Mechanical methods of venous thromboembolism prevention: from guidelines to clinical practice

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ABSTRACT

The paper discusses guidelines for the prevention of venous thromboembolism (VTE), with particular emphasis on the use of mechanical methods. Mechanical prophylaxis of VTE does not involve the risk of bleeding, which may be life-threatening. Mechanical methods are particularly recommended in patients at high risk of bleeding while on pharmacological thromboprophylaxis. Although antithrombotic prophylaxis is safe and cost-effective, there is evidence that the majority of preventive measures are applied too rarely in clinical practice, and that only a small proportion of patients receive complete and appropriate prophylaxis in the real-world clinical setting.

Introduction

Venous thromboembolism (VTE) constitutes a major interdisciplinary challenge in health care.¹,² It is one of the most important and potentially preventable causes of death and illness among hospitalized patients.³ The annual incidence rate of VTE is 0.75 to 2.69 per 1000 individuals in the general population, 2 to 7 per 1000 individuals aged 70 years or older, and 3 to 12 per 1000 individuals aged 80 years or older.⁴ Determining the real incidence rate is difficult owing to the often asymptomatic course of the disease, resulting still relatively often in sudden death caused by pulmonary embolism. The mortality rate in pulmonary embolism complicated by shock exceeds 15%.⁵ The total number of symptomatic VTE events in Poland is estimated at 57,000 cases of deep vein thrombosis (DVT) and 35,000 cases of pulmonary embolism per year. The long-term complications of VTE include recurrent thrombosis, postthrombotic syndrome, and chronic thromboembolic pulmonary hypertension.

Prevention of VTE is considered to be one of the most important interventions determining the safety of patients and influencing the cost of treatment. Overall VTE treatment costs, including hospitalization, use of anticoagulation, and possible inferior vena cava filter insertion, as well as postthrombotic syndrome treatment costs, vastly outweigh the costs of antithrombotic prophylaxis. Based on research studies and observational data, the widely available methods of prophylaxis are highly effective, also in terms of the costs.⁶ The majority of hospitalized patients are burdened with at least 1 risk factor for VTE. The risk factors include age of more than 40 years, obesity (body mass index >30 kg/m²), positive family history of VTE, multiorgan trauma, stroke, paresis or paraplegia, long-term immobilization, cancer, previous VTE, congenital or acquired thrombophilia, sepsis, New York Heart Association (NYHA) functional class III or IV, respiratory failure, autoimmune diseases, nephrotic syndrome, myeloproliferative disease, nocturnal paroxysmal hemoglobinuria, external venous compression (eg, tumor, hematoma, and arterial malformation), pregnancy and puerperium, long-term immobilization associated with travel (eg, long-distance flight), varicose veins in the lower limbs, obesity, and acute infection.⁷,⁸ The risk factors related to diagnostic and therapeutic interventions are surgical procedures (especially major surgery in the lower limbs, pelvis, and abdomen), catheter placement in large veins, anticancer treatment (chemotherapy), hormonal treatment, use of angiogenesis inhibitors, use of oral contraceptives,
hormone replacement therapy, or selective estrogen receptor modulators, as well as the use of erythropoiesis-stimulating drugs. The main goal of thromboprophylaxis is to reduce mortality and VTE incidence rates in patients at risk of VTE.

The year 2012 saw the publication of guidelines of the 9th Conference on Thrombotic and Thrombolytic Therapy of the American College of Chest Physicians (ACCP), which were updated in 2016. In 2012, the Polish Working Group (experts in the field of VTE prophylaxis and treatment, specialists in selected fields of medicine, and experts in methodology for developing guidelines in the field of clinical practice) published the third edition of Polish guidelines for VTE prevention and treatment. Subsequently, further documents certified by the Polish Working Group were published, which were dedicated to particular subgroups of patients, especially oncological ones. The documents were also published in other countries. An updated National Institute for Health and Care Excellence (NICE) guidance on VTE, published in March 2018, was aimed at reducing the incidence of hospital-associated VTE.

In 2018, the American Society of Hematology (ASH)/McMaster University GRADE Center developed new guidelines for the prevention of VTE in medical patients. Many of the pharmacological prophylaxis methods presented in the guidelines considerably reduce the risk of VTE symptoms. However, they are usually inseparable from the risk of bleeding complications when using in the clinical setting in medical and surgical patients. Mechanical antithrombotic prophylaxis is recommended owing to its effective prevention of factors in the Virchow triad, that is, venous stasis, hypercoagulability (by the induction of fibrinolysis activation), as well as endothelial dysfunction, provoked mainly by venous stasis and hypoxia.

At the same time, it does not involve the risk of bleeding, which might be life-threatening. Mechanical methods are particularly recommended in patients at high risk of bleeding complications. However, it is necessary to emphasize that the results of all available studies have shown that in most clinical moderate-to-high risk situations, pharmacological prophylaxis is more effective and should be applied unless contraindicated.

Although antithrombotic prophylaxis is safe, cost-effective, and recommended by numerous scientific guidelines, there is evidence that it is used too rarely in clinical practice and that only a small proportion of patients receive complete and appropriate VTE prophylaxis. An analysis of the results of international registries and different studies of patients hospitalized for nonsurgical reasons demonstrated that only from 2.6% to 38.9% of them received mechanical VTE prophylaxis.

The ENDORSE study (Epidemiologic International Day for the Evaluation of Patients at Risk for Venous Thromboembolism in the Acute Hospital Care Setting), conducted in 358 hospitals of 32 countries and covering over 68 000 patients, showed that approximately 42% of patients treated conservatively and 64% of those in surgical wards required antithrombotic prophylaxis owing to their thrombotic risk factors, assessed on the basis of the 2004 ACCP guidelines. As for patients for whom antithrombotic prophylaxis had to be implemented, it was used in only about 60% of surgical patients and in about 40% of those treated conservatively. Particularly worrying is the lack of prophylaxis in the case of over 60% of patients with malignant neoplasms and patients with an ischemic stroke, for whom the thrombotic risk is very high. Mechanical methods were used in as little as about 8% of patients.

The ENDORSE study also covered Polish hospitals and included an analysis of over 1000 patients from surgical wards and 1500 patients treated conservatively. It was found that in Poland, only two-thirds (66%) of patients from surgical wards and over a third (35%) of patients treated conservatively received thromboprophylaxis. The preferred form of VTE prophylaxis was anticoagulants, mostly heparins (92.1% of patients in internal wards and 99.2% of patients in surgical wards who used the prophylaxis recommended by the ACCP), followed by vitamin K antagonists and other anticoagulants. The use of mechanical prophylaxis was reported only in less than 2% of surgical patients. The proportions of prophylaxis methods applied in Poland are similar to world data, although the use of mechanical prophylaxis is less frequent.

The need to improve the current situation is evidenced not only by the ENDORSE study, but also by the results of the IMPROVE registry (International Medical Prevention Registry on Venous Thromboembolism), a study conducted to assess antithrombotic prophylaxis in more than 15,000 patients treated noninvasively in 52 hospitals of 12 countries. Pharmacological and/or mechanical antithrombotic prophylaxis was received by only 60% of patients eligible for this procedure in accordance with the ACCP guidelines.

The above results point to the necessity of taking a decisive action to provide patients at risk of VTE with antithrombotic prophylaxis that is consistent with the current guidelines. It is therefore essential to increase the awareness of VTE risk and to improve the implementation of the methods of antithrombotic prophylaxis, including mechanical methods, through education, broadly interpreted. The simplest and oldest VTE prophylaxis methods include using graduated compression stockings (GCSs), intermittent pneumatic compression (IPC) of the lower limbs, foot compression devices, as well as IPC of an upper limb (4%–10% of cases of venous thrombosis). They reduce venous stasis by displacing blood from...
the leg veins into the more proximal vein system segments, thereby increasing the speed and volume flow of the blood in the deep venous system of the lower limb. Knee-length compression stockings are also recommended in the management of patients with clinically massive DVT, especially in the setting of severe leg symptoms, as an adjunctive therapy to reduce leg edema and to prevent the postthrombotic syndrome.

It is recommended that special attention should be given to the correct technique and time of using mechanical techniques so that maximum effectiveness will be ensured. It is necessary to select the right size of the GCS or IPC equipment and to ensure that the patient follows all recommendations. When using IPC, the advised IPC device use should not be shorter than 18 hours a day and, if possible and accepted by the patient, a continuous day and night application is suggested. Of great help are small portable devices that record the proper (18–22 h/d) duration of IPC use, and that do not restrict the patient’s freedom to move independently.

Sequential compression devices (SCDs) used for IPC – leg cuffs and foot cuffs that exert a sequential circular compression on the limb – can replace a muscle pump function that operates under normal conditions during movements. During immobilization in a supine position, the work of lower-limb muscles is minimized. This causes a significant slowdown in blood flow in relation to the normal state. The cuffs exert a precisely calculated compression on the lower limbs in the following sequence: from the ankles, through the calves, to the thighs. At least 2 ways of the sequential compression are proposed: nonadjusted or adjusted to the leg volume. In the former, fixed and preset rate of the compression cycle repetitions are used; in the latter, the rate of the compression cycles depends on the leg volume and vein system refilling. The compression lasts 10 to 20 seconds, after which the cuffs relax, letting out the air and allowing the veins to be filled again with blood. Subsequently, the cuffs are rhythmically filled and emptied, and the device calculates the time it takes the veins to be filled with blood again in order to determine the moment the limbs need to be compressed again. The SCD system increases blood flow, preventing the accumulation of blood in the lower limbs and formation of blood clots. The compression of large muscle mass through an SCD cuff also increases fibrinolysis, which accelerates processes leading to the dissolution of blood clots. In order to increase the method efficacy, it is recommended that leg cuffs or foot cuffs should be used simultaneously with GCS (FIGURE 1).

Contraindications to the use of IPC include advanced leg ischemia, skin or tissue necrosis or local skin infections, a massive swelling of the lower limbs or pulmonary edema due to congestive heart failure, extreme cases of lower limb distortions, acute DVT, and the presence of malignant neoplasms within the limbs. Secondary outcomes in IPC-treated patients were local skin injuries, observed in about 3% of patients.

Although, in comparison with IPC, GCSs seem to be a cheaper and more comfortable VTE prophylaxis measure, IPC is considered to be more effective in reducing the incidence of DVT.

The results of the studies on surgical patients conducted to compare combined mechanical (IPC) and solely pharmacological prophylaxis demonstrate a strong trend towards a limited occurrence of DVT in combined therapy. In some groups of patients (eg, some groups of surgical patients at relatively low risk), similar results were obtained when combined prophylaxis with the use of GCS and pharmacological methods was compared with pharmacological prophylaxis only.

Applying methods of mechanical antithrombotic prophylaxis involves costs of purchasing and maintaining the equipment and requires trained personnel to provide patients with proper specialist care. Medical staff (nurses and physiotherapists) need to be trained in the proper use of IPC. The training should include information on the following points: selecting patients eligible for the use of IPC, informing the patient about the use of IPC, selecting proper pneumatic cuffs, putting on the cuffs, monitoring the use of IPC, including possible complications, making staff aware of technical problems, for example, an alarm activated when the pressure in the cuff is too high or too low.

Guidelines for the use of mechanical anticoagulant prophylaxis in various clinical conditions Owing to the relatively scarce clinical trial data concerning the results of using mechanical prophylaxis in various clinical situations, the majority of recommendations are the “weak” 2B and 2C. In the recently published ASH guidelines for medical patients, many recommendations are conditional, with very low certainty in the evidence of effects. In such situations, it may be justified to take an action that is different from the one recommended after the doctor’s careful consideration of the possible benefits and risks of such a decision. Only a few recommendations have the status of stronger 1C recommendations, which means that the treatment can be used in the case of most patients.

It should be emphasized that all VTE prophylaxis methods applied using the evidence-based approach should be interpreted in
Abdominal and pelvic surgery (gastrointestinal tract, urological, gynecological, bariatric, and vascular operations); minimally invasive, plastic, and reconstructive surgery According to the 2012 ACCP guidelines as well as respective Polish Working Group guideline document, 3-5 in low-risk patients, identified according to the modified Caprini risk assessment model, it is suggested that mostly mechanical method of prophylaxis should be used (2C). In the case of moderate-risk patients, it is suggested that low-molecular-weight heparin (LMWH) (2B), unfractionated heparin (UFH) (2B) or mechanical prophylaxis, preferably IPC (2C), should be used. In high-risk patients, it is suggested that mechanical prophylaxis is added to pharmacological methods to increase the efficacy of VTE prevention (2C). Patients at high risk of serious hemorrhagic complications should receive mechanical prophylaxis, preferably IPC, until the risk of bleeding is reduced and pharmacological prophylaxis can be implemented (2C). In patients at no risk of bleeding complications, where LMWH and UFH are contraindicated, it is suggested that fondaparinux or mechanical prophylaxis, preferably IPC, should be used (2C). With regard to the time of the mechanical prophylaxis implementation, it is advisable to continue mechanical prophylaxis until the patient achieves anticipated mobility or is discharged from the hospital. 9

Major orthopedic surgery Kakkos et al 28 conducted a systematic review and meta-analysis of 6 randomized controlled trials (1399 patients) to compare the efficacy of providing combined anticoagulant prophylaxis (IPC with pharmacological prophylaxis) with the use of each method separately in patients undergoing hip or knee replacement arthroplasty surgery. In patients who underwent knee surgery, the DVT rate was reduced from 18.7% in patients with pharmacological prophylaxis to 3.7% in patients with combined prophylaxis (P = 0.03). In patients undergoing hip surgery, the reduction was from 9.7% in the group with pharmacological prophylaxis to 0.9% in the group with combined prophylaxis (P < 0.001). The meta-analysis confirmed the advantage of the combined VTE prophylaxis over each method separately, and justified further randomized controlled trials on the effectiveness of combined mechanical and pharmacological prophylaxis in arthroplasty surgery and in other clinical conditions with high risk of thrombotic complications.

In a current comprehensive review, Flevas et al 29 discuss the available options of mechanical and pharmacological VTE prophylaxis in orthopedics. The authors recommend using the 2012 ACCP guidelines, 30 which take into account the simultaneous application of mechanical and pharmacological prophylaxis in patients at high risk of VTE following major orthopedic surgery. According to the current guidelines, in elective hip or knee replacement and in the surgical treatment of a proximal femur fracture, mechanical prophylaxis (1C) is recommended as one of the options, along with pharmacological methods (1B) (LMWH, UFH, apixaban, dabigatran, fondaparinux, rivaroxaban, and vitamin K antagonists). 31 In patients with an increased risk of bleeding, mechanical thromboprophylaxis methods (especially IPC) are recommended (1C). Patients who attach great importance to avoiding bleeding complications and little attention to discomfort associated with the use of IPC will opt for mechanical prophylaxis. It is advisable to continue mechanical prophylaxis until the patient achieves anticipated mobility or is discharged from the hospital. 9 In elective spine surgery, it is suggested that mechanical prophylaxis should be used and pharmacological prophylaxis added after reducing the risk of bleeding (2C).

Neurosurgery The following thrombotic risk factors play a role in patients undergoing neurosurgery: advanced age, malignant neoplasm, long time of surgery, and paraplegia or paralysis presence. Owing to the high risk of bleeding complications in this patient group, the guideline documents 4-22 suggest that these patients should first receive mechanical prophylaxis, preferably IPC, and that pharmacological prophylaxis should be added when the risk of bleeding decreases (2C).

Trauma and burns Patients with severe trauma, especially after spinal injury, are exposed to a very high risk of VTE. Additional risk factors are blood transfusion, surgery, fracture of limb bones, spinal cord injury, head injury, venous damage, mechanical ventilation lasting more than 3 days, male sex, black race, paraplegia, and coexistence of multiple diseases. Mechanical prophylaxis plays an important role in VTE prevention in patients with trauma who are at high risk of both VTE and bleeding. 27 According to the guidelines, in patients with severe trauma, mechanical prophylaxis is suggested as part of the thromboprophylaxis protocol. 3,23 When there is a high risk of VTE, a simultaneous use of pharmacological and mechanical prophylaxis is suggested, and in the presence of the contraindications to pharmacological prophylaxis, the choice is to use mechanical methods, preferably IPC, and to start pharmacological prophylaxis after the risk of bleeding subsides (2C).

In patients with severe or extensive burns and at high risk of bleeding, it is recommended that GCS and/or IPC should be used until the risk of bleeding decreases. It is advisable to continue mechanical prophylaxis until the patient achieves anticipated mobility or is discharged from the hospital. 9
Thoracic surgery  In patients undergoing thoracic surgery with moderate VTE risk, an alternative use of mechanical (2C) or pharmacological prophylaxis (2B) is recommended.\textsuperscript{3,23} in the case of high risk of VTE, a combined use of both prophylaxis methods is suggested (2C). In patients at high risk of major bleeding, it is recommended that IPC be used until the risk of bleeding decreases and pharmacological prophylaxis is possible (2C). It is advisable to implement mechanical prophylaxis on admission to the ward and continue it until the patient achieves mobility.\textsuperscript{3}

Cardiac surgery  The majority of patients undergoing cardiac surgery are at high risk of bleeding (emergency surgery, implantation of ≥5 bridges, advanced age, renal failure, long duration of extra-corporeal circulation, use of antiplatelet agents, coagulation disorders during the extracorporeal bypass). In a cardiac surgery patient at risk of VTE and bleeding, the use of mechanical prophylaxis (preferably IPC) in the postoperative period is a valid option that potentially reduces VTE risk without increasing the bleeding rate (2C).\textsuperscript{3} It is advisable to consider using mechanical prophylaxis and continuing it until the patient achieves anticipated mobility or is discharged from the hospital.\textsuperscript{3}

Intensive care  According to the guidelines,\textsuperscript{2,22} in critically ill patients at high risk of serious bleeding (prolonged activated partial thromboplastin time and/or prothrombin time, decreased platelet count), it is suggested that GCS or IPC should be used and that, after the risk of bleeding is reduced, pharmacological rather than mechanical methods should be applied (2C).\textsuperscript{3,10,31,32} For critically ill patients, the ASH guideline panel suggests pharmacological or mechanical VTE prophylaxis is alone over combined prophylaxis (conditional recommendation, very low certainty in the evidence of effects).\textsuperscript{15} It is advisable to implement mechanical prophylaxis on admission to the ward and continue it until the patient achieves mobility.\textsuperscript{3} However, the authors of the just published results of the randomized clinical trial found that among critically ill patients who were receiving pharmacological thromboprophylaxis, adjunctive IPC did not result in a significantly lower incidence of lower-limb DVT than pharmacological thromboprophylaxis alone.\textsuperscript{36}

Medical patients with acute diseases  The CLOTS 1 (Clots in Legs or Stockings after Stroke)\textsuperscript{9} study of 2518 patients hospitalized for stroke found that using GCS reduces the incidence of proximal DVT by only 0.5% (95% CI, −1.9% to 2.9%; \( P = 0.88 \)), which would require using GCS in 200 patients to avoid one case.\textsuperscript{3} In the randomized multicenter CLOTS 2 study conducted to compare knee-length stockings with thigh-length stockings for VTE prophylaxis in immobilized stroke patients, proximal DVT occurred in 98 of 1552 patients (6.3%) who used thigh-length stockings, compared with 138 of 1562 (8.8%) of those using knee-length stockings (95% CI, 0.7%–4.4%; \( P = 0.008 \)). No difference was reported in the number of deaths from pulmonary embolism.\textsuperscript{21,35} Skin injuries occurred in 3.9% of patients in the thigh-length stocking group and 2.9% of those in the knee-length stocking group. The study led to the conclusion that using thigh-length GCSs is more effective in the prevention of proximal DVT than using knee-length stockings, although it involves a greater risk of skin injury.\textsuperscript{26}

In 2013, the results of the CLOTS 3 multicenter randomized controlled trial were published. The study evaluated the effectiveness and safety of IPC in reducing DVT risk in patients after stroke.\textsuperscript{2} The study involved 2876 patients treated between December 2008 and September 2012 in 94 British centers. Patients were randomized to 2 parallel groups: those with and those without IPC. The patients underwent compression ultrasound examination of both lower limbs 7 to 10 days and 25 to 30 days after being included in the study. The control study was conducted after 6 months to assess the survival rate and the development of symptomatic VTE. The primary endpoint was the occurrence of proximal DVT within 30 days of randomization. Adverse effects included injuries or damage to the skin of the lower limbs. It was found that the primary endpoint (DVT) occurred in 122 of the 1388 patients (8.5%) with IPC and in 174 of the 1438 patients (12.1%) in the control group (absolute risk reduction of 3.6%). Death in a 30-day treatment period occurred in 156 patients (11%) with IPC and 189 patients (13%) not subjected to IPC (\( P = 0.057 \)); damage to the skin of the lower limbs was observed in 44 patients (3%) and 20 patients (1%), respectively (\( P = 0.002 \)); and falls with bodily injury, in 33 patients (2%) and 24 patients (2%), respectively (\( P = 0.221 \)).

Intermittent pneumatic compression was ultimately assessed to be an effective method of reducing DVT risk, in addition possibly improving the survival rate in a highly diverse group of patients immobilized after a stroke. In accordance with the CLOTS 3 study protocol, a remote analysis of the results was conducted after 6 months and published in 2014.\textsuperscript{37} The purpose was to examine the impact of IPC use on disability, living conditions, quality of life, and treatment costs (length of the treatment period, costs of IPC use). It was concluded that using IPC is inexpensive, prevents DVT, improves the survival rate, but does not improve the quality of life. Based on these study results, the guidelines suggest\textsuperscript{3,23} that in the case of patients with a recent ischemic stroke and reduced mobility pharmacological prophylaxis or IPC should be used alternatively, and that GCS should not be applied as the main method of prophylaxis (2B). Combining both methods may provide an additional benefit in comparison with the use of each method individually. Intermittent pneumatic compression should be temporarily removed to enable early mobilization and monitoring of skin damage.\textsuperscript{3,37}
In the case of patients with a recent hemorrhagic stroke and limited mobility, it is recommended that IPC and LMWH should be used at a prophylactic dose, with the first dose of LMWH being given 2 to 4 days after the bleeding if the clinical picture and/or imaging does not show any increase in hemorrhagic changes. Using both methods may produce additional benefits in VTE prophylaxis (2C). On the contrary, the ASH guidelines suggest the administration in acutely ill medical patients of pharmacological or mechanical methods of VTE prophylaxis alone: (conditional recommendation, very low certainty in the evidence of effects). According to the NICE guidelines, it is advisable to consider using IPC within 3 days of acute stroke. This treatment should be continued for 30 days or until the patient’s mobility is normal.

Cancer patients Patients with cancer are at a 6-fold higher risk of developing VTE, especially in the course of surgery or chemotherapy. Using drugs that inhibit angiogenesis (eg, thalidomide, lenalidomide, and bevacizumab) and preparations that stimulate erythropoiesis is an additional risk factor in these patients. Other risk factors include the age of more than 40 years, obesity, VTE in family history, congenital or acquired thrombophilia, illness treated conservatively, NYHA classes III and IV heart failure, respiratory failure, sepsis or varicose veins in the lower limbs, and long flight (> 8 hours). In this group of medical oncological patients, mechanical prophylactic methods are not recommended as monotherapy, except for conditions where pharmacological prophylaxis is contraindicated. In medical oncological patients treated conservatively in hospital conditions, pharmacological and/or mechanical prophylaxis should be used, similarly to other medical patients at high risk of VTE. According to the guidelines’ dedicated to this patient group, in patients at high risk of bleeding, it is recommended that IPC and/or GCSs should be used until the risk of bleeding is reduced (2C). In patients with persistent VTE risk factors, GCSs should be used.

Mechanical deep vein thrombosis prophylaxis during pregnancy Owing to a small amount of data, recommendations for using anticoagulants in pregnant women are based on the extrapolation of data obtained in studies concerning other groups of patients. High-risk factors include immobility, previous VTE, preeclampsia or intrauterine fetal growth restriction, severe thrombophilia, blood transfusion, postpartum infection, and comorbidities such as systemic lupus erythematosus, heart disease, and sickle cell disease. Low-risk factors include a body mass index exceeding 30 kg/m², multiple pregnancy, postpartum hemorrhage, smoking more than 10 cigarettes per day, and milder forms of thrombophilia. According to the guidelines, if there are contraindications against pharmacological treatment in pregnant women at risk of VTE, it is suggested that mechanical prophylaxis, namely GCSs or IPC, should be used (2B). In women after a cesarean delivery with very high risk of thrombotic complications and numerous additional risk factors in the postpartum period, it is recommended that GCSs or IPC should be used simultaneously with pharmacological prophylaxis (LMWH), and that pharmacological prophylaxis should be extended up to 6 weeks after delivery (2C). The preferred method of mechanical prophylaxis is IPC, which should be applied until the patient achieves full mobility.

Long distance flight (> 4 hours) In the guidelines dedicated to this patient group, in passengers travelling by plane on routes lasting over 4 hours, it is suggested that they wear clothes without ribbing, do appropriate exercises, and avoid dehydration. People with an increased risk of VTE (recent surgery, prior history of VTE, postpartum women, active malignancy, or ≥2 risk factors, including combinations of the above with hormone replacement therapy, obesity, or pregnancy), should wear knee socks with graduated compression or take LMWH in a prophylactic dose. For people with an increased risk of thromboembolism complications, and in whom LMWH or GCS is not feasible (eg, resource-constrained setting or aversion to other indicated anticoagulants), the ASH guideline panel suggests using aspirin rather than no VTE prophylaxis (conditional recommendation, very low certainty in the evidence of effects).

Conclusions Mechanical methods of VTE prophylaxis (GCSs and/or IPC) are suggested in patients at high risk of bleeding complications following pharmacological prophylaxis, but also simultaneously with pharmacological prophylaxis in patients at high thrombotic risk. According to available literature, it seems that the use of possible VTE prophylaxis options in patients at risk of thrombosis continues to be limited and insufficient. This state of affairs can be improved by conducting an educational campaign focused on the purposes and effectiveness of employing mechanical methods of antithrombotic prophylaxis.

ARTICLE INFORMATION
CONFLICT OF INTEREST None declared.
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