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NURSING INTERVENTIONS FOR PEOPLE AT RISK OF VENOUS THROMBOEMBOLISM ASSOCIATED WITH CHEMOTHERAPY: SCOPING REVIEW

Intervenções de enfermagem à pessoa com risco de tromboembolismo venoso associado à quimioterapia: Scoping Review

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ABSTRACT

Introduction: Venous thromboembolism is the second leading cause of death in people with cancer. This risk increases in people undergoing chemotherapy. This complication causes physical and emotional suffering, and targeted nursing interventions are essential. **Objective:** To map the scientific evidence on nursing interventions to prevent and manage venous thromboembolism in people with cancer undergoing chemotherapy. **Methods:** Scoping Review according to the methodology of the Joanna Briggs Institute. The research was conducted in the MEDLINE® and CINAHL® databases in April 2023. The review followed the PRISMA-ScR EQUATOR checklist. **Results:** Twenty-six articles published between 2004 and 2023 were included. After analysis, three main dimensions emerged: assessment of the risk of venous thromboembolism, independent interventions, and interdependent interventions. **Conclusion:** Nurses play a crucial role in preventing and managing venous thromboembolism, using a systematised approach to risk assessment, education, monitoring for signs and/or symptoms of these complications, and implementing targeted interventions.

KEYWORDS: Antineoplastic agents; Cancer; Nursing care; Primary and secondary prevention; Venous thrombosis.

RESUMO

Introdução: O tromboembolismo venoso é a segunda causa de morte na pessoa com cancro. Este risco aumenta em pessoas sob quimioterapia. Esta complicação provoca sofrimento físico e emocional, sendo fundamental intervenções de enfermagem dirigidas. **Objetivo:** Mapear a evidência científica sobre intervenções de enfermagem que permitem prevenir e gerir o tromboembolismo venoso na pessoa com doença oncológica sob quimioterapia. **Métodos:** *Scoping Review* segundo metodologia do Instituto Joanna Briggs. Pesquisa realizada nas bases de dados MEDLINE® e CINAHL® em abril de 2023. A revisão seguiu a checklist PRISMA-ScR EQUATOR. **Resultados:** Incluídos 26 artigos, publicados entre 2004 e 2023. Após análise, emergiram três grandes dimensões: avaliação do risco de tromboembolismo venoso, intervenções autónomas e intervenções interdependentes. **Conclusão:** O enfermeiro é preponderante na prevenção e gestão do tromboembolismo venoso, recorrendo a uma abordagem sistematizada de avaliação do risco, educação e vigilância de sinais e/ou sintomas destas complicações e implementação de intervenções dirigidas.

PALAVRAS-CHAVE: Cancro; Cuidados de enfermagem; Prevenção primária e secundária; Quimioterapia; Tromboembolismo venoso.

Introduction

Cancer is a disease with a regular increase in cases in the Portuguese population of 3% per year, making it an epidemic in today's society[1]. This progression of the disease has led to a corresponding increase in the administration of systemic antineoplastic therapies, and the thromboembolism associated with these treatments has been identified as the second leading cause of death in people with cancer[2]. There has been an increase in the number of cases diagnosed with these complications, associated with an increase in the survival of people with cancer, the number of treatments available and the effectiveness of the complementary tests they undergo periodically[3].

Thromboembolism can be of arterial or venous origin. Arterial complications are more frequent in the presence of advanced disease and pre-existing cardiovascular disease, with the most common arterial complications being stroke and acute myocardial infarction[4]. Complications of venous origin are called venous thromboembolism (VTE), with incidence reports varying widely between studies, ranging from 1.6% to 6%[5]. The most common cases are deep vein thrombosis (DVT) and pulmonary embolism (PE)[5,6], which are more prevalent in the first six months after a cancer diagnosis and are sometimes the first sign of oncological disease[7]. Virchow's triad, made up of three elements, can explain these complications: hypercoagulability, related to the release of tumour-derived microparticles into the bloodstream; endothelial damage, caused by tumour invasion into adjacent tissues; treatments such as chemotherapy or the placement of central venous catheters (CVC); and venous stasis, caused by immobility in bed or tumour compression[8].

A study by Khorana et al. (2007) identified a significant increase in VTE in the inpatient oncology population, with a rate of 26%, but up to 47% in people undergoing chemotherapy, revealing an association between this therapy and VTE[10]. In addition to the data, VTE has a negative impact on people with cancer, causing physical and psychological sequelae and aggravating the distress associated with cancer and its treatments[11].

Thromboprophylaxis with anticoagulants can reduce the incidence of VTE by about 50%[12], improving the morbidity and mortality associated with this complication and reducing the use of healthcare resources[13,14]. However, low levels of awareness about VTE can compromise adherence to anticoagulant therapy or its effectiveness recovery[11,14].

In VTE prevention, the National Comprehensive Cancer Network (NCCN) recommends the implementation of actions to reduce the incidence of these complications in the populations at intermediate to high risk, which should be assessed using a risk assessment model[13]. In contrast, in management, the European Society for Medical Oncology (ESMO) emphasizes the importance of preventing the recurrence of complications through early treatment with anticoagulants[7].

Despite the evidence, chemotherapy-associated VTE is underestimated compared with other complications, such as febrile neutropenia[15]. There are also inconsistencies in the management of VTE in people with cancer, so there is an urgent need to improve care[15]. Thus, nurses are expected to be agents of change in prevention and management[11,14].

Nursing has kept pace with scientific development, providing new fields of action, more autonomous and specialised professionals who take on increasingly complex care and greater responsibility, with a substantial impact on the quality of care provided and on health services[16].

Nurse intervention in a multidisciplinary approach is essential for quality care for people at risk of VTE[17], and is crucial for improving risk assessment and VTE education[18]. Given this premise, we needed to determine the nurse's intervention and identify the actions that belong to the prevention and chemotherapy-associated VTE management domains. As we wanted a broad search of the literature, with the need to cover various concepts, we chose a Scoping Review, following the guidelines recommended by the Joanna Briggs Institute (JBI)[19], to map the scientific evidence on nursing interventions to prevent and manage VTE in people with cancer undergoing chemotherapy.

Methods

This review was conducted following the JBI methodology[19], in which the search strategy and analysis of the articles were carried out based on the guidelines for systematic reviews and the extension of meta-analyses: PRISMA-ScR[20].

In this context, the research question was formulated: "What nursing interventions are directed towards the prevention and management of venous thromboembolism (VTE) in persons with cancer undergoing chemotherapy?" This question was developed according to the PCC strategy: P = Population (people with cancer); C = Concept (prevention and management of VTE); C = Context (Chemotherapy). The inclusion and exclusion criteria were determined based

on the elements of the PCC framework and guided by the principles of the Joanna Briggs Institute (JBI).

The population of the articles included were adults over the age of nineteen[21], with any oncological disease at risk or diagnosed with VTE. In terms of concept, this review included all studies describing nursing interventions in the field of VTE prevention or management. We used to determine a nursing intervention as 'any treatment, based on clinical judgement and knowledge, a nurse carries that out to improve client outcomes'[22] (p.27), VTE prevention as 'reducing the risk of embolism in a patient with thrombi or the risk of thrombus formation' (p.345), and VTE management as 'limiting complications for a patient who has or is at risk of peripheral circulation occlusion' (p.344).

Regarding the context, studies on outpatient and inpatient chemotherapy treatments were included, and chemotherapy involve drugs that interfere with different phases of the cell cycle and indiscriminately damage cancerous or healthy cells[23].

Regarding methodology, studies with a qualitative, quantitative, mixed design and other reviews were included, with no time limit and access to the full text. To ensure quality in selecting and extracting data, only studies in English and Portuguese were chosen.

The exclusion criteria defined were the population: children and pregnant women; the concept: exclusively pharmacological prescriptions; and finally, the context: exclusive treatments with hormone therapy, target therapy, and immunotherapy and home or long-term care contexts.

Research strategy

This Scoping Review used a three-phase strategy[19]. The first was a preliminary search limited to the EBSCOhost platform, which allowed us to recognize articles on the subject and identify the words in their titles and keywords. The indexed terms of each database to be included in this research were selected from these articles.

The second stage comprised a search that included all the keywords and terms indexed for each of the MEDLINE and CINAHL Complete electronic databases carried out on 19 and 20 April 2023, which included the Boolean terms AND and OR (Table 1) The articles identified were migrated to the Rayyan® electronic tool to organise and facilitate the screening process and eliminate duplicates. The screening process included reading the titles and abstracts of the articles, conducted independently and anonymously by two reviewers (AM, AF), who selected the articles for full reading. Of the articles selected, those with full text were chosen according to the inclusion and exclusion criteria, and disparities were resolved by consensus and validated by a third author (MC). Finally, the third stage included analysing the reference list of eligible articles and identifying additional articles.

Table 1. Search strategy in databases.

MEDLINE	"(MM "Patients" OR MM "Neoplasms" OR AB tumor OR AB onco* OR AB carcino*)" **AND** (MM "Venous Thrombosis" OR MM "Venous Thromboembolism" OR AB "cancer-associated thrombosis" OR MM "Embolism and Thrombosis" OR MM "Thrombosis" OR AB "venous disease thrombosis") OR (AB nurs* OR MM "Nurses" OR MM "Nurse Practitioners" OR MM "Nurse Clinicians" OR MM "Nursing" OR MM "Nursing Care" OR MM "Oncology Nursing" OR MM "Nurse's Role" OR MM "Nurse Specialists" OR MM "Nursing Assessment" OR AB "nurse intervention" OR MM "Nursing Care" OR "thromboembolism nursing" OR MM "Practice Guidelines as Topic" OR MM "Secondary Prevention" OR AB "prevention and control" OR AB "thromboembolism prevention" OR MM "Health Promotion" OR MM "Risk Management" OR MM "Risk Assessment" OR MM "Risk Factors") **AND** "(AB chemotherapy OR MM "Antineoplastic Agents" OR MM "Drug Therapy")
CINAHL	"(MM "Cancer Patients" OR AB cancer OR AB neoplasm OR AB carcino* OR AB onco* OR AB tumor)" **AND** "((MM "Venous Thrombosis" OR MM "Thrombosis" OR MM "Embolism and Thrombosis" OR MM "Pulmonary Embolism" OR AB "cancer-associated thrombosis") AND (AB nurs* OR MM "Preventive HealthCare" OR MM "Practical Nurses" OR MM "Nursing Practice" OR MM "Advanced Nursing Practice" OR MM "Nursing Assessment" OR MM "Nursing Role" OR AB "thromboembolism nursing" OR MM "Nursing Management" OR MM "Nursing Interventions" OR MM "Nursing Role" OR MM "Nursing Care" OR MM "Patient Education" OR MM "Patient Education" OR MM "Education, Nursing, Practical" OR MM "Health Education" OR AB prevention OR AB "prevention and control" OR AB "thromboembolism prevention" OR MM "Secondary HealthCare" OR MM "Self-Management" OR MM "Self-Care" OR MM "Risk Assessment" OR AB algorithms OR AB "thromboembolism risk factors" OR MM "Management" OR MM "Health Information Management")" **AND** "(AB chemotherapy) OR MM "Chemotherapy, Cancer" OR MM "Antineoplastic Agents")"

AB – Abstract; MM – Index descriptor; "AND" or "OR" – boolean operators

Data collection and synthesis of the results

The data were extracted and systematised in a table built in Microsoft Excel® for this purpose. The data extracted

were author(s), year and country of the study, purpose/objective, methodology, population/sample size, nursing interventions in preventing and managing VTE in people with cancer, and context of chemotherapy treatment. The authors of the articles were contacted to obtain information about the data when deemed necessary.

The systematised data was grouped according to keywords or similarity in each data extraction category. The data extraction was compared, and disagreements were resolved between the reviewers through a discussion with a third reviewer (MC). The data was presented as a narrative, according to the two concepts of this review: VTE prevention with three dimensions - VTE risk assessment, autonomous and interdependent interventions and VTE management with two dimensions - autonomous and interdependent interventions.

Results

Selection of sources of evidence

Forty-six records were identified: 22 in CINAHL®, 24 in MEDLINE®, and ten from other sources, which we selected from the references of the 46 articles identified. Two were excluded for duplicates, resulting in 54 articles being chosen. After reading and analysing the titles and abstracts, 15 were excluded, and 29 records were obtained for full reading. After reading 39 articles in total, 26 articles were included in the review, and the references to the excluded articles and the reasons for their exclusion can be seen in Figure 1.

Characteristics of included studies

The articles included in this review were published between 2004 and 2023. The studies were carried out in 9 countries: the USA (n=15)[2,7,13,18,25–35], Canada (n=3)[14,36,37], the United Kingdom (n=2)[11,15], Italy (n=1)[38], China (n=1)[39], Switzerland (n=1)[12], Germany (n=1)[40], Greece (n=1)[41], France (n=1)[42]. No studies were identified at the national level, (Table 2).

In terms of methodology, there was a predominance of literature reviews (n=7)[13,28,29,34,35,40,42], narrative reviews (n=4)[12,26,30,31], followed by retrospective studies (n=3)[25,32,38], prospective studies (n=3)[18,39,41], qualitative studies (n=2)[15,27], mixed studies (n=1)[11] and several articles did not specify the methodology used (n=6)[2,7,14,33,35–37]. As far as care settings are concerned, these are divided into four areas: outpatient (n=12)[11,12,14,18,25,27,28,32,33,37,38,41], hospitalisation and outpatient (n=8)[2,7,13,29,30,34,35,40], not mentioned in the articles (n=5)[15,26,36,39,42] and hospitalisation (n=1)[31].

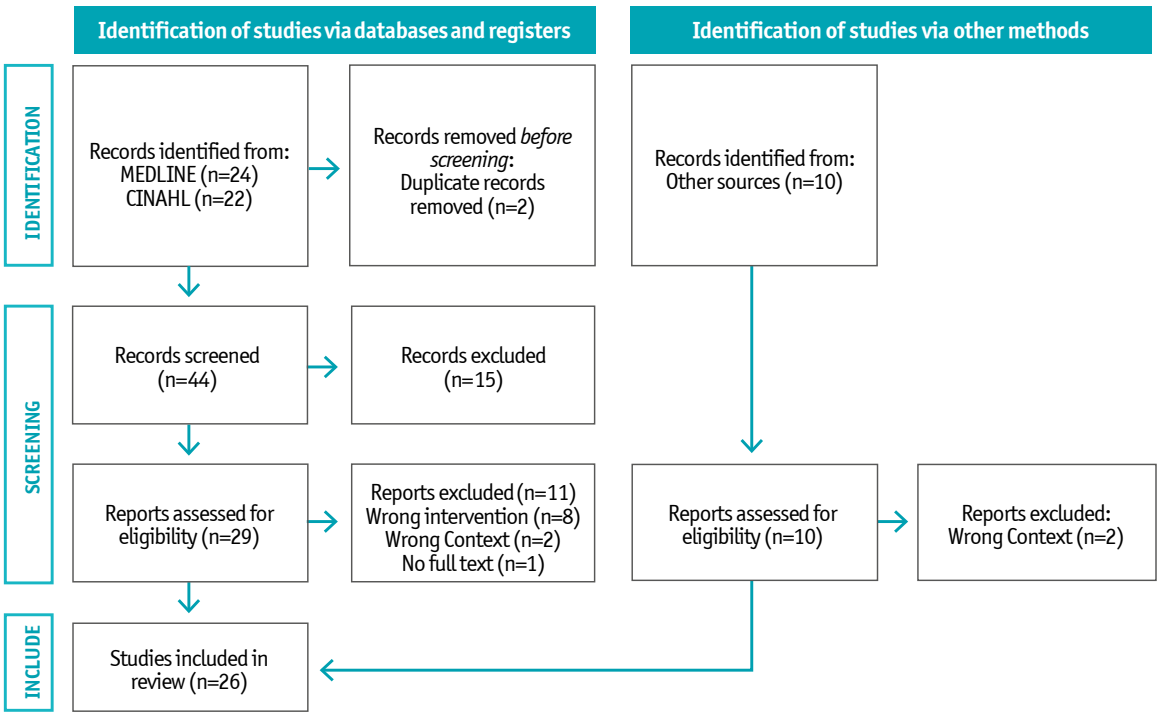

Figura 1. PRISMA 2020 diagram of the article selection process[24]

Table 2. Summary of the data obtained from analysing the articles.

AUTHORS/ YEAR/ COUNTRY	AIM/ OBJECTIVES	METHODS	POPULATION	CONCEPT: NURSING INTERVENTIONS FOR THE PREVENTION AND MANAGEMENT OF VTE IN PEOPLE WITH ONCOLOGICAL DISEASES	CONTEXT
Fu et al.[39] 2022; China	• Develop and validate a new clinical model based on an artificial neural network to predict PICC-related thrombosis in breast cancer patients undergoing chemotherapy and determine whether it is possible to improve thrombosis prediction performance.	Prospective cohort study	1844 breast cancer patients with PICCs for chemotherapy	• Identifying the risk of thrombosis improves care. • The artificial neural network stands out as the most effective.	Not mentioned
Spyropoulos et al.[25] 2020; USA	• Validate COMPASS-CAT for patients undergoing chemotherapy, diagnosed with breast, colon, lung and ovarian cancer.	Retrospective validation study of COMPASS--CAT	3.814 patients with breast, colon, lung and ovarian cancer	• Risk assessment using scores in the first 6 months after cancer diagnosis.	Outpatient
Rossel et al. [12] 2020; Switzerland	• Summarize the evidence on VTE prevention in the outpatient oncology population and the impact of trial results on recommendations for practice.	Narrative review	Not mentioned	• VTE risk assessment for all people before starting chemotherapy, with the KS. • Anticoagulant therapy reduces VTE complications by around half but increases the risk of hemorrhage, so it is only recommended if the KS≥2 points.	Outpatient
Kirschner et al.[40] 2021; Germany	• Analysing current treatment options in relation to individual VTE risk.	Literature review	Not mentioned	• Assessing the risk of VTE with KS in people with cancer in outpatient and inpatient settings. In the latter context, it should be assessed whether: (1) mobility maintained; (2) no surgery; (3) no diagnosis of multiple myeloma. • Mechanical prophylaxis with IPC or compression stockings is not recommended in people with thrombocytopenia (<50,000mc/L). • If VTE is diagnosed in a person with cancer, secondary thromboprophylaxis is recommended, given the disease or active treatments.	Outpatient and inpatient
Syrigos et al.[41] 2018; Greece	• To identify the most clinically relevant hypercoagulability biomarkers in patients with lung adenocarcinoma to develop an improved VTE risk assessment model.	Prospective cohort study	150 patients with lung adeno carcinoma	• Identification of risk factors: (1) hospitalization in the last 3 months prior to the assessment, (2) cardiovascular disease and/or cardiovascular comorbidities, (3) overweight or obesity, (4) personal history of thrombosis, (5) cancer diagnosis time of less than 6 months at the time of the assessment.	Outpatient
Farge et al.[42] 2010; France	• To draw up guidelines for the management of VTE in oncological clients according to the Standards, Options and Recommendations methodology.	Literature review	38 publications included	• The initial treatment for VTE in people with oncological disease is LMWH and UFH and the duration of treatment can exceed 6 months.	Not mentioned

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Viale[25] 2005; USA	• To make oncology nurses aware of the increased risk of VTE in clients with oncological disease due to factors such as chemotherapy and hypercoagulation caused by the neoplasm.	Narrative review	Not mentioned	• Identification of VTE risk factors. • Monitoring for signs and symptoms of VTE allows for appropriate and immediate intervention.	Not mentioned
Khorana & Rao[28] 2007; USA	• Evaluate the literature on risk factors for cancer-associated VTE and discuss data from a large observational study of cancer patients undergoing chemotherapy, which revealed new risk factors for chemotherapy-associated VTE.	Literature review	Not mentioned	• Identification of the 5 VTE risk predictor criteria: (1) tumors location, (2) platelet count ≥350,000/ mm3, (3) hemoglobin <10 g/dL and/or use of erythropoietin, (4) white blood cell count >11,000/mm3; (5) body mass index; • KS makes it possible to identify the risk of VTE.	Outpatient and inpatient
Khorana[2] 2009; USA	• Analyse the association between thrombosis and cancer, discuss new prevention and treatment regimens. • Describe the impact of recently published guidelines on clinical practice.	Not mentioned	Not mentioned	• Anticoagulant therapy is recommended for all hospitalized people with a diagnosis or suspicion of oncological disease to prevent or treat VTE. • Mechanical techniques: (1) graduated compression stockings, (2) IPC, (3) mechanical foot pumps; are only recommended as a sole method if there is a contraindication to anticoagulants.	Outpatient and inpatient
Kuderer & Lyman[29] 2014; USA	• Discuss the guidelines of the American Society of Clinical Oncology (ASCO) 2013.	Literature review	Not mentioned	• Daily anticoagulant therapy is recommended for people with cancer who are hospitalized and undergoing systemic treatment. • Training on guidelines and promoting compliance with them ensures the quality of care provided to cancer patients. • Patient education should address the warning signs and symptoms of VTE. • Risk assessment should be carried out using a validated risk assessment tool. • When VTE is diagnosed, treatment involves administering LMWH for 5 to 10 days.	Outpatient and inpatient
Nisio et al.[38] 2019; Italy	• Comparing the discriminatory performance of the Khorana, PROTECHT, CONKO and ONKOTEV scores over the first 3 to 6 months and 12 months	Retrospecti-ve cohort	776 people with advanced or metastatic cancer	• In the conventional 3-point reference, the Khorana, PROTECHT, CONKO and ONKOTEV scores perform poorly, so the reference threshold should be lowered to 2 points. • Periodic reassessments of scores that tend to decrease in effectiveness over time.	Outpatient
Dutia et al.[30] 2012; USA	• Discuss risk assessment models that have been developed specifically to identify people with cancer and a high risk of VTE.	Narrative review	Not mentioned	• VTE risk assessment using scores in the inpatient and outpatient setting. • Anticoagulants in outpatient and inpatient settings are similar, and it is recommended that they be administered if the person is under active treatment for the oncological disease according to the risk identified. • Chemotherapy is simple to fill in and incorporates available data.	Outpatient and inpatient

AUTHORS/ YEAR/ COUNTRY	AIM/ OBJECTIVES	METHODS	POPULATION	CONCEPT: NURSING INTERVENTIONS FOR THE PREVENTION AND MANAGEMENT OF VTE IN PEOPLE WITH ONCOLOGICAL DISEASES	CONTEXT
Angelini & Khorana[31] 2017; USA	• To provide an overview of the evidence supporting the use of tools to assess the risk of VTE associated with cancer.	Narrative review	Not mentioned	• Risk stratification should be carried out before starting chemotherapy and periodically to adjust anticoagulant therapy. • The models for assessing VTE risk in hospitalized patients are the Caprini, Padua, and IMPROVE scores. • The determining factors for maintaining therapeutic prophylaxis include (1) active oncological disease, (2) CVC fully implanted, and (3) active treatment with chemotherapy. • Educating about the risk of VTE can lead to early recognition of symptoms and improves adherence to anticoagulant therapy.	Outpatient and inpatient
Ashrani et al.[32] 2016; USA	• To identify non-cancerous and cancerous risk factors for cancer-associated VTE.	Retrospective case-control study	2.782 patients diagnosed with VTE over 28 years	• Identification of risk factors: (1) tumor location, (2) stage of cancer disease, (3) liver metastasis, (4) chemotherapy, (5) low weight or obesity, (6) hospitalization, (7) CVC and (8) infection. • Risk factors can be used to identify active cancer patients at high risk of VTE.	Inpatient
Holmes et al.[18] 2020; USA	• Develop an effective risk assessment model to improve VTE education and risk assessment rates. • Increase the percentage of high-risk people receiving VTE prophylaxis using a new multidisciplinary, electronic health record-based program to implement guidelines.	Prospective study	918 outpatients starting chemotherapy	• Implementation of multi-professional guidelines that include VTE risk assessment, education and preventive therapeutic prophylaxis. • Monthly VTE education rates increased to 94.7% after two years of implementing the program, which led to a high knowledge rate and improved thromboprophylaxis in people at high risk of VTE. • The KS and Protect are valid tools for assessing the risk of VTE.	Outpatient
Cunningham[33] 2006; USA	Not mentioned	Not mentioned	Not mentioned	• A targeted care plan, education, and regular contact with the person with VTE are indispensable elements in managing the person with VTE. • The care plan for people with cancer and VTE should include: (1) coordination of services; (2) monitoring and accessibility; (3) education of the person and carer; (4) daily contact with the person; (5) monitoring of analytical values; (6) administration of medication; (7) making it easier for the person to acquire the therapy; (8) complete registration. • A targeted care plan, education, and regular contact with the person with VTE are indispensable elements in managing the person with VTE. The person's education should address: 1. Economic availability before implementing treatment. 2. Encouraging the person to walk, rather than sitting or standing for long periods, or when lying down, they should perform exercises such as dorsiflexion. 3. Monitoring for signs and symptoms of other complications of VTE, such as PE (dyspnea, chest pain and tachycardia) or DVT (sudden oedema of a limb, pain, heat, flushing, feeling of heaviness or tightness) and post-thrombotic syndrome (chronic oedema, pain, altered pigmentation and induration). • Monitoring for signs of bleeding.	Outpatient

AUTHORS/ YEAR/ COUNTRY	AIM/ OBJECTIVES	METHODS	POPULATION	CONCEPT: NURSING INTERVENTIONS FOR THE PREVENTION AND MANAGEMENT OF VTE IN PEOPLE WITH ONCOLOGICAL DISEASES	CONTEXT
Sardo et al.[36] 2021; Canada	• Promote awareness of cancer-associated thrombosis among oncology nurses and improve patient education about this complication.	Not mentioned	Not mentioned	• Educating people with cancer about VTE is essential for recognizing early signs, symptoms, and complications. • Nurse training is vital for assessing the risk of VTE in people with cancer and promoting education in this population.	Not mentioned
Viale & Schwartz[27] 2004; USA	• Provide information on the nursing knowledge base on VTE and cancer patients, as well as treatment strategies.	Qualitative study	567 Nurses	• Training and awareness of oncology nurses improve identification of signs and symptoms of VTE. • Physical assessment should include: (1) observation of unilateral oedema, (2) erythema, (3) warmth, (4) sequence of onset of symptoms, (5) duration of symptoms, (6) signs of PE. • Question people about physical activity, use of oral contraceptives, recent infections, insect bites, trauma and smoking.	Outpatient
Baddeley et al. [11] 2021; UK	• To evaluate the impact of the informative video 'Blood Clots, Cancer and You' on the treatment of people with cancer receiving systemic antineoplastic therapy.	Mixed methods study clinical audit and interviews	50 patients with VTE associated with antineoplastic therapy	• Prioritizing VTE in people with cancer. • Increase healthcare professionals' knowledge of these complications. • Inform the person with cancer about VTE in an individual pre-chemotherapy session using written, verbal and digital information.	Outpatient
J.Bayadinova, Sardo, Penton, et al.[37] 2022; Canada	• Promote awareness of VTE to improve patient and professional education, health outcomes and reduce VTE complications.	Not mentioned	Not mentioned	• Improve nurses' awareness of these complications. • Low levels of education on the part of the individual can compromise adherence to anticoagulant therapy. • Assessing the risk of VTE in daily practice using validated, easy-to-use instruments allows for more comprehensive care.	Outpatient
Bayadinova, Sardo, Higgins-Nogareda, et al. [14] 2022; Canada	• Improving patient education and health outcomes.	Not mentioned	Not mentioned	• Education promotes early recognition of the signs and symptoms of VTE and seeking health services in good time, preventing complications such as post-thrombotic syndrome, pulmonary hypertension and death. • The language should be simple to facilitate understanding, regardless of educational level.	Outpatient
Noble et al.[15] 2015; UK	• Exploring the wider experience of patients living with cancer-associated thrombosis.	Qualitative study	20 people interviewed	• People with cancer are unaware of how to recognize the signs and symptoms of VTE and how to treat it properly. • Simple changes in VTE management will lead to significant improvements in physical and psychological outcomes in the face of a VTE diagnosis.	Not mentioned
Lyman et al.[34] 2015; USA	• Provide current recommendations on the prophylaxis and treatment of VTE in people with cancer.	Systematic literature review	53 publications included	• Educational sessions should include information on the signs and symptoms of VTE. • Anticoagulant therapy is recommended for most hospitalized people. • LMWH is recommended in the first 5 to 10 days of treatment after VTE diagnosis and as long-term secondary prophylaxis (at least 6 months).	Outpatient and inpatient

AUTHORS/ YEAR/ COUNTRY	AIM/ OBJECTIVES	METHODS	POPULATION	CONCEPT: NURSING INTERVENTIONS FOR THE PREVENTION AND MANAGEMENT OF VTE IN PEOPLE WITH ONCOLOGICAL DISEASES	CONTEXT
Streiff et al. [13] **2021; USA**	• NCCN guidelines for cancer-associated venous thromboembolic disease focusing on the prevention, diagnosis and treatment of people with cancer who have developed or are at risk of developing VTE.	Literature review	Not mentioned	• Identification of patients at risk of developing VTE and implementation of anticoagulation based on the person's inpatient/ambulatory cancer status and the medical/surgical area. • In the presence of a contraindication to anticoagulants, mechanical prophylaxis is recommended: (1) compression stockings or (2) IPC. This method reduces DVT and has been associated with a lower risk of skin complications. • Contraindications to mechanical prophylaxis: acute DVT. • Contraindications for compression stockings: (1) Ulcer or wound; (2) Arterial insufficiency and peripheral neuropathy; (3) Large haematomas. • People at low risk of VTE (KS <2) do not need routine anticoagulant therapy, unlike those at intermediate or high risk (KS ≥2), who should consider anticoagulation for 6 months or more if the risk persists. • The most used anticoagulants in outpatient settings are: (1) direct oral anticoagulants, (2) low molecular weight heparin. • Adherence to anticoagulant therapy should be monitored.	Outpatient and inpatient
Key et al.[35] **2023; USA**	• Update the VTE guideline - ASCO	Literature review	176 publications included	• The clinical manifestations of DVT of the lower limbs include: (1) redness, (2) tenderness, (3) oedema, (4) superficial collateral veins. • The manifestations of PE are: (1) dyspnea, (2) chest pain, (3) cough, (4) tachycardia, (5) cyanosis, (6) dizziness, (7) syncope and (8) sweating; • Initial and long-term treatment can be carried out with the following anticoagulant therapies: (1) low molecular weight heparin, (2) unfractionated heparin, (3) and activated factor X inhibitors (formerly known as Direct Oral Anticoagulants), which are preferred over vitamin K antagonists (VKAs) due to their greater efficacy.	Outpatient and inpatient
Falanga et al.[7] **2023; USA**	• Facilitate the implementation of the updated Clinical Practice Guideline of the European Society for Medical Oncology (ESMO) which summarizes the recommendations for the prevention and treatment of VTE in people with cancer.	Not mentioned	Not mentioned	• All people with cancer should receive a VTE risk assessment using the following instruments: (1) KS (outpatient), (2) Padua or IMPROVE (inpatient); allowing for the identification of people at higher risk who may benefit from primary thromboprophylaxis with anticoagulants. • Prophylaxis with LMWH or UFH is recommended for people with cancer who are hospitalized and confined to bed with an acute medical complication. • Mechanical prophylaxis is not recommended in outpatient settings but is recommended in inpatient and surgical settings if pharmacological treatment is not recommended or in combination. • Educational materials for people with cancer about VTE should include (1) risk factors, (2) signs and symptoms, and (3) healthy lifestyle information. • VTE treatment can include oral or injectable anticoagulants and is generally divided into (1) the acute phase (first 5-10 days after diagnosis), (2) the long-term treatment phase (first 3-6 months), (3) the long-term treatment phase (beyond six months).	Outpatient and inpatient

CVC - central venous catheters; DVT - Deep Vein Thrombosis; IPC – Intermittent pneumatic compression; KS – Khorana score; LMWH – Low Molecular Weight Heparin; PE – Pulmonary Embolism; UFH – Unfractionated Heparin; UK – United Kingdom; USA – United States of America; S – study; VTE - Venous thromboembolism.

Synthesis of results

The evidence obtained from the analysis of the studies allowed for a response to the research question and is synthesised in Table 3, to facilitate a quick overview.

Two distinct concepts emerged from the analysis of the data: nursing intervention in the prevention of VTE and management of VTE in people with oncological disease undergoing chemotherapy. The data were grouped according to the two concepts in this review: VTE prevention with three dimensions VTE risk assessment, autonomous interventions and interdependent interventions, and VTE management with two dimensions independent interventions and interdependent interventions, which are systematized in Table 3.

Discussion

The results of this Scoping Review revealed that nurses play a crucial role in the prevention and management of VTE in people undergoing chemotherapy[11,14,15,18,26,27,33,34,36,37]. A multidisciplinary approach that includes nurses in preventing and managing these complications could reduce the physical and psychological suffering associated with them[18,43]. The eligible studies showed that VTE prevention was the most prominent concept identified in 21 articles[2,11-15,18,25, 28-32,34,35,36,37,39-42]. In this dimension, the assessment of the risk of VTE for all people with active oncological disease, in hospital, or before starting chemotherapy predominates, as it is one of the first approaches[44,45], and the most mentioned in the research studies[2,11-15,18, 25, 28-32,34-37,39-42]

Table 3. Presentation of data according to the dimensions identified in each concept.

	CONCEPT: NURSING INTERVENTION IN VTE PREVENTION	CONCEPT: NURSING INTERVENTION IN VTE MANAGEMENT
VTE risk assessment	• Use of instruments to stratify the risk of VTE in pre-chemotherapy cancer patients[7,12,13,25,28-32,38,40]. • Scores validated for the outpatient setting: Khorana Score[7,12,18,28,30], PROTECHT score[18,38], CONKO and ONKOTEV score[38]. • Scores validated for the inpatient setting: Score Pádua[7], IMPROVE score[7], Khorana score[40], Caprini score, Pádua and IMPROVE score[31]. • Identification of VTE risk factors: recent hospitalisation, cardiovascular disease, overweight or obesity, history of previous VTE[25,26,32,41]; location of the neoplasm[2,28-30]; advanced oncological disease [2, 13,25, 28, 30,32,37,42]; chemotherapy treatment[2,13,27,28,32,37].	–
Independent intervention	• Improving health professionals' knowledge of these complications[11,14,27,29,36,37]. • Education for people at risk of VTE undergoing chemotherapy to improve identification of the signs and symptoms of this complication[7, 14,15, 18,29,31,33,34,36]. • Surveillance for signs and symptoms of VTE in people with cancer undergoing chemotherapy[26,27,33]. • Maintenance and surveillance of CVC [39]. • Hemorrhage surveillance in people on chemotherapy and anticoagulants[12]. • Complete record of intervention in VTE prevention[33].	• Education for people with VTE undergoing chemotherapy treatment[33,36]. • Promotion of venous return[33]. • Record of intervention in VTE management[33].
Interdependent Intervention	• People at intermediate to high risk of VTE should start anticoagulant therapy[2,7,13,14,28,29, 30,31,34,38,40,42]; • Mechanical prophylaxis is recommended concomitantly with anticoagulants[2,7,13,40]. • Administration of anticoagulant therapy[7]; • Promoting adherence to anticoagulant therapy to prevent VTE[13]; • Monitoring adherence to anticoagulant therapy[31, 37].	• Education on the initial treatment of VTE can include injectable drugs such as LMWH or oral drugs such as activated factor X inhibitors[7,29,34,35,42]; • The person diagnosed with VTE must undergo secondary thromboprophylaxis with anticoagulants, which may last longer than 6 months[7,40,42]; • Other treatments include fibrinolytic treatment and a vena cava filter[7,42]; • Promoting adherence to anticoagulant therapy to prevent complications[13]; • Monitoring adherence to anticoagulant therapy[13].

• Nursing intervention in VTE prevention

- VTE risk assessment: Risk assessment is recommended for all people with pre-chemotherapy oncological disease, but the diversity of existing models can make selection difficult[45]. The Khorana score was the instrument most often mentioned in the literature as a VTE risk assessment model[7,12,28,30,18]. This score is capable of stratifying risk in people with cancer despite its limitations, namely by excluding from its stratification neoplasms with a high risk of VTE[46], such a cerebral neoplasm [28,40,47,48] and multiple myeloma[7,13]. In the context of hospitalization, other scores have been identified, namely the Caprini and Padua, which assess the risk associated with other risk factors, such as immobility and other comorbidities[31].

Identifying people at intermediate to high risk is decisive for selecting individuals who benefit from prophylactic anticoagulant therapy, with preference given to mechanical techniques such as compression stockings and Intermittent Pneumatic Compression (IPC). Mechanical methods are only eligible in an inpatient setting or when the use of anticoagulant therapy is inadvisable[44].

Identifying risk factors makes it possible to promote healthier lifestyles in people with chronic illnesses[49]. This study identified some modifiable factors related to the person, namely reduced physical activity, smoking and obesity[13]. Although malnutrition was only identified in one article[32], other authors recognise its relevance, as it contributes to a generalised inflammatory state, capable of potentiating complications such as VTE[50,51].

- Independent intervention: Education stands out in nurses' independent intervention, as revealed in the study, which found that 85% of cancer patients surveyed said that it was necessary to receive education about VTE, but 51.7% emphasized that the education they received was insufficient or not very informative[52]. Education can contribute to the early identification of these complications, as revealed in one of the studies, which can reduce the morbidity and mortality associated with them[15].

On the other hand, the plan of care and its recording, using a specific language and supported by scientific evidence, is of little relevance in this review but is highlighted by other authors[53].

- Interdependent intervention: The administration of anticoagulant therapy, education about the importance of maintaining and taking care when administering this therapy and monitoring for signs and symptoms of bleeding are the interdependent interventions most frequently mentioned in this research[2,7,13,14,28-31,34,38,40,42], which corroborates the guidelines of the American Society of Hematology [44].

About mechanical techniques, the data analysed acknowledges the need to validate their efficacy with recent studies, preferring prophylactic anticoagulant therapy, as mentioned in the studies[7,13,30,40].

• Nursing intervention in VTE management

Nurse intervention in the management of VTE has been recognised since 2004[27,33], and continues to be mentioned today in both outpatient and inpatient settings[45].

- Independent intervention: Education on the signs and symptoms of complications associated with VTE and modifying lifestyles[17] is a crucial intervention, also in the context of VTE management. Promoting physical exercise is an advantageous intervention in the rehabilitation of these complications[17,54], as it promotes venous return, as determined[33].

- Interdependent intervention: In this context, it has emerged that thromboprophylaxis with anticoagulants is a more effective measure than mechanical mechanisms alone in this population[13], contrary to what was recommended in 2006[17]. Other treatments, such as fibrinolytic therapy and the vena cava filter, can be considered[33,42]. Nurses should promote education about and adherence to anticoagulant treatment[17], this is crucial for preventing recurrent complications[13].

The fact that no time limit has been imposed has made it possible to observe a change in the selection of anticoagulant drugs used in the treatment and management of VTE complications, starting with unfractionated heparin (UFH)[33], passing through low molecular weight heparin[42] and more recently including direct inhibitors of activated factor X even in the initial phase of treatment between the 5th and 10th day[35].

Limitations of the study

This search was carried out in only two databases, and only records in Portuguese and English were considered, which may be a limitation in accessing relevant evidence. The absence of theses, dissertations, and other 'grey' literature in this review can be considered another limitation, as well as the fact that six articles did not mention the methodology used in their studies.

Conclusion

The purpose of this review was to map all the available evidence on nursing intervention for people with cancer undergoing chemotherapy. The research made it possible to answer the study question by demonstrating three dimensions of nursing intervention in VTE prevention: pre-

chemotherapy risk assessment, independent interventions, and interdependent interventions. Two other dimensions related to nursing intervention in VTE management were also identified: autonomous interventions and interdependent interventions.

The final analysis of the articles shows that nurses are the professionals chosen in ten studies to play a crucial role in caring for people at risk of VTE. Their actions are essential in assessing the risk, educating the person about the signs and symptoms of VTE, and preventing and detecting complications early on. This could contribute to a reduction in morbidity and mortality associated with VTE in people with oncological diseases undergoing chemotherapy.

This review shows that it is essential to continue researching this subject to include VTE in the care provided to people with cancer, as well as other side effects of chemotherapy. Further studies on the impact of nursing interventions in this population would be pertinent.

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