Title: Evidence-Based Compression: Prevention of Stasis and Deep Vein Thrombosis
Author: Rhys J. Morris, PhD; John P. Woodcock, PhD, DSc, CPhys, FIInstP, FIPEM
Source: Annals of Surgery 2004; 239(2)

Objective: To summarize the currently published scientific evidence for the venous flow effects of mechanical devices, particularly intermittent pneumatic compression, and the relation to prevention of deep vein thrombosis (DVT).

Summary Background Data: While intermittent pneumatic compression is an established method of DVT prophylaxis, the variety of systems that are available can use very different compression techniques and sequences. In order for appropriate choices to be made to provide the optimum protection for patients, the general performance of systems, and physiological effects of particular properties, must be analyzed objectively.

Methods: Medline was searched from 1970 to 2002, and all relevant papers were searched for further appropriate references. Papers were selected for inclusion when they addressed specifically the questions posed in this review.

Results: All the major types of intermittent compression systems are successful in emptying deep veins of the lower limb and preventing stasis in a variety of subject groups. Compression stockings appear to function more by preventing distension of veins. Rapid inflation, high pressures, and graded sequential intermittent compression systems will have particular augmentation profiles, but there is no evidence that such features improve the prophylactic ability of the system.

Conclusions: The most important factors in selecting a mechanical prophylactic system, particularly during and after surgery, are patient compliance and the appropriateness of the site of compression. There is no evidence that the peak venous velocity produced by a system is a valid measure of medical performance.

Title: Thromboembolism After Total Knee Arthroplasty: Intermittent Pneumatic Compression and Aspirin Prophylaxis
Author: Christopher M. Larson, MD, Douglas P. MacMillan, MD, Paul F. Lachiewicz, MD
Source: Journal of the Southern Orthopaedic Association 2001;10(3)

Abstract: This is a study of two consecutive antithromboembolism regimens after total knee arthroplasty. In group 1, 131 patients were given aspirin prophylaxis alone (650 mg by mouth twice a day). In group 2, 123 patients were treated with aspirin, knee-high compression stockings, and intermittent knee-high pneumatic compression devices, which were started intraoperatively. The prevalence of deep vein thrombosis in group 1 was 15.9% (21 of 131 patients). One patient had a possible symptomatic nonfatal pulmonary embolism, and one patient had a symptomatic calf thrombus. Asymptomatic thrombi were detected in calf veins in 9 patients, popliteal vein in 1 patient, and femoral vein in 5 patients. In Group 2, the prevalence was 7.4% (9 of 123 patients). Asymptomatic thrombi were located in calf veins in 6 patients, popliteal vein in 1 patient, and femoral vein in 2 patients. There was a significant difference in the prevalence of deep vein thrombosis between the two groups. A history of previous thromboembolism was a significant risk factor for a new thrombus. The prevalence after bilateral one-stage knee arthroplasty was 24.3% for group 1 and 12.5% for group 2. Aspirin and knee-high intermittent pneumatic compression together are more effective than aspirin alone for prevention of deep vein thrombosis after primary and revision knee arthroplasty.
Title: Deep Vein Thrombosis in Hospitalized Patients: A Review of Evidence-based Guidelines for Prevention
Author: Wendy Kehl-Pruett ARNP, MSN, CCRN

Abstract: Deep vein thrombosis affects many hospitalized patients because of decreased activity and therapeutic equipment. This article reviews known risk factors for developing deep vein thrombosis, current prevention methods, and current evidence-based guidelines in order to raise nurses' awareness of early prevention methods in all hospitalized patients. Early prophylaxis can reduce patient risk of deep vein thrombosis and its complications.

Intermittent pneumatic compression devices work by creating pressure on the leg muscles, using air-filled sleeves. This pressure assists in improving venous blood return while decreasing blood pooling and can be applied either in sequential compression devices or longitudinally in rapid inflation, asymmetrical compression devices. Both devices look similar, provide about 45 mm Hg of pressure to the calf muscles, and have been shown to reduce DVT rates from 15% to 6.9% in a prospective, randomized study of 423 orthopedic patients who had total knee replacements. Pneumatic compression is safe with few contraindications and most patients tolerate these devices. Patients with complaints of feeling warm with the use of these devices can often be appeased by using the ventilation mechanism that allows cool air to circulate underneath the plastic sleeves. Other complaints may involve patients with restless leg syndrome who find it difficult to rest with the continuous inflation/deflation mechanism of these devices at night. The ACCP guidelines currently recommend using mechanical prophylaxis measures in all hospitalized patients with anticoagulant contraindications. Use in combination with anticoagulants is also recommended for those patients at high risk for developing DVT without anticoagulant contraindications. Mechanical measures should be used initially in surgical patients with a high risk for bleeding until anticoagulants can be reconsidered. Compression modalities were all found to be safe and effective. However, to be effective, these measures must be used for the duration of bedrest, not just a few hours a day. Nurses must encourage patient use and compliance.

Title: Venothrombotic Events: Evidence-Based Risk Assessment, Prophylaxis, Diagnosis, and Treatment
Author: Ruth McCaffrey and Cindy Blum

Abstract: Venothrombotic events (VTE), including deep vein thrombosis and pulmonary emboli, are a common cause of death among community-dwelling, hospitalized, and recently hospitalized outpatients. Nurse practitioners are well positioned to complete a risk assessment, initiate prophylaxis for those at risk to prevent VTE, and provide early diagnosis and treatment if VTE does occur. This article presents information about the incidence and prevalence of VTE, the importance of risk assessment and prevention, and evidence-based guidelines for prophylaxis and treatment.

Intermittent pneumatic compression devices (IPC) provide dynamic compression to promote blood flow in leg veins. Pneumatic compression is safe with few contraindications and most patients tolerate these devices. Patients with complaints of feeling warm with the use of these devices can often be appeased by using the ventilation mechanism that allows cool air to circulate underneath the plastic sleeves. Other complaints may involve patients with restless leg syndrome, who find it difficult to rest with the continuous inflation/deflation mechanism of these devices at night. Impulse technology, a form of IPC known as the “foot pump,” is very effective for prevention of DVT. This device moves blood up the deep calf toward the heart and enhances overall circulation of the limb. The “foot pump” may be even more effective than other more bulky thigh- or knee-high devices. Again, these devices are only effective if used properly and applied for appropriate lengths of time.
Author: Geerts WH, Bergqvist D, Pineo GF, Heit JA, Samama CM, Lassen MR, Colwell CW; American College of Chest Physicians.
Source: Chest. 2008 June; 133(6 Suppl):381S-453S

Abstract: This article discusses the prevention of venous thromboembolism (VTE) and is part of the Antithrombotic and Thrombolytic Therapy: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). Grade 1 recommendations are strong and indicate that the benefits do or do not outweigh risks, burden, and costs. Grade 2 suggestions imply that individual patient values may lead to different choices (for a full discussion of the grading, see the “Grades of Recommendation” chapter by Guyatt et al). Among the key recommendations in this chapter are the following: we recommend that every hospital develop a formal strategy that addresses the prevention of VTE (Grade 1A). We recommend against the use of aspirin alone as thromboprophylaxis for any patient group (Grade 1A), and we recommend that mechanical methods of thromboprophylaxis be used primarily for patients at high bleeding risk (Grade 1A) or possibly as an adjunct to anticoagulant thromboprophylaxis (Grade 2A). For patients undergoing major general surgery, we recommend thromboprophylaxis with a low-molecular-weight heparin (LMWH), low-dose unfractionated heparin (LDUH), or fondaparinux (each Grade 1A). We recommend routine thromboprophylaxis for all patients undergoing major gynecologic surgery or major, open urologic procedures (Grade 1A for both groups), with LMWH, LDUH, fondaparinux, or intermittent pneumatic compression (IPC). For patients undergoing elective hip or knee arthroplasty, we recommend one of the following three anticoagulant agents: LMWH, fondaparinux, or a vitamin K antagonist (VKA); international normalized ratio (INR) target, 2.5; range, 2.0 to 3.0 (each Grade 1A). For patients undergoing hip fracture surgery (HFS), we recommend the routine use of fondaparinux (Grade 1A), LMWH (Grade 1B), a VKA (target INR, 2.5; range, 2.0 to 3.0) [Grade 1B], or LDUH (Grade 1B). We recommend that patients undergoing hip or knee arthroplasty or HFS receive thromboprophylaxis for a minimum of 10 days (Grade 1A); for hip arthroplasty and HFS, we recommend continuing thromboprophylaxis > 10 days and up to 35 days (Grade 1A). We recommend that all major trauma and all spinal cord injury (SCI) patients receive thromboprophylaxis (Grade 1A). In patients admitted to hospital with an acute medical illness, we recommend thromboprophylaxis with LMWH, LDUH, or fondaparinux (each Grade 1A). We recommend that, on admission to the ICU, all patients be assessed for their risk of VTE, and that most receive thromboprophylaxis (Grade 1A).

Title: Prevention of Deep Vein Thrombosis and Pulmonary Embolism
Author: This practice bulletin was developed by the ACOG Committee on Practice Bulletins Gynecology with the assistance of Daniel Clarke Pearson, MD, and Lisa N. Abaid, MD, MPH
Source: The American College of Obstetricians and Gynecologists Clinical Management Guidelines for Obstetrician-Gynecologists, Number 84, August 2007

Abstract: Despite advances in prophylaxis, diagnosis, and treatment, venous thromboembolism remains a leading cause of disability and death in postoperative, hospitalized patients (1-3). Venous thromboembolism most commonly occurs in the form of a deep vein thrombosis or pulmonary embolism. Beyond the acute sequelae, venous thromboembolism may result in chronic conditions, including postthrombotic syndrome, venous insufficiency, and pulmonary hypertension. The purpose of this bulletin is to review the current literature on the use of thromboprophylaxis in gynecology patients and to provide evidence-based recommendations to guide clinical decision making.

Intermittent pneumatic compression devices reduce stasis by regularly compressing the calf with an inflatable pneumatic sleeve. When used during and after major gynecologic surgery, the devices are as effective as low-dose heparin and low molecular weight heparin in reducing DVT incidence.