in Japanese patients undergoing joint replacement in a real-world setting.

Method: Overall, 1,294 patients (1,073 females and 221 males) who underwent total knee arthroplasty (TKA) and 868 patients (740 females and 128 males) who underwent total hip arthroplasty (THA) in 34 Japanese national hospital organization (NHO) hospitals were enrolled. The primary efficacy outcome was the incidence of deep vein thrombosis (DVT) detected by mandatory bilateral ultrasonography up to post-operative day (POD) 10 and pulmonary embolism (PE) up to POD28. The main safety outcomes were bleeding (major or minor) and death from any cause up to POD28.

Results: Patients undergoing TKA (n = 1,294) received fondaparinux (n = 360), enoxaparin (n = 223), unfractionated heparin (n = 72), anti-platelet agents (n = 45), or no medication (n = 594). Patients undergoing THA (n = 868) received fondaparinux (n = 261), enoxaparin (n = 148), unfractionated heparin (n = 32), anti-platelet agents (n = 44), or no medication (n = 383). The incidence rates of sonographically diagnosed DVTs up to POD10 were 24.3% in patients undergoing TKA and 12.6% in patients undergoing THA, and the incidence rates of major bleeding up to POD28 were 1.2% and 2.3%, respectively. Neither fatal bleeding nor fatal pulmonary embolism occurred. Significant risk factors for postoperative VTE identified by multivariate analysis included gender (female) in both TKA and THA groups and use of a foot pump in the TKA group. Only prophylaxis with fondaparinux reduced the occurrence of VTE significantly in both groups. Propensity score matching analysis (fondaparinux versus enoxaparin) showed that the incidence of DVT was lower (relative risk 0.70, 95% confidence interval (CI) 0.58 to 0.85, P = 0.002 in TKA and relative risk 0.73. 95% CI 0.53 to 0.99, P = 0.134 in THA) but that the incidence of major bleeding was higher in the fondaparinux than in the enoxaparin group (3.4% versus 0.5%, P = 0.062 in TKA and 4.9% versus 0%, P = 0.022 in THA). Conclusions: These findings indicate that prophylaxis with fondaparinux, not enoxaparin, reduces the risk of DVT but increases bleeding tendency in patients undergoing TKA and THA.

Venous thromboembolism during hip plaster cast immobilisation: Review of the literature, Struijk-Mulder M.C.; Ettema H.B. Netherlands Journal of Medicine, January 2014, vol./is. 72/1(17-19);

Introduction: There is a paucity of data regarding the risk of deep vein thrombosis during hip plaster cast immobilisation. The purpose of this article was to review the available evidence regarding the incidence of symptomatic venous thromboembolism (VTE) during hip plaster cast immobilisation. Methods and Materials: All papers describing hip plaster cast immobilisation published in the English literature retrieved from PubMed, EMBASE and the Cochrane database were reviewed. Articles regarding children, hip dysplasia, congenital hip dislocation and Legg-Calve-Perthes were excluded. A total of three papers were available for analysis. We also describe a case of pulmonary embolism during hip cast immobilisation. Results: The overall incidence of symptomatic VTE during hip plaster cast immobilisation was 0% in 343 patients. The incidence of symptomatic VTE in hip cast brace was 2.3% (range 0-3%). Discussion: Our systematic review of the literature showed a paucity of data regarding the incidence of VTE during hip plaster cast immobilisation. We describe the first case of pulmonary embolism during hip plaster cast immobilisation. We recommend that patients who are fitted with a hip plaster cast should be routinely screened for additional risk factors. When risk factors are present, patients should be considered for pharmacological thromboprophylaxis.

Mechanical ThromboProphylaxis

Adherence to mechanical thromboprophylaxis after surgery: A systematic review and meta-analysis, Craigie S., Tsui J.F., et al. Thrombosis Research, 2015, vol./is. 136/4(723-726);

Background: Many clinical practice guidelines, while recommending mechanical thromboprophylaxis after surgery, have raised concerns that discomfort may result in nonadherence. We therefore addressed adherence to mechanical thromboprophylaxis after surgery. Methods: We searched MEDLINE from January 1, 2000 to May 21, 2015 for English-language observational studies that assessed patient adherence to mechanical thromboprophylaxis after surgery. We conducted a meta-analysis to estimate average adherence rates. Results: We identified 8 studies (7 for compression devices, 1 for stockings) with median follow up time of 3 days. The pooled estimate of adherence for compression devices was 75% (median 78%, range 40%-89%). Studies with shorter follow-up (< 3 days, n = 4, pooled...
adherence 75%) and longer follow-up (>3 days, n=3, pooled adherence 75%) reported similar adherence (p=0.99). The studies varied in definitions of adherence, frequency of assessment, length of follow-up and completeness of reporting. No study followed patients after discharge. Conclusions: Up to one fourth of patients are nonadherent to mechanical thromboprophylaxis while hospitalized. Clinicians considering the relative merits of mechanical versus pharmacologic prophylaxis should address the issue of adherence. Strategies to improve adherence merit investigation.

Comparative effectiveness of combined pharmacologic and mechanical thromboprophylaxis versus either method alone in major orthopedic surgery: A systematic review and meta-analysis. Sobieraj D.M., Coleman C.L., Tongbram V., Chen W., et al Pharmacotherapy, 2013, vol./is. 33/3(275-283),

Study Objective. To evaluate the comparative efficacy and safety of combination pharmacologic and mechanical venous thromboembolism (VTE) prophylaxis versus either method alone in major orthopedic surgery. Design. Systematic review with meta-analysis of six randomized controlled trials. Patients. Patients undergoing total hip replacement, total knee replacement, or hip fracture surgery who received VTE prophylaxis. Measurements and Main Results. We conducted a systematic literature search of the MEDLINE, Cochrane Central Register of Controlled Trials, and Scopus databases (January 1980-July 2011) to identify trials that directly compared pharmacologic plus mechanical VTE prophylaxis to either strategy alone, evaluated United States Food and Drug Administration-approved agents, and reported rates of mortality, VTE, bleeding, and other adverse effects. Six trials were included, none of which were conducted in patients who had hip fracture surgery. The quality of each trial was evaluated, and the strength of evidence for each outcome was rated. No significant difference was found in the rate of pulmonary embolism or nonfatal pulmonary embolism when the combination of pharmacologic and mechanical prophylaxis was compared to pharmacologic prophylaxis alone, with low strength of evidence. The risk of deep vein thrombosis (DVT) was significantly decreased in the combination group (relative risk [RR] 0.48 [95% confidence interval (CI) 0.32-0.72]), with moderate strength of evidence, with benefits of combination therapy persisting in the total knee replacement subgroup (RR 0.41 [95% CI 0.25-0.68]). There was insufficient evidence to evaluate other final or intermediate outcomes or harms. In the comparison of combined pharmacologic and mechanical prophylaxis to mechanical prophylaxis alone, there was insufficient evidence to evaluate any final health outcomes or harms. There was no significant difference in the risk of proximal DVT when comparing combination prophylaxis to mechanical prophylaxis alone (RR 0.78 [95% CI 0.35-1.74]) based on low strength of evidence. Conclusions. The risk of DVT was decreased with the use of combination prophylaxis versus pharmacologic prophylaxis alone in patients undergoing total hip replacement or total knee replacement. However, due to primarily insufficient evidence for most outcomes evaluated, the balance of benefits to harms of combined pharmacologic and mechanical prophylaxis versus either strategy alone cannot be determined in patients undergoing major orthopedic surgery.

Dynamic mechanical thromboprophylaxis is a major heparin-independent risk factor for the formation of anti-platelet factor 4/heparin antibodies in patients undergoing total knee or HIP arthroplasty. Miyata S., Bito S., Migita K., Nakamura M., et al Journal of Thrombosis and Haemostasis, 2015, vol./is. 13/(113),

Background: Spontaneous or fondaparinux-associated heparininduced thrombocytopenia (HIT) is caused by platelet-activating antibodies (Abs) against platelet factor 4 (PF4)/heparin (H) complexes without H exposure, mostly in orthopedic surgery patients (pts). This implies that surgery itself could trigger this immune response, although the mechanism is unclear. Aims: We aim to investigate how surgery could trigger an immune response against PF4/H complexes. Methods: In a multicenter, prospective study of 2069 pts undergoing total hip or knee arthroplasty (TKA or THA), approximately half were treated with unfractionated H (UFH), low-molecular-weight H (LMWH), or fondaparinux. The other half received only mechanical prophylaxis [dynamic: intermittent plantar compression or intermittent pneumatic compression device, static: graduated compression stocking (GCS), or both]. We measured anti-PF4/H IgG/A/M before and 10 days after surgery using an immunoassay. Results: Multivariate analysis revealed that the dynamic mechanical prophylaxis (DMP), in addition to female sex and TKA (vs. THA), was an independent risk factor for the seroconversion (odds ratio 2, 95% CI 1.3-3, P=0.001), which was confirmed with propensity score matching. For TKA, the seroconversion rate in pts treated with DMP and no anticoagulant (15.3%) and pts treated with UFH (14.8%) or LMWH (13.7%) without DMP were similar, and it was higher than that in pts treated with fondaparinux without DMP (5.7%) or only GCS (6.4%). The proportion of pts with >1.4 optical density was higher among those treated with any anticoagulant and DMP than among those not treated with DMP, suggesting that DMP may also act as a co-stimulator in the immune response. Conclusion: We propose a novel hypothesis that DMP is involved in the immune response against PF4/H independent of H, probably due to stimulation of PF4 release and production of polyanions such as glycosaminoglycans and nucleic acids with tissue damage, which is presumably associated with the risk of developing HIT.


- Patients first • Personal responsibility • Passion for excellence • Pride in our team
INTRODUCTION: Thromboembolism remains a leading cause of maternal morbidity and mortality. Subcutaneous compression devices serve as a clinically effective, cost-effective, noninvasive means of thromboprophylaxis. Use of these devices perioperatively during cesarean delivery is supported by the American College of Obstetricians and Gynecologists. Unfortunately, data from other fields suggest that appropriate use and patient compliance with these devices may be suboptimal. The objective of this study was to determine postoperative subcutaneous compression device compliance in women who have undergone cesarean delivery and evaluate causes of noncompliance. METHODS: This prospective quality assurance analysis evaluated subcutaneous compression device compliance between 5 and 7 AM postoperative day 1 for women who underwent cesarean delivery at a single tertiary center. Institutional review board approval was obtained. Clinical and demographic risk factors for thromboembolism were abstracted. Factors leading to patient noncompliance were evaluated. RESULTS: One hundred sixty-six patients from May to July 2013 were included in the analysis. A total of 19.9% of patients were noncompliant with subcutaneous compression device use. Reasons for noncompliance included patient discomfort, machine malfunction, and incorrect device use. Patients who were noncompliant had similar risk factors for thromboembolism compared with women who were compliant. CONCLUSION: Although an effective method of thromboprophylaxis in postoperative patients, subcutaneous compression device use demonstrated suboptimal compliance in postcesarean delivery patients. These findings are similar to those from other fields. Quality assurance should be undertaken to evaluate appropriate subcutaneous compression device use and develop strategies to improve compliance. For patients who are noncompliant with subcutaneous compression devices and at risk for thromboembolism, pharmacologic prophylaxis may be considered.

Mechanical thromboprophylaxis is sufficient to prevent lower extremity deep vein thrombosis after kidney transplantation. Kim J.I., Hwang J.K., Park S.C., et al Transplantation, 2012, vol./is. 94/(842),

Purpose: It is well known that lower extremity (LE) deep vein thrombosis (DVT) is a common problem with potentially devastating results in patients undergoing major surgical procedures. But a few data are available on the incidence and prevention of LE DVT after kidney transplantation (KT). Most studies were designed retrospectively and came from Western countries. The aim of our study was to evaluate the incidence according to preventive methods of LE DVT within 1 month after KT in Korean. Methods: 187 consecutive patients were included during the period December 2009 to October 2011. These KT recipients were divided into two groups according to DVT prophylaxis. One group used graduated elastic stocking (GES) (n=93), the other group used pneumatic compression device (PCD) (N=94). In this study the frequency of LE DVT during the first 1 month after KT was evaluated using serial duplex ultrasound. The duplex ultrasound was performed on postoperative days (POD) 7, 14, 28. All patients were screened before KT for a hypercoagulable state by measuring the lupus anticoagulant, antiphospholipid antibody, hyperhomocysteinemia, protein C deficiency, protein S deficiency, antithrombin-III deficiency, Factor Va Leiden mutation and prothrombin gene 20210A mutation. At the end of surgery, closed suction drains were left in place until the drainage was less than 50 ml/day for two consecutive days. Results: LE DVT occurred in 4 patients (2.1%) during the first 4 weeks after KT. All DVT developed in GES group. None occurred in PCD group. In only one of the four was there any clinical evidence of a DVT and three patients were asymptomatic and the diagnoses were made during routine DU. All DVTs occurred on the side of the graft. The DVT developed a median time of 14 days (range 1-28 days) after kidney transplantation. Interestingly, Factor Va Leiden mutation and prothrombin gene 20210A mutation were not found in 187 consecutive patients for the study and tested for genetic thrombophilia. Conclusion: The total incidence of DVT in this study was relatively lower than that of Western population and PCD could be reduced to some extent of the incidence of LE DVT compared with GES (p=0.058). And we could not found Factor Va Leiden mutation and prothrombin gene 20210A mutation in our study populations. These findings suggest that these inherited thrombophilic risk factors have to be considered as the main cause of a different incidence of DVT between different races.

Background: Anti-embolism stockings (AES) and intermittent pneumatic compression devices (IPC) are commonly used methods of mechanical thromboprophylaxis (MT) for prevention of Venous Thromboembolism (VTE). Despite the frequency of their use much uncertainty exists around the practical aspects of their application. The ambiguity arises from the need to identify the risk and benefit ratio for each patient to ensure risk of harm is minimised and the potential for benefit is maximised. Aims: We aimed to provide evidence-based solutions to the most commonly reported dilemmas by examining the available literature. In particular, our goals were to discover the optimum length of time AES should be worn, if AES cause skin damage and in which instances thigh length IPC would be chosen over knee length. Methods: A comprehensive literature search was conducted and the results reviewed. Results: The literature was often sparse and on some occasions conflicting. When used in conjunction with national guidance however, we found that the literature helped to construct answers to the most common dilemmas; although these answers were mostly based on current best practice rather than clinical evidence. Conclusion: Although individual clinical judgement must be applied when making decisions about the use of AES and IPC, current literature offers some guidance to help clinicians make the right choice. This information should be shared with clinicians to ensure disparities in practice are reduced, and to improve confidence in clinical decisionmaking.


Purpose Chemoprophylaxis for venous thromboembolism (VTE) following spinal surgery remains a contentious issue. This study aims to
identify the current VTE prophylaxis practice in units offering acute spinal surgery in England. We also report the incidence of clinically apparent VTE episodes in our unit where mechanical thromboprophylaxis is used alone. Methods National survey of 74 trusts offering acute spinal surgery. Senior clinical staff were contacted by telephone and completed a survey into the routine VTE prophylaxis in their units. There was a retrospective review of adult patients undergoing spinal surgery lasting more than three hours in our institution from 2008 to 2013. The rate of deep vein thrombosis (DVT) diagnosis by Doppler venous ultrasound scan (USS) and the rate of pulmonary embolism (PE) diagnosed on computerised tomography and pulmonary angiography (CTPA) was recorded. Results 74 acute hospital trusts offering spinal surgery were contacted. 61 (82.4 %) agreed to participate and 7 were excluded as they had no protocol for thromboprophylaxis. Of the remaining 54 trusts, 27 (50 %) routinely used mechanical VTE prophylaxis and 33 (61 %) routinely used chemoprophylaxis. In our unit, 178 patients were identified. All patients received mechanical thromboprophylaxis (calf pumps and compression stockings) alone. Only one had clinical signs of a DVT that warranted USS investigation which was subsequently negative. 4 patients underwent postoperative CTPA and 2 had radiographic evidence of PE. The incidence of PE was 1.1 % (2/178). Conclusions We report a low rate of VTE in patients undergoing spinal surgery with mechanical thromboprophylaxis alone. It is difficult to justify the routine use of chemical thromboprophylaxis, as the numbers needed to prevent one VTE event are extremely large. There is little agreement between approaches to thromboprophylaxis between spinal surgery units in England. 

The efficacy of mechanical thromboprophylaxis in critically ill patients: A propensity score adjusted analysis. Ababi Y., et al
American Journal of Respiratory and Critical Care Medicine, 2011, vol./is. 183/1 MeetingAbstracts

Rationale: Clinical practice guidelines recommend the use of mechanical thromboprophylaxis with graduated compression stockings (GCS) and/or intermittent pneumatic compression (IPC) devices as an adjunct or as a substitute to pharmacologic thromboprophylaxis in patients who are at high risk for bleeding. The objective of this study is to evaluate the efficacy of mechanical thromboprophylaxis. Methods: A prospective cohort study was done between 7/2006 and 1/2008 to measure the incidence of clinically suspected and radiologically confirmed venous thromboembolism (VTE) in medical-surgical intensive care unit (ICU) patients. Seven hundred fourteen patients were enrolled in this analysis. DVT prophylaxis was given according to established evidence-based guidelines in the hospital. Propensity scores were derived to adjust for baseline imbalances. A multivariate Cox proportional regression analysis with a time dependent covariate and stratification on propensity scores was used to calculate adjusted hazard rates (HR). Results: There were 52 VTE episodes out of 714 analyzed patients. Total VTE incidence rate was 58 cases per 10,000 patient-days. When GCS or IPC prophylaxes were used, the incidence rate was 77 and 30 cases per 10,000 patient-days, respectively. The unadjusted HRs were 1.12 (95% CI 0.83-1.99, p = 0.68) for GCS vs. no-mechanical device use, 0.44 (95% CI 0.2-0.92, p = 0.03) for IPC vs. no mechanical device and 2.59 (95% CI 1.18-5.69, p = 0.02) for GCS vs. IPC. After adjustment to propensity score and other covariates, the adjusted HRs were 0.97 (95% CI 0.52-1.82, p = 0.94) for GCS vs. no-mechanical device, 0.39 (95% CI 0.17-0.89, p = 0.03) for IPC vs. no-mechanical device and 2.59 (95% CI 1.11-6.02, p = 0.03) for GCS vs. IPC. Conclusions: The use of SCD is associated with reduced VTE rate compared to GCS or no mechanical prophylaxis. The use of GCS was not associated with reduced VTE.

Unfractionated heparin and mechanical thromboprophylaxis in hip arthroplasty. Garcia, Flávio Luís, Marins, et al

To evaluate the efficacy and safety of unfractionated heparin associated with mechanical prophylaxis as a method for preventing venous thromboembolism in hip arthroplasty. We retrospectively reviewed the records of 181 hip arthroplasties out of 216 consecutive cases.
performed over a period of 39 months in our hospital. We excluded 35 cases due to non-adherence to the standardized method of thromboprophylaxis or loss to follow-up. All arthroplasties evaluated completed one-year follow-up after surgery with five consultations at predefined periods. Efficacy of the proposed method was evaluated by the occurrence of symptomatic venous thromboembolism confirmed by specific tests and safety was determined by the lack of occurrence of major bleeding according to criteria established by the International Society on Thrombosis and Haemostasis. There were four cases of symptomatic venous thromboembolism (2.2%), with three cases of deep vein thrombosis (1.65%) and one case of pulmonary embolism (0.55%). We found one case of severe bleeding (0.55%). Unfractionated heparin associated with mechanical prophylaxis proved to be an effective and safe method for preventing venous thromboembolism in patients undergoing hip arthroplasty, presenting rates of thromboembolic complications and major bleeding within the range reported with other methods currently used of thromboprophylaxis. Level of Evidence IV, Case Series.

Obstetric Thromboprophylaxis

Efficacy of obstetric thromboprophylaxis and long-term risk of recurrence of venous thromboembolism, Lindqvist P., Bremre K Acta Obstetricia et Gynecologica Scandinavica, June 2011, vol./is. 90/6(648-653)

Objective. To study the efficacy of thromboprophylaxis with low molecular weight heparin (LMWH) in pregnant women with one previous venous thromboembolic event (VTE). Secondary aims were to study the long-term risk of secondary recurrence, bleeding and obstetric complications. Design. A prospective national study of long-term LMWH thromboprophylaxis in Sweden. Settings. All hospitals in Sweden during January 1998-December 2002. Participants. Pregnant women with one previous VTE and controls drawn from the Swedish Medical Birth Registry. The women were cross-matched with the Swedish Hospital Discharge Register to identify all recurrences and to ascertain the annual risk of recurrence. Main Outcome Measures. Recurrence of VTE, bleeding complications at delivery and obstetric complications. Results. 326 of 393 registered women could be evaluated. The relative risk reduction in VTE was 88%. There was an absolute increased risk of VTE during the thromboprophylaxis period: 1.2% compared to 0.2% among controls (p<0.001). The risk during the immediate post-treatment period (49-100 days post-partum) was increased 28-fold. The annual incidence of VTE after delivery was 1%. The risk of hematoma and major blood loss at delivery was increased during thromboprophylaxis (p<0.001). There were no differences in the incidences of preclampsia, intrauterine growth restriction or placental abruption. Conclusions. The relative risk reduction in VTE during thromboprophylaxis was 88%. After pregnancy, the annual long-term risk of recurrence was 1%. The risk was most pronounced in the post-treatment period. There was an increased risk of bleeding complications among women given LMWH, but there was no effect on obstetric complications.


Obstetric thromboprophylaxis is difficult. Since 10 years Swedish obstetricians have used a combined risk estimation model and recommendations concerning to whom, at what dose, when, and for how long thromboprophylaxis is to be administrated based on a weighted risk score. In this paper we describe the background and validation of the Swedish guidelines for obstetric thromboprophylaxis in women with moderate-high risk of VTE, that is, at similar or higher risk as the antepartum risk among women with history of thrombosis. The risk score is based on major risk factors (i.e., 5-fold increased risk of thromboembolism). We present data on the efficacy of the model, the cost-effectiveness, and the lifestyle advice that is given. We believe that the Swedish guidelines for obstetric thromboprophylaxis aid clinicians in providing women at increased risk of VTE with effective and appropriate thromboprophylaxis, thus avoiding both over- and under-treatment.

Pelvic magnetic resonance venography reveals high rate of pelvic vein thrombosis after cesarean section, Lindqvist P.G.; Hellgren M. American Journal of Obstetrics and Gynecology, February 2006, vol./is. 194/2(436-437)

In the run-in phase of a thromboprophylactic trial in women at moderate to high risk of deep vein thrombosis postcesarean section, we used magnetic resonance venography and found a surprisingly high rate of pelvic deep vein thrombosis (46% overall). Pelvic magnetic resonance venography may be a useful surrogate outcome in obstetric thromboprophylaxis studies but the clinical significance is not known.

Long Term Consequences of VTE & Complex Management


Objectives: This study estimated the cost-effectiveness of novel oral anticoagulants for (i) acute treatment and (ii) secondary prevention, of VTE from the perspective of the NHS. Methods: Secondary prevention: A Markov model was developed to evaluate cost-effectiveness of aspirin, rivaroxaban, dabigatran, warfarin (INR 2-3), apixaban 2.5mg and apixaban 5mg, compared to "no pharmacotherapy". Acute treatment: A decision tree model for short term outcomes, followed by the secondary prevention model for long-term consequences, was used to evaluate cost-effectiveness of dabigatran, rivaroxaban, apixaban and edoxaban, compared with warfarin (INR 2-3). All interventions were considered at the licensed dose(s). Efficacy and safety parameters were informed by network meta-analyses and longitudinal studies were used to parameterise the long term follow up. The models had a life time horizon with costs and QALYs discounted at 3.5%. Results: All results are presented at a 20,000 willingness to pay per QALY threshold Acute treatment: Apixaban
showed the highest expected QALYs (12.02) and was the most cost-effective intervention with an incremental net monetary benefit of 645 (-1,274 to 2,100) compared to Warfarin. Rivaroxaban also had a positive incremental net benefit (167); all other comparators had a negative incremental net monetary benefit compared with warfarin. Secondary prevention: Although aspirin has a higher risk of recurrent VTE compared to the anticoagulants it had the highest incremental net monetary benefit compared with warfarin; 596 (-6,494 to 4,524). This was due to the low cost and risk of adverse events of aspirin. All other comparators had a negative incremental net monetary benefit compared with warfarin. Conclusions: For acute treatment, apixaban had the highest probability (57%) of being cost-effective at a willingness to pay threshold of 20,000 for acute treatment. Novel oral anticoagulants are unlikely to be cost-effective for long term use in secondary prevention.

Cost-effectiveness of venous thromboembolism prophylaxis in total hip and knee replacement surgery: the evolving application of health economic modelling over 20 years. Wolowacz, S E, Hess, N, et al Current Medical Research and Opinion, 2008, vol. 24, no. 10, p. 2993-3006, In the last two decades, there has been considerable evolution of methods for cost-effectiveness modelling. Some of the first models were developed in the area of venous thromboembolism (VTE) prophylaxis. Hence, this area can serve as an important example to illustrate evolving standards. Our objectives are to document evolving methodology by describing VTE models, assess their critical strengths and weaknesses, and inform future advances for models in this therapeutic area. A systematic review of economic models of primary VTE prevention following hip and knee replacement surgery was undertaken. Electronic searches of PubMed, EMBASE, the Cochrane library, and grey literature were conducted (1985-2006). Reference lists of included articles and reviews were examined for relevant studies. Twenty-nine cost-effectiveness models were identified. Nineteen other cost-effectiveness analyses were excluded because they were not model-based; 16 were simple cost calculations and three were analyses of resource use data collected alongside clinical trials. The majority of models (24) were constructed as decision trees, frequently utilising previously published model structures, with some adaptation for new comparators, and/or addition of relevant events omitted by earlier models (e.g., bleeding due to prophylactic treatment). Later models have included Markov processes to model potential long-term consequences of VTE (recurrent VTE and post-thrombotic syndrome) over longer time horizons. Systematic identification of clinical evidence and more sophisticated analysis methods (e.g., Bayesian mixed-treatment comparisons and probabilistic sensitivity analyses) have recently been introduced. Model structures have evolved substantially in this highly studied therapeutic area, with improvements made to the model structure, the comprehensiveness of clinical evidence included, and the underlying calculation methodology.

Emerging options in the treatment of venous thromboembolism. Nutescu, Edith A American Journal of Health-system Pharmacy : AJHP, vol. 61, no. 23 Suppl 7, p. S12., The long-term consequences of recurrent venous thromboembolism (VTE) and post-thrombotic syndrome, clinical profiles of traditional and novel antithrombotic agents used to treat VTE, current treatment recommendations for acute symptomatic VTE, clinical experience with newer antithrombotic agents for acute treatment and extended secondary prevention of VTE, and an emerging VTE treatment paradigm are discussed. Novel antithrombotic agents, with more specific activity on the coagulation cascade, more predictable pharmacodynamics and pharmacokinetics, simpler dosing regimens, and few or no laboratory monitoring requirements, have been developed to overcome limitations associated with some of the nonspecific traditional anticoagulants. Unfractionated heparin (UFH) and low molecular weight heparin (LMWH) are currently the recommended options for initial anticoagulation in patients with acute VTE. Warfarin is the most commonly used agent for chronic anticoagulation. Emerging evidence now also supports the role of factor-Xa inhibitors and oral direct thrombin inhibitors in the acute treatment and extended secondary prevention of VTE. In recent clinical trials, fondaparinux (a synthetic factor-Xa inhibitor) was comparable in efficacy and safety to unfractionated heparin for the treatment of acute symptomatic PE and to the LMWH enoxaparin for treating acute DVT. Ximelagatran, an oral direct thrombin inhibitor, was comparable in safety and efficacy to enoxaparin plus warfarin for treatment of acute VTE (DVT with or without PE). In addition, ximelagatran has been demonstrated to be superior to placebo for the extended secondary prevention of VTE, when continued for an additional 18 months beyond an initial six months of therapy. The benefits of extended anticoagulation for secondary VTE prevention have also been recently demonstrated with both low (INR 1.5-2.0) and regular intensity (INR 2.0-3.0) warfarin therapy. A new paradigm for treating VTE is evolving based on the results of recent research to incorporate the use of emerging antithrombotic therapies in the acute treatment period and both traditional and novel agents in the chronic, extended-treatment period.

Epidemiology, risk factors and sequelae of venous thromboembolism. Wong P., Baglin T. Phlebolgy, 2012, vol./is. 27/SUPPL.2(2-11), 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 postthrombotic 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.


Venous thromboembolism (VTE) is increasingly recognized in paediatric practice. Few clinical trials have been performed in this area in children and management is largely extrapolated from adult practice where there is a considerable evidence base. This is likely to be unsatisfactory for a number of reasons. Firstly, there are significant differences in epidemiology and potential differences in the mechanisms for VTE in this age group. Secondly, many aspects of haemostasis are age-dependant, which has implications for the use of anticoagulants in the paediatric population. Thirdly, there are very limited data available on the safety and efficacy of anticoagulants to manage specific indications in paediatric practice, often with limited paediatric formulations available. In addition, children may survive for a prolonged period following these events so that long-term consequences may be highly significant in this age group. The aim of this guideline is to provide a rational basis for the investigation and management of children aged 1 month-16years with VTE, including cerebral venous thrombosis (CVT). The guideline is targeted at healthcare professionals involved in the management of children and adolescents with VTE, particularly paediatric haematologists.


Introduction: Venous thromboembolism (VTE) events have been associated with surgical procedures and cancer status. Pulmonary embolism is a potentially fatal event, and long term consequences of deep venous thrombosis can result in significant disability. Data regarding VTE by tumor type for surgical patients are sparse. The current study was designed to define the incidence, relative risk, and adjusted odds ratio of VTE following surgical intervention by cancer site. Methods: We performed a retrospective cohort study of patients entered into the ACS-NSQIP database from 2005-2008 who underwent a surgical procedure and had a post-operative neoplasm diagnosis. The incidence of VTE was calculated by tumor type for malignant and benign/CIS neoplasms. The relative risk of post-operative VTE for cancer was calculated by tumor site. An odds ratio was calculated for each neoplasm site using logistic regression, and controlled for body mass index (BMI), age, operative time, and sex. BMI, age and operative time were divided into categorical variables in concordance with those indicated by VTE prophylaxis guidelines. Results: All patients with a neoplasm were identified (n=130,284); 4289 cases were excluded due the uncertain behavior of the neoplasm. We identified 92,072 malignant neoplasms and 33,923 benign/CIS neoplasms, which were used as controls. The presence of colon cancer, rectal cancer, pancreatic cancer, uterine cancer, ovarian cancer, and breast cancer had statistically significant higher relative risk for VTE in patients with malignant neoplasms before controlling for patient characteristics. After controlling for age, sex, BMI and operative time, only malignancies of the large intestine, uterus, ovaries, and adrenals remained as having statically significant elevated odds ratio of developing VTE after a surgical procedure. Conclusions: The incidence of VTE is higher in patients with malignant neoplasm undergoing surgical procedures when compared to their benign counterparts. The relative risk of VTE varies by tumor type and is not uniform across patients undergoing surgical procedures. After controlling for patient characteristics known to be associated with VTE, the odds ratio of VTE remained elevated for malignancies of specific sites. Recommendations for VTE prophylaxis for patients undergoing surgical procedures should be based on the overall risk profile of the patient including an adjustment tailored to the specific type of malignancy.

**Inferior vena cava filters.** Kinney T.B.


Venous thromboembolism (VTE) remains a common disease with significant clinical impact upon our patients. Diagnostic challenges occur because of the nonspecific nature of the presenting symptoms. The advent of multidetector computed tomography, methods to stratify patients into VTE risks (low, intermediate, high) along with serological assays (D-dimers), have helped direct patients through proper workup and into conclusive diagnosis. In most cases, standard medical therapy for VTE is anticoagulation therapy (OAT). In situations where standard OAT is either contraindicated or complications result from that therapy, insertion of inferior vena cava (IVC) filters is considered. Recent reports suggest that although IVC filters are able to prevent pulmonary emboli (PE) in the short and intermediate term, there appear to be long-term consequences including excess recurrent deep venous thrombosis (DVT and IVC/filter occlusions). Recognition of the time sequence of IVC filter benefits and complications has encouraged development of optional IVC filters, which can be left in place indefinitely or removed usually before certain time constraints. This article will attempt to address the timing of IVC filter placements to protect patients from significant PE.
Long-term consequences and costs associated with venous thromboembolism. Mody S., Lefebvre P., et al
Journal of Managed Care Pharmacy, 2011, vol./is. 17/3(260),

BACKGROUND: Patients with venous thromboembolism (VTE) are at increased risk of developing recurrent VTE and post-thrombotic syndrome (PTS), and it is important for health care systems and formulary/ policy decision makers to understand the long-term costs associated with VTE. OBJECTIVE: To quantify the long-term consequences and costs associated with the development of VTE. METHODS: An analysis was conducted of health insurance claims between January 2004 and September 2008 from the Ingenix IMPACT database. Subjects aged > 18 years as of the date of first VTE diagnosis (index deep vein thrombosis [DVT], pulmonary embolism [PE], or both) with > 180 days of continuous insurance coverage prior to the index VTE were identified and matched 1:1 with controls without VTE (no VTE), based on exact matching factors and propensity scores. Patients’ histories were analyzed for up to 1 year after the index VTE event. The proportion of patients with recurrent VTE requiring hospitalization and PTS events was calculated. PTS was defined as occurring > 90 days after the index VTE event if the patient had both a venous imaging procedure and a claim for lower extremity pain, swelling, varicose veins, postphlebitic syndrome, or other disorders of the circulatory system. Total incremental health care costs associated with VTE were calculated, as well as costs related to complications of VTE, including medical services for VTE, PTS, thrombocytopenia, superficial venous thrombosis, venous ulcer, pulmonary hypertension, stasis dermatitis, and venous insufficiency.

RESULTS: The VTE and no-VTE cohorts (16,969 subjects in each group) were well matched with respect to age, gender, comorbidities, and VTE risk-factor distributions. The index VTE was DVT, PE, or both in 12,711; 2,473, and 1,785 patients, respectively. The risks of recurrent VTE requiring hospitalization and PTS during the 1-year follow-up period were 3.6% and 6.2%, respectively. VTE patients had significantly higher average yearly costs compared to the no-VTE group ($33,531 vs. $17,590, cost difference = $15,941; 95% CI = 14,819-17,012). The largest driver of cost difference was all-cause hospitalization ($10,659; 95% CI = 9846-11,491). Costs related to VTE complications represented 13.3% of the overall cost difference ($2913; 95% CI = 2693-3157). CONCLUSIONS: In this large matched-cohort study, VTE was associated with a 3.6% risk of hospitalization due to VTE recurrence and a 6.2% risk of PTS at 1 year after index VTE. Costs related to VTE complications represented nearly one-fifth of the incremental costs associated with VTE.


Following an overt episode of deep vein thrombosis (DVT), the long-term prognosis of the patient is predominantly obscured by three natural complications: recurrence of venous thromboembolism (VTE), post-thrombotic syndrome and death. Antithrombotic treatments have been proven effective in preventing recurrence of VTE but carry the risk of major bleeding. A high mortality rate persists during the first year following an acute VTE, with a small but continuing risk beyond the first year. Recurrences of VTE account for the minority of causes of deaths. With effective initial anticoagulant treatment, the early (within approximately 3 months) risk of recurrence is 3-6%. Long-term follow-up studies have shown that although the risk of recurrence of VTE beyond the first 6 months is lower, the risk persists over several years. Approximately 25% of DVT patients remain asymptomatic in the long term but severe signs of post-thrombotic syndrome (ulceration) are observed in 2-10% of patients 10 years after DVT. Major advances have been made in the management of acute VTE but the excess risks of death, recurrence of VTE and post-thrombotic syndrome persist for several years following the initial event. Appropriate therapeutic strategies for these events are still being developed and future study should be directed towards finding the optimal regimen for patients who require prolonged treatment.


The incidence and clinical significance of pulmonary residual thrombosis 6 months after an acute pulmonary embolism (PE) are still not well-known. To evaluate the association between residual vascular obstruction and the risk of venous thromboembolism (VTE) recurrence or death. Computed tomography pulmonary angiography (CTPA) was repeated in 97 consecutive patients 6 months after an acute episode of hemodynamically stable pulmonary embolism. We assessed the long-term consequences of residual thrombosis on vital status and incidence of recurrent VTE. Six patients were lost for follow-up. The remaining 91 patients were classified according to the presence (Group 1: 18 cases) or absence (Group 2: 73 cases) of residual pulmonary vascular obstruction. After a mean +/- SD of 2.91 +/- 0.99 years, there were eight (8.8%) deaths and 11 (12.1%) VTE recurrences. Groups 1 and 2 did not differ in the incidence of death or VTE recurrence. Persistent pulmonary vascular obstruction on 6-month CTPA did not predict long-term adverse outcome events.

"Post-thrombotic panic": Panic, positive outcomes and the paradoxical impact of venous thromboembolism (VTE). Hunter R., Bennett P.D., Lewis S., Rance J., Noble S. Journal of Thrombosis and Haemostasis, 2015, vol./is. 13(92-93),

Background: The long-term consequences of experiencing venous thromboembolism extend beyond physical phenomena such as post-thrombotic syndrome and pulmonary hypertension. Previous research suggests survivors of large volume symptomatic pulmonary emboli later experience elevated levels of distress and anxiety that impact their quality of life, with some demonstrating characteristics akin to posttraumatic stress disorder (PTSD). Aims: To understand the psychosocial impact of VTE through participants own words. Methods: Twelve patients with newly diagnosed VTE were recruited through a hematology clinic. Semi structured qualitative interviews were audio recorded and transcribed verbatim. Transcripts were analyzed using interpretative phenomenological analysis (IPA) to identify emergent themes identified. Results: The content of themes varied according to gender, age at time of VTE and participant's experience of
diagnosis and treatment. Emergent themes suggest a paradoxical duality and include: 1. Post-traumatic stress symptoms: Participants described significant symptoms of anxiety and panic, intrusive thoughts and images, and fear of VTE recurrence. 2. Positive outcomes: The experiences were life changing for participants, leading to re-evaluation of life and subsequent changes in self. Conclusion: Our initial data demonstrates that the post-thrombotic period can be a time of significant psychosocial distress including posttraumatic stress symptomology. It also highlights a duality of trauma and growth after VTE, which suggests a potential role for health psychology in identifying and supporting individuals at risk of post-traumatic stress. Opportunities for impacting patient outcomes via targeted interventions to enhance psychological wellbeing and recovery are discussed.


1st of 2 articles on venous thromboembolism (VTE), including definition, signs, symptoms and long-term consequences. Risk factors are identified and an example of a medical risk assessment tool is included.


Objectives: Venous thromboembolism (VTE) including deep vein thrombosis (DVT) and pulmonary embolism (PE) is a common cardiovascular disorder. Acute VTE has been traditionally managed with short course parenteral anticoagulation followed by 3-6 months of a vitamin-K antagonist. Novel oral anticoagulants do not require routine coagulation monitoring and dose adjustment, thus potentially providing an alternative treatment option. The cost-effectiveness of dabigatran vs. rivaroxaban over a 6 months treatment course in the UK health care setting was evaluated in this research. Methods: A life-time Markov model was developed, encompassing recurrent VTE events and VTE-related deaths, and the most common adverse events during anticoagulation therapy: major or clinically relevant bleed (MCRB). The model was populated with data from pooled RE-COVER and RE-COVER II dabigatran trials and the 6 months treatment duration subgroup of the rivaroxaban EINSTEIN-DVT and EINSTEIN-PE trials. Long-term consequences of VTE were considered. Costs were analysed from the NHS and Public Social Services perspectives. Health outcomes were assessed in quality-adjusted life years (QALY). Utility values for modelled health states were EQ-5D data from RE-COVER studies, and published data. Probabilistic sensitivity analyses (PSA) were undertaken. Results: In patients with index PE, 6 months treatment with dabigatran dominated treatment with rivaroxaban projecting less recurrent VTE and less MCRB at lower costs. Dabigatran was likely to remain cost-effective in 70% of cases at a threshold used in the UK of 30,000/QALY gained. Dabigatran continued to dominate treatment with rivaroxaban in patients with index DVT, projecting less non-fatal PE, less intracranial haemorrhages and less clinically relevant bleeds, but more recurrent DVT, with 68% likelihood of remaining cost-effective. In the pooled DVT/PE group, dabigatran dominated treatment with rivaroxaban and was 62% likely to remain cost-effective. Conclusions: Dabigatran is less costly and more effective than rivaroxaban when administered for 6 months after index PE, index DVT or both.


Venous thromboembolism (VTE) is associated with short- and long-term morbidity and mortality. Strategies to identify and stratify patients at risk for VTE and guidelines for its prevention are discussed. VTE, which includes deep venous thrombosis (DVT) and pulmonary embolism (PE), is a common and potentially fatal health problem. An estimated 2 million patients in the United States will develop a DVT annually. Although VTE is asymptomatic in many patients, the risk of mortality remains high--approximately 100,000 deaths annually in the United States--despite the availability of effective treatments. Many patients who initially survive a PE die within 90 days of discharge. VTE is also associated with long-term consequences, such as recurrent VTE and the disabling and costly postthrombotic syndrome (PTS). VTE produces a significant economic burden due not only to the direct medical costs associated with acute inpatient care but also to the long-term, follow-up costs. The routine use of prophylaxis to prevent VTE is justified due to high prevalence, asymptomatic nature, long-term morbidity, high mortality rate, and cost of the disorder. Health-system pharmacists can help to diminish the risk of VTE by identifying and stratifying at-risk patients and ensuring that appropriate prophylaxis is provided. Implementing a methodical and aggressive approach will reduce the incidence as well as the morbidity, mortality, and cost associated with VTE.

Risk Assessent


Abstract: Venous thromboembolism (VTE) is a common and important cause of death in hospital patients. We therefore investigated possible associations between the introduction of the compulsory national VTE risk assessment tool in England in 2010 and patient outcomes. A retrospective database study, using data from the Health and Social Care Information Centre and Office of National Statistics, was undertaken. The main outcome measures were VTE-related secondary diagnosis rates, 30-day and 90-day readmission rates and mortality rates. The observed mean VTE-related secondary diagnosis rate for 2011-2012 was 91% of the rate estimated from a linear regression model of the data for 2006-2007 to 2010-2011. Similarly, the observed mean 30-day VTE-related readmission rate for 2011 was 96% of the estimated rate and the observed mean 90-day VTE-related readmission rate for 2011 was 96% of the estimated rate.
A study of compliance with the protocol for thromboembolic prophylaxis in a university hospital, Mort J.E.; Daw K
British Journal of Oral and Maxillofacial Surgery, June 2011, vol./is. 49/(S84-S85)

Abstract: In 2010 NICE published its clinical guidelines on reducing the risk of venous thromboembolism (VTE including deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. A trust risk assessment form was introduced and all in-patients mandatorily risk assessed for VTE within 24 h of admission. We present the initial findings of a study looking at compliance of risk assessment and prophylaxis for adult in-patients in the maxillofacial unit at a university hospital, in accordance with the NICE recommendations. Method: Sixty-seven consecutive adult patients, admitted in a single month, were included in the study and their case notes audited retrospectively. These parameters were checked against the gold standard: (1) risk assessment completed (within 24 h), (2) risk factors for VTE identified and (3) appropriate VTE prophylaxis regime implemented. Following the first cycle changes were implemented to improve compliance. A second cycle was then completed using approximately the same number of patients and the results compared. Results: In the first cycle compliance was poor. Three simple interventions were introduced over a one-month period, which vastly improved most of the parameters measured. We discuss these interventions and the need to monitor compliance in maxillofacial units. Clinical relevance: According to the American College of Chest Physicians 2004, “pulmonary embolus (PE) is the most preventable cause of hospital death and the number one strategy to improve patient safety in hospitals”. Simple interventions can improve compliance with evidence based local protocols, which if implemented fully will have a significant impact on patient outcomes.

An audit of hospital-acquired venous thromboembolism (HAT) rates according to medical Specialty, at the Great Western Hospital, Swindon, Swan D.; Rhodes S
British Journal of Haematology, April 2012, vol./is. 157/(37)

Hospital acquired venous thromboembolism (HAT) represents a major source of potentially avoidable mortality and morbidity worldwide. NICE have provided guidance on reducing venous thromboembolism (VTE) risk by assessing patients on admission to hospital, after 24 hours and whenever the clinical situation changes. In this audit, we reviewed all 65 cases of HAT that were identified between June and December, 2010, to see whether patients had been appropriately VTE risk assessed, and whether rates of HAT varied significantly between specialties (general surgery, trauma and orthopaedics (T&O), medicine, obstetrics and gynaecology, day surgery and day orthopaedics). Overall, 92.3% had an initial VTE risk assessment, but only 25.9% were reassessed after 24 hours, and only 31% were reassessed every 72 hours. Assessments were correct in 87.7%, and pharmacological prophylaxis was prescribed unless contraindicated in 89.7%. Rates of HAT were similar throughout the specialties, with the exception of T&O, which was significantly greater (0.705% of patients, p = 0.0001). Initial assessment was poorer in this group (88.9%), but 100% received pharmacological prophylaxis. Surprisingly, the HAT rate was not significantly less for day surgery patients than general surgery ones (p = 0.874) despite an average hospital stay of 1 day compared with 12.2 days. The percentage of HAT was actually higher in the day surgery group (0.199% vs. 0.180%). These patients were the least accurately assessed, with 50% (n = 4) being incorrectly placed in the low risk group, and therefore not given pharmacological prophylaxis on discharge. This audit has shown the need to improve reassessment, which was consistently poor. T&O patients had the highest risk of HAT, despite prophylaxis, and day surgery conferred a greater than expected risk, possibly partly attributable to inaccurate assessment and consequent inadequate prophylaxis. Due to small case numbers, data analysis from a longer time-period is needed, but this may be an area where reeducation could impact patient outcome.

An evidence-based practice approach to improving nursing care of acute stroke in an Australian Emergency Department, Considine J.; McGillivray B
Journal of Clinical Nursing, January 2010, vol./is. 19/1-2(138-144)

The aim of this study was to improve the emergency nursing care of acute stroke by enhancing the use of evidence regarding prevention of early complications. Background. Preventing complications in the first 24–48 hours decreases stroke-related mortality. Many patients spend considerable part of the first 24 hours following stroke in the Emergency Department therefore emergency nurses play a key role in patient outcomes following stroke. Design. A pre-test/post-test design was used and the study intervention was a guideline for Emergency Department nursing management of acute stroke. Methods. The following outcomes were measured before and after guideline implementation: triage category, waiting time, Emergency Department length of stay, time to specialist assessment, assessment and monitoring of vital signs, temperature and blood glucose and venous-thromboembolism and pressure injury risk assessment and interventions. Results. There was significant improvement in triage decisions (214% increase in triage category 2, p = 0009; 156% decrease in triage category 4, p = 0048). Frequency of assessments of respiratory rate (p = 0009), heart rate (p = 0022), blood pressure (p = 0032) and oxygen saturation (p = 0001) increased. In terms of risk management, documentation of pressure area interventions increased by 288% (p = 0006), documentation of nil orally status increased by 138% (ns), swallow assessment prior to oral intake increased by 413% (p = 0003), speech pathology assessment in Emergency Department increased by 61% (ns) and there was 935 minute decrease in time to speech pathology assessment for admitted patients (ns). Relevance to clinical practice. An evidence-based guideline can improve emergency nursing care of acute stroke and optimise patient outcomes following stroke. As the continuum of stroke care begins in the Emergency Department, detailed recommendations for evidence-based emergency nursing care should be included in all multidisciplinary guidelines for the management of acute stroke.
VTE events are the most common cause of death in the inpatient setting. It is estimated that the use of low molecular weight and unfractionated heparins in "at risk" patients can reduce symptomatic VTE disease by up to 50% and fatal PE by 66%. Optimised prophylaxis would result in better patient outcomes, shorter lengths of hospital stay and reduced overall cost [2, 3]. Objectives: The aim of this study was to determine the portion of surgical patients at risk of VTE in Sligo Regional Hospital and to assess whether these patients were in receipt of appropriate thromboprophylaxis. We aimed to compare current practices employed in this hospital to the recommendations outlined in the latest NICE clinical guidelines. We wish to recommend methods of improving doctor compliance with prescription of prophylactic therapies. Methodology: All general surgical inpatients in Sligo Regional Hospital were assessed on the basis of a hospital chart, drug kardex and clinical review on a single date in November 2013. * A pro forma based on NICE Clinical Guidelines 92, "Venous thromboembolism; reducing the risk", Jan 2010, was used as the auditing tool. * Risk factors for VTE and bleeding, outlined in Table 1, were included. The date of initiation of pharmacological and/or mechanical treatment was noted as well as the dose of pharmacological VTE prophylaxis. Results: The average age of the 33 patients included in this study was 66-years-old; with ages ranging from 35 to 92 years. All patients were assessed for VTE bleeding risk. 30% of patients had at least one risk factor for bleeding and 100% had at least one risk factor for VTE. 38% of patients were classified as high risk for VTE, with the remainder being of moderate risk. VTE prophylaxis was given appropriately to 72% of patients. Of the patients provided with appropriate thromboprophylaxis, 38% had no prophylactic cover for 24 h or more due to delayed prescription. The dosing was not always appropriate. 28% of patients were in receipt of inappropriate prophylaxis, with almost half of this cohort receiving no prophylactic therapy whatsoever. Conclusion: Despite long-standing recognition of the risk of VTE in surgical patients, venous thromboprophylaxis remains underutilized. Passive dissemination of guidelines alone is unlikely to improve VTE prophylaxis practice. A number of active strategies are required, such as a specialised segment on the drug kardex, clinician education workshops and frequent auditing. We suggest that all drug kardexes remain invalid until a VTE risk assessment has been conducted and appropriate prophylactic cover prescribed by the relevant member of the treating team. These strategies would ensure that at-risk patients receive appropriate care with the added benefits of shorter hospital stays and reduced overall cost to Sligo Regional Hospital.

**Thrombosis and cancer**, Young A.; Chapman O Nature Reviews Clinical Oncology, August 2012, vol./is. 9/8(437-449) Venous thromboembolism (VTE) is a potentially life-threatening condition that can be associated with significant morbidity. Thrombosis and cancer are linked by numerous pathophysiological mechanisms; the frequency of VTE and the recurrence rate are increased in the cancer population in comparison with other patient groups. VTE is the second most common cause of death in patients with cancer, but can also be the initial presenting complaint in patients with an occult malignancy. Risk factors for cancer-related VTE include tumour type, surgery, chemotherapy and the use of central venous catheters; predictors of VTE for individuals are only now beginning to emerge. Patients with cancer who develop symptomatic VTE during chemotherapy are at a greater risk of early mortality than those without VTE. The apparent impact of VTE on early mortality in patients with cancer raises the question of whether anticoagulation might improve long-term survival in this population, by direct tumour biology-modifying mechanisms. There are widely published guidelines that highlight the benefits of effective VTE strategies in patients with cancer. In partnership with the patient and their carers, the clinical team can improve patient outcomes with optimal risk assessment and concordance with national and international guidelines in the prophylaxis and treatment of VTE.

**Venous thromboembolism (VTE) risk assessment and prophylaxis: A comprehensive systematic review of the facilitators and barriers to healthcare worker compliance with clinical practice guidelines in the acute care setting**, Young A.; Chapman O JBI Database of Systematic Reviews and Implementation Reports, 2012, vol./is. 10/57(3812-3893) 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. 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 of 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. 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.

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