NURSING CARE FOR PEOPLE WITH ISCHEMIC STROKE SUBMITTED TO THROMBOLYSIS: SYSTEMATIC REVIEW OF THE LITERATURE

CUIDADOS DE ENFERMAGEM À PESSOA COM ACIDENTE VASCULAR CEREBRAL ISQUÉMICO SUBMETIDA A TROMBÓLISE: REVISÃO SISTEMÁTICA DA LITERATURA

CUIDADOS DE ENFERMERÍA PARA PERSONAS CON ICTUS ISQUÉMICO SOMETIDA A TROMBOLISIS: REVISIÓN SISTEMÁTICA DE LA LITERATURA

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ABSTRACT

Introduction: Nursing care is fundamental and with a high degree of scientific evidence in the safety and monitoring people with ischemic stroke.

Our objective was identifying the contribution of nursing care to adults with ischemic stroke submitted to intravenous thrombolysis, at the hospital.

Methods: A systematic review that addresses six primary studies, published and indexed to the EBSCOHost and PubMed databases, according to the defined descriptors, previously defined inclusion and exclusion criteria, constituting a qualitative systematic review.

Results: From the analysis of the articles, we highlight the compliance with the door-to--needle time up to 60 minutes after the onset of stroke symptoms, as well as the efficacy of rt-Pa with a dosage below 0.9 mg/kg, since administered as early as possible. Nursing interventions are specific and require monitoring of the National Institutes Health Stroke Scale, as well as vital signs and capillary blood glucose.

Conclusion: The definition of nursing care for the person with an ischemic stroke submitted to thrombolysis is important to standardize the nurses' procedures to the neurocritical person with this pathology and relevant to the planning of the nursing interventions itself.

Keywords: Ischemic Stroke; Nursing Care; Thrombolytic Therapy.

RESUMO

Introdução: Os cuidados de enfermagem são fundamentais e, de elevado grau de evidência científica, na segurança e monitorização da pessoa com acidente vascular cerebral isquémico.

O nosso objetivo foi identificar o contributo dos cuidados de enfermagem à pessoa adulta com acidente vascular cerebral isquémico submetida a trombólise endovenosa, no hospital.

Métodos: Revisão sistemática que aborda seis estudos primários, publicados e indexados às bases de dados EBSCOHost e PubMed, de acordo com os descritores definidos, critérios de inclusão e exclusão previamente definidos, constituindo uma revisão sistemática qualitativa.

Resultados: Da análise dos artigos, salienta-se o cumprimento do tempo porta-agulha até aos 60 minutos após início dos sintomas de acidente vascular cerebral, bem como a eficácia do rt-Pa com dosagem inferior a 0,9 mg/kg, desde que administrado o mais precoce-

mente possível. As intervenções de enfermagem são específicas e exigem monitorização do *National Institutes Health Stroke Scale*, bem como dos sinais vitais e glicemia capilar.

Conclusão: A definição dos cuidados de enfermagem à pessoa com acidente vascular cerebral isquémico submetida a trombólise é importante para uniformizar os procedimentos dos enfermeiros à pessoa neurocrítica com esta patologia e, também relevante para o planeamento das intervenções de enfermagem em si.

Palavras-chave: Acidente Vascular Cerebral Isquémico; Cuidados de Enfermagem; Terapia Trombolítica.

RESUMEN

Introducción: Los cuidados de enfermería son fundamentales y con un alto grado de evidencia científica en la seguridad y el monitoreo de las personas con ictus isquémico. Nuestro objetivo era identificar la aportación de los cuidados de Enfermería a la persona adulta con ictus isquémico sometida a trombólisis intravenosa en el hospital.

Método: Una revisión sistemática que aborda seis estudios primarios publicados e indexados a las bases de datos EBSCOHost y PubMed de acuerdo con los descriptores definidos, criterios de inclusión y exclusión previamente definidos, constituyendo una revisión sistemática cualitativa.

Resultados: Del análisis de los artículos, se destaca el cumplimiento del tiempo puerta--aguja hasta los 60 minutos tras el inicio de los síntomas del ictus, tal como la eficacia del rt-Pa con dosificación inferior a 0,9 mg/kg, desde que administrado lo antes posible. Las intervenciones de Enfermería son específicas y exigen monitorización del *National Institutes Health Stroke Scale*, así como de los signos vitales y glicemia capilar.

Conclusion: La definición de los cuidados de enfermería a la persona con ictus isquémico sometida a trombolisis es importante para uniformizar los procedimientos de los enfermeros al paciente neurocrítico con esta patología y relevante para la planificación de las intervenciones de enfermaría en sí.

Descriptores: Cuidados de Enfermería; Ictus Isquémico; Terapia Trombolítica.

INTRODUCTION

The choice of the theme of this systematic literature review (SLR) falls on the approach to nursing care for people with ischemic stroke submitted to thrombolysis, due to the importance of updating the theme. The objective of this study was to identify the contribution of nursing care to adult people with ischemic stroke submitted to intravenous thrombolysis in the Hospital.

In Europe, although cardiovascular diseases are responsible for the second cause of death, there has been a decrease in the number of deaths from this etiology. However, data from the same source show that cases of ischemic stroke have increased in some European and non-European countries[1]. The Stroke Action Plan at Europe level (2018-2030) sets out targets to reduce the number of strokes in Europe by 10%[2]. It also presupposes the existence not only of large centers but of specific units with trained multidisciplinary teams, defined and appropriate functions for people with stroke.

Diseases of the circulatory system are increasingly the target of control and monitoring by health professionals. The Organization for Economic Cooperation and Development (OECD) shows that based on the adoption of preventive measures and the use of new anticoagulants, the mortality rate for these diseases in the circulatory forum has improved in recent years, as it has decreased, the case of ischemic stroke in people under the age of 70, about 39%[3]. In 2020, the objective of this Program was "To increase to 1800 the number of people with stroke who have access to specific treatment"[3,4], since in 2015 the number of people submitted to thrombolysis was 1516[3].

The incidence of stroke is proportional to the increase in age, and the highest probability of occurrence in people over 75[3]. However, no less important, there are other risk factors such as hypertension, smoking, diabetes *mellitus*, hypercholesterolemia, obesity/physical inactivity, carotid arterial disease, transient ischemic vascular accidents, arouse fibrillation, blood diseases, alcoholism/drugs[4]. The adoption of preventive measures (control of risk factors) allows the reduction of the number of deaths associated with cardiovascular diseases, as well as the number of episodes of hospitalization, which constitutes a complication of stroke.

Through the installation, in most cases sudden, of signs and symptoms such as "difficulty in speaking", "mouth next door" and "lack of strength of a limb" a stroke[1-7] should be suspected, to which a process of activation of VV (*Via Verde*) stroke should be followed, according to Norm No. 015/2017, authored by the Directorate General of Health (DGS).

Therefore, ischemic stroke is defined as the pathology resulting in interruption of blood circulation caused by a thrombus or plunger[8].

CVA VV is fundamental for the rapid care of the population, as it allows a time gain for treatment efficacy "in 80.7% of the cases less than two hours occurred between the identification of signs and symptoms of stroke and referral through the respective Green Way"[3,9,10]. The INEM National Institute of Medical Emergency (INEM) revealed about 3496 cases this year that were referred by VV stroke[7], which begins in the pre-hospital context.

The DGS Standard, together with the guidelines of the American Stroke Association (ASA) identify nursing care, with emphasis on immediate care to the Person, an ABCDE assessment, perceiving the circumstance and time of symptom onset, general objective examination and neurological examination with evaluation of the National Institutes Health Stroke Scale (NIHSS)[8]. According to these authors, imaging tests should also be performed, namely a cranio-encephalic computed tomography (CE CT) and, a cerebral angio--computed tomography (CT), an electrocardiogram if possible, laboratory tests and, continuous monitoring of the person's state of consciousness, vital signs (15 in 15 minutes in the first 2 hours, 30 in 30 minutes in the next 4 hours and hour by hour from 6 hours after the procedure to the first 24 hours), peripheral oxygen saturation, glycemia, swallowing capacity, among other nursing care. The recommended pre-thrombolysis blood pressure should ≤ 185/110 mm/Hg, as hypotension causes hypoperfusion. During the following 24 hours the interval ≤ 180/105 mm/Hg. For 24 hours, preferably no more peripheral accesses should be punctured, or placed central catheter, arterial line or bladder catheter – this should be performed pre thrombolysis, such as nursing care[8]. Other important nursing assessments are the NIHSS scale that quantifies the degree of neurological deficit, as well as changes in clinical status and the identification of people at higher hemorrhagic risk[8].

The importance of the use of VV stroke is related to the need to start nursing treatment and care in the first hours after the onset of stroke symptoms, given that the temporal window for thrombolysis is up to 4 hours and 30 minutes after the onset of symptoms; to ensure the effectiveness of the main interventions and treatments[8]. Thrombolysis consists of the administration of alteplase or activator of recombinant tissue plasminogen (rt-Pa), a medicine belonging to the thrombolytic class, so surveillance during its administration is essential by nurses. The DGS, in its National Program for the Safety of Patients (2015/2020) called for "increasing safety in the administration of medication"[3,9], a strategy that was part of the health quality policy, since the medication involves many incidents and the risk of alteplase is increased by its hemorrhagic effect[10]. Thrombolysis is a pro-

cedure in which thrombus lysis occurs that caused ischemia[11]. It is the most appropriate therapeutic option for neurological dysfunction caused by ischemic stroke, which despite having some indications: diagnosis of stroke (CE CT without hemorrhage), onset of symptoms seen < at 4 hours and 30 minutes and age ≥ 18 ; they also present relative and absolute contraindications (CI), which are related to the presence of intracranial hemorrhage[12]. Powers *et al*[8] and Demaerschalk *et al*[12] defined the guidelines for indications and CI. This type of treatment can be conducted even in decentralized units, if there is telemedicine support and defined guidelines, which is a perspective for the whole of Europe[2]. It is assumed that in units, whose physical presence is physicians in specialty of Internal Medicine and 1 Intensive, as well as nurses with training in the procedure, such procedure is possible. Despite the strict schedule regarding the time window for drug administration, Powers *et al*[8] established guidelines that reveal the importance of performing it during the first 60 minutes, after the onset of symptoms. At thrombolysis, the recommended dose is 0.9 mg/kg (maximum 90 mg) in 60 minutes and nurses should administer 10% of the dose within the 1st minute and the remainder in the following time[8]. They should discontinue treatment in situations of severe and persistent headache, vomiting, nausea, hypertension, altered state of consciousness, active bleeding, angioedema and increased intracranial pressure[8]. Nurses who conduct this treatment must continuously record the set of interventions performed.

METHODS

This review followed a set of well-defined phases during its preparation and began by identifying a problem; a question of research; define the inclusion and exclusion criteria of the articles; identify, select and organize the selected studies; extract and synthesize the data in tables and evaluate the quality in terms of evidence and dissemination[13].

Trying to understand which nursing care stems from thrombolysis in the adult person with ischemic stroke submitted to thrombolysis, this systematic review was developed, in which an analysis and critical diagnosis was made, based on the evidence and concepts of the literature, following the PICOD methodology in the formulation of the research question[13].

   – Population (Participants): Adult person in the Hospital.

   – Intervention: Identify Nursing Care.

   – Comparison of interventions/"Outcomes": Compare the nursing interventions found in the different studies.

   – Study design: A qualitative systematic review based on 6 primary studies conducted only in humans, in English.

Based on this methodology, we tried to answer the research question: <u>What are the nursing care for the person with Ischemic stroke submitted to intravenous thrombolysis?</u>

To perform data collection, a survey was conducted, during the month of October 2021, in two free access databases, EBSCOHost and PubMed. Three descriptors/keywords were defined that were inserted in the Descriptors in Health Sciences (DeCS) and validated in the Medical Subject Headings (MeSH), in English, namely: "Ischemic stroke"; "Thrombolytic therapy" and "Nursing care"; combined between itself with the operator "Boolean" "AND" and "Full Text" while delimiting search. To narrow down this question, some inclusion and exclusion criteria of the research were used.

In the search engine of EBSCOHost, after the three descriptors were placed, a total of 461 articles were obtained. After the inclusion criteria, namely free access to the full text, 444 articles were available, after the time was limited to the last 5 years and 111 articles were left for analysis and, finally, the analysis by experts was included and 103 articles remained, without any article being repeated. Of these, the articles in English were selected in a total of 100, as another inclusion criterion and, finally, the criterion involving an adult target audience, culminating in 5 articles for analysis. Among these 5 articles, an article was selected for inclusion in this systematic review based on the level of evidence[14] based on the Joanna Briggs Institute (JBI) instrument and the degree of recommendation[15] also of JBI. The remaining 4 – 2 of which by title/subject, 1 by reading the abstract and 1 by full reading of the article were excluded.

In PubMed, using the same order of placement of the three descriptors, the research culminated in 114 articles. After the introduction of the inclusion criteria by the following sequence: access to the free full text were 44 articles and, with the definition of the time (the last 5 years) were 26 articles for analysis, and the duplicate items were automatically excluded. From this universe of 26 articles, 10 were excluded by title/subject, 6 after reading the abstract, 4 after full reading of the article and 1 by study design (since it is a secondary study). Thus, 6 articles were included, through the levels of evidence and degrees of recommendation of JBI.

The bibliographic research can be summarized in the following flowchart/prism (Fig. 1ⁿ) which describes the entire process of selection and inclusion of articles.

In this review article, ethical questions regarding their reference are considered, and bibliographic research was conducted according to good practices in research.

Six studies were selected, validated by two researchers, all of them primary, after two compilations of evaluation of the level of evidence/methodological quality and degree of recommendation, thus constituting a qualitative systematic review of the literature, as it shows Table 1ⁿ.

The first evaluation performed on the articles determines the level of evidence[14] based on the JBI instrument. Among the total number of articles selected and analyzed, the following studies with evidence levels of 1c, 2d, 2d, 3c, 3e and 4d were identified.

Also based on JBI, an evaluation was made according to the degree of recommendation, based on the FAME, that is, reliability, adequacy, significance and efficacy, choosing to keep all the articles in the studies, since in all the quality is strong, level A[15].

The other analysis of the articles was also performed based on JBI, regarding methodological quality[17]. As each article has the criteria answered with "YES" and, this corresponds after a simple three rule, in more than 75% of the total questions that JBI tools require, chose to be included, with validation by two researchers, in the filling of the grids. In general, in the 6 articles, the "YES" percentage is between 75% and 100% of agreement on the questions of the instrument.

Table 1ⁿ shows a summary for all articles with article identification, title of the article, study design, level of evidence, degree of recommendation and methodological quality.

The studies included in this review were developed in several countries, namely 2 in the United States of America (article 1 and 2), 3 in China (article 3, 5 and 7) and 1 on several continents (article 6).

RESULTS

Table 2↗ shows a summary for all articles with the aim of the study, identification of participants, main interventions and results.

DISCUSSION

In the analysis of all articles, the epidemiological importance that stroke of ischemic origin represents was noticeable, with the vast majority attributed to the presence of emboli and, which worsen with conditions such as AF.

The author Babkair[18] reveals, in addition to this etiology, that there are risk factors, such as race, age and heredity, diabetes *mellitus* and arterial hypertension, which is in line with the Introduction and, with what are nursing care, about teaching and prevention of risk factors and complications. The author also reveals that the participant who was analyzed in his study was Caucasian, and this breed is less at risk of developing a stroke, information that is in line with the guidelines of the AHA[6]. Despite the risk that thrombolysis may have, of complications such as arrhythmias and hemorrhagic transformation (HT), Babkair[18] revealed that his participant underwent this treatment, allowing that at the date of discharge, he did not present motor deficits – hence the need for the nursing team to function as quickly as possible, in a coordinated manner. This study indicates that a rapid nursing diagnosis and treatment is crucial for better neurological outcomes in this pathology. The study follows the practical example of nursing care that the literature recommends peopling who are the target of a stroke: in addition to identifying risk factors, signs and symptoms, treatment and complications; nursing care directed by monitoring the state of consciousness, neurological deficits, values of vital signs, in line with the recommendations of Powers *et al*[8], in their guidelines.

The study by Faigle R *et al*[19] we are told about the nurses' strict monitoring of vital signs (blood pressure, capillary glycemia, pulse) during the thrombolysis procedure and, which is in line with the guidelines, and this procedure is performed not necessarily in intensive care units but by nurses trained in this type of procedure/treatment.

Liu Z *et al's* study[20] it tells us of four interventions that together translate into the continuous quality of nursing care, such as the presence of two nurses who work full-time with specific competencies in stroke, notification by pre-hospital services to a stroke VV,

speed of screening based on "FAST" and health education measures. However, as evidenced in the initial part of the article, CVV begins in a pre-hospital context, and it is important to articulate these teams and the hospital team. If, in more developed countries there are already devices to perform CT inside ambulances, in Portugal this reality is only possible within imaging services, so it is important to properly route to this location. The presence of nurses who do an immediate screening, which requires training and the possibility of regularly screening people with this pathology, makes it easier and safer to identify neurological deficits. Also, the referral to the emergency room by this nurse and the follow-up of the Person to the CT are important nursing care to expedite the thrombolysis process. As Powers et al[8] indicates thrombolysis presents better neurological outcome and lower risk of complications if rt-Pa is administered within the first 60 minutes after symptom onset. This was the intervention studied in this article, which aimed to understand whether the quality measures mentioned above resulted in a reduction of needle-door time after rapid screening and, whose conclusion was affirmative. This time went from 73 to 49 minutes, that is, about 24% in the pre-intervention group and 86% after. The actual time of laboratory results decreased, between the two periods, with the follow-up of the nursing team. Liu Z et al[20] even reveal better control in the quality of nursing care, not least because in addition to nursing care during the pre- and intra-thrombolysis process (identification of symptoms, blood collection, AC follow-up, surveillance of vital signs) highlight nursing care in the distribution of leaflets and information sharing that addresses risk factors, spoken by Babkair[18].

Zhou Y et al[21] they compared two groups in relation to the time from the onset of symptoms to the performance of the computed tomography (CT), time of the CT, needle-carrying time and the rate of thrombolysis. Again, the NIHSS assessment was critical to assessing deficits in people. It is also revealed throughout this study the monitoring of vital signs (15 in 15 minutes in the first hour of thrombolysis and recorded by nurses), already so enunciated by Powers et al[8] and, by Faigle R et al[19] regarding blood pressure control (≤ at 185/110 mm/Hg), capillary glycemia, placement and identification of peripheral venous accesses, blood collection for analysis and placement of bladder catheter and nasogastric tube by nurses. What is intended in this study is to understand whether highly trained nursing teams to expedite the necessary pre-thrombolysis care and administer thrombolytic medication make the difference positively for faster administration, since it has already been perceived that despite the importance of thrombolytic dose, the most key point is the beginning of the time of administration. Thus, there was a group of people with nursing follow-up to the CE and then to the stroke unit, and another in which rt-Pa was administered immediately in the CT. The needle-carrying time in this study was estimated at 55 minutes, being longer than in the study by Liu Z et al[20] but, in accordance

with the 'major' recommendation, of the 60 minutes, as revealed by the guidelines of Powers *et al*[8]. The thrombolysis rate increased from 13% to 33%, and in the group with specialized nursing (5 years of professional experience) in stroke, CT was performed after 30 minutes of symptom onset. The presence of nurses with specific competencies for thrombolysis (it is not necessary to belong to intensive care, as revealed by Faigle R, *et al*[19] in his study), it was important in monitoring vital signs, in the speed of thrombolysis and, consequently, in its success.

The study by Bluhmki E *et al*[22] with randomized clinical trials, defines a control group undergoing alteplase at a dose of 0.9 mg/kg and another placebo group (without alteplase) and subgroups for both (one aged ≤ to 80 and the other aged > to 80) who met the alteplase administration criteria. It concluded that a better result after stroke was obtained in the control group compared to the placebo group, regardless of age. Hemorrhagic complications were more frequent in the subgroup aged > 80 after thrombolysis. The importance of this study about the question about nursing care is related to the identification that nurses should perform in the screening, about the inclusion criteria of people with ischemic stroke for thrombolysis, and age is a non-impeditive factor in these guidelines.

The study by Zhang X *et al*[23] reveals to the authors who addressed the guidelines of stroke, that ischemic stroke is the most frequent type of stroke, about 60%-80%, so thrombolysis is the most effective and safe treatment since performed up to 4 hours 30 minutes after the onset of symptoms, preferably with a needle-carrying time of 60 minutes. This study brought us information like those of Liu Z *et al*[20] and Bluhmki E *et al*[22] in relation to needle carrier times up to thrombolysis. The rate of thrombolysis at 60 minutes was about 80%, as in the study by Liu Z *et al*[20] and from Zhou *et al*[21], and therefore the time from the end of CT to thrombolysis is important and not the time properly from the onset of symptoms to CT, in which the importance of training nursing teams to make this time brief is highlighted, maintaining the safety of people and the surveillance of signs such as headaches and/or hypertension, which may be mandatory to suspend thrombolysis.

However, although this study focused more specifically on the thrombolysis process, it is noteworthy that the preparation in syringe of rt-Pa is performed by nurses, as well as its administration of 10% in the first minute, as in the remaining infusion dose for 1 hour.

CONCLUSION

In response to the objective initially proposed, it is concluded that nursing interventions are crucial in the procedure that is intravenous thrombolysis and that the studies included in this SLR answer this same initial question. It was possible to identify in most studies, nursing interventions that are related to the early identification and systematized evaluation of the Person with signs and symptoms suggestive of stroke, monitoring of vital signs, NIHSS and state of consciousness, capillary glycemia, pain, as well as rigorous guidance in the preparation, administration and surveillance of the use of thrombolytic medication – strategies that can positively improve thrombolysis results. The performance of nurses is also fundamental to define the effectiveness of treatment, contributing to the reduction of mortality, reduction of hospitalization time and associated costs in people with ischemic stroke.

Over the years, there has been a higher rate of intravenous thrombolysis, due in part to health education measures and access to information by users/family/population, promoting access to timely care; but also, due to evidence-based practice, which leads nurses and multidisciplinary teams to act with knowledge and technical skills through disease and treatment. It is concluded, with the elaboration of this SLR, that the nursing team should organize, to gather information about the person, coordinate people to decide who is the nurse who accompanies the person to the CT scan and, which ones prepare the medication and other devices for thrombolysis, to minimize the time from the beginning of symptoms to the administration of rt-PA. The compliance and reduction of needle--door time is due to the speed between the performance of the CT and the onset of thrombolysis. It is observed, in all articles that analyze needle-carrying time, that thrombolysis was performed up to 60 minutes, provided that the multidisciplinary teams are trained, led correctly and, with specific units – which meets the guidelines stated. It is stressed the importance of the training of health professionals in this sense, as well as the need to include the theme in the daily practice of nursing teams.

However, there are limitations, such as the coordination of these teams in decentralized hospitals and the lack of forms for the records of nursing care performed during thrombolysis. It can also be seen that none of the studies were conducted either in Portugal or in the European continent, so there is the suggestion of developing research studies that address the phenomenon in question, contributing to the improvement of nursing care in Portugal.

Authors' contributions

MC: Study design and coordination, data analysis and review.

MP: Study design, data collection, storage and analysis, review and discussion of results.

All authors read and agreed with the published version of the manuscript.

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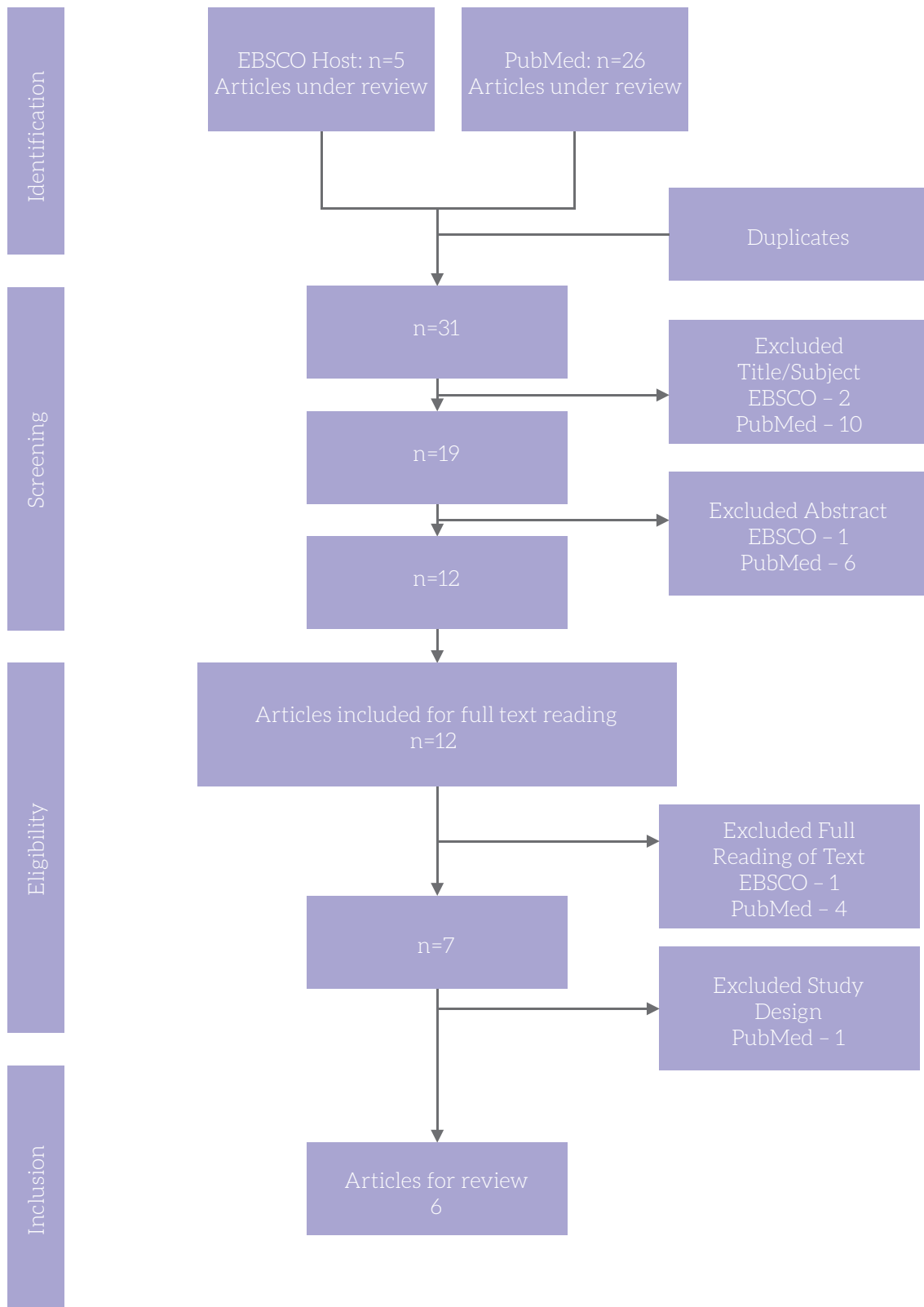
Figure 1 – Selection of studies with application of exclusion criteria[16].⤢

Table 1 – Classification of articles listed for analysis.↖↖

Article identification/ Author/Year	Title of the article	Study design	Level of evidence[14]	Degree of recomendation[15]	Methodological Quality[17]
Artigo 1 Babkair LA[18] (2017)	Cardioembolic Stroke: A Case Study.	Descriptive Observational: Case Study	Level 4d	Grade A: Strong	100 % – Applied Checklist for Case Reports.
Artigo 2 Faigle R et al[19] (2020)	Safety Trial of Low-intensity Monitoring After Thrombolysis: Optimal Post Tpa-Iv Monitoring in Ischemic Stroke (OPTIMIST).	Analytical Observational: prospective transverse	Level 3e	Grade A: Strong	75% – Applied Checklist for Analytical Cross Sectional Studies.
Artigo 3 Liu Z et al[20] (2018)	Effects of Nursing Quality Improvement on Thrombolytic Therapy for Acute Ischemic Stroke.	Quasi-Experimental: a retrospective with control	Level 2d	Grade A: Strong	89% – Applied Checklist for Quasi-Experimental Studies (non-randomized experimental studies).
Artigo 4 Zhou Y et al[21] (2017)	New standardized nursing cooperation workflow to reduce stroke Thrombolysis delays in patients with acute ischemic stroke.	Quasi-Experimental: a retrospective with control group	Level 2d	Grade A: Strong	100% – Applied Checklist for Quasi-Experimental Studies (non-randomized experimental studies).
Artigo 5 Bluhmki E et al[22] (2020)	Alteplase for Acute Ischemic Stroke in Patients Aged > 80 Years: Pooled Analyses of Individual Patient Data.	Experimental: randomized control	Level 1c	Grade A: Strong	92% – Applied Checklist for Randomized Controlled Trials.
Artigo 6 Zhang, X et al[23] (2021)	The risk factors of early hemorrhage after emergency intravenous thrombolysis in patients with acute ischemic stroke.	Analytical Observational: retrospective com control group	Level 3c	Grade A: Strong	82% – Applied Checklist for Cohort Studies.

Table 2 – Synthesis of study results. →↖

Article 1	**Babkair, LA[18] (2017) / Cardioembolic Stroke: A Case Study**
Study Objective	Evaluate the disease, treatment and prevention strategies for people undergoing cardioembolic stroke, by analyzing fibrillation (AF).
Population	1 participant – clinical case report.
Interventions or phenomena of interest	Person data: Slurred speech and changes in the left hemibody with 3 hours of evolution. NIHSS of 17, Glasgow Coma Scale of 10. Nursing interventions and care to the study participant: identification of the above-mentioned symptoms, evaluation of vital signs, electrocardiogram – revealed AF, CT and angiogram. He took blood for tests, blood gases and blood glucose research. Fulfilled criteria for thrombolysis that he did with the nursing team and, later, mechanical thrombectomy, with recovery of deficits.
Results	Screening in the identification of the time of onset of symptoms is a care on the part of the nursing team fundamental to the beginning of treatment and thus accelerate the thrombolysis procedure, minimizing the complications associated with stroke. Monitoring and evidence-based practice are important among nursing care, and nurses should identify the etiology and pathophysiology of stroke, as well as assess and record vital signs and control blood pressure, to be less than 185/110 mm/Hg (guidelines) during the procedure. By means of inclusion criteria for treatment with thrombolysis, nurses should prepare and administer the drug, based on their indications. Nursing teaching should be done to the person and to the family, based on health education, modifying risk factors, to prevent the occurrence of new strokes.
Article 2	**Faigle R *et al*[19] (2020) /Safety Trial of Low-intensity Monitoring After Thrombolysis: Optimal Post Tpa-Iv Monitoring in Ischemic Stroke (OPTIMIST)**
Study Objective	Assess whether people with ischemic stroke who have thrombolysis with NIHSS < 10 do not require intensive care if a safety system with a low-intensity monitoring protocol is used.
Population	35 participants – analytical, cross-sectional prospective study.
Interventions or phenomena of interest	People aged between 18 and 80 were eligible, with NIHSS < 10 and without the need for critical care at the end of thrombolysis. The low-intensity protocol implies an evaluation of vital signs and neurological status every 15 minutes at the 1st hour after thrombolysis, every 2 hours for another 8 hours and every 4 hours after these 9 hours, up to 24 hours. The team in this unit is composed of nurses trained in stroke disease but not in intensive care. The evaluation of participants is based on the 24-hour NIHSS assessment, NIHSS and Rankin at discharge, and NIHSS at 90 days.
Results	It is feasible to care for people in a post-thrombolysis environment with low-intensity monitoring because there was no need for critical care/transfers to ICU at the end of thrombolysis to people with NIHSS < 10. This type of monitoring maintains the rigor in the evaluation of vital signs and neurological evaluation without nursing care of intensive care services, and the procedure can be performed in a similar environment with nurses trained in the procedure and thus reduce the time of hospitalization. The mean NIHSS 24 hours after thrombolysis was 1, at the date of discharge also and at 90 days it was 0.

Table 2 – Synthesis of study results.←→↖

Article 3	Liu Z *et al*[20] (2018) / Effects of Nursing Quality Improvement on Thrombolytic Therapy for Acute Ischemic Stroke
Study Objective	Evaluate the influence of the implementation of strategies for continuous improvement of the quality of nursing care in reducing thrombolysis time in acute ischemic stroke.
Population	The initial total number of participants belonging to VV stroke is 606, 192 and 767, distributed over 3 periods. Inclusion criteria were applied: the stroke being ischemic were: 410, 121 and 407 respectively; of these: 127, 34 and 91 refused treatment, therefore the total in 485 participants for the study, of both sexes, age ≥ 18 , stroke with CT and onset of symptoms until 4:30 am and follow-up by telephone at 90 days after discharge. These 485 were included in the pre-intervention period (213), experimental period (52) and post-intervention (220) – all of them different participants.
Interventions or phenomena of interest	The intervention refers to the measures/strategies to improve the continuous quality of nursing care and include: full-time nurses with skills to act in the stroke, pre-notification of services in the pre-hospital, rapid screening ("FAST"), increase in nursing quality and health education.
Results	After the implementation of the quality measurements, the average needle carrier time was reduced from 73 to 49 minutes in the post-intervention period and the mean time of onset of the nail was reduced from 193 to 167 minutes. Between the experimental period and the post also the needle carrier time decreased, from 65 to 56 minutes. It should be noted that the percentage of needle-carrying time at 60 minutes went from 23.94% to 86.36%. The improvement of the continuous quality of nursing care proved to be fundamental in reducing the needle-carrying time for thrombolysis.

Table 2 – Synthesis of study results.←→↖

Article 4	Zhou Y *et al*[21] (2017) / New standardized nursing cooperation workflow to reduce stroke Thrombolysis delays in patients with acute ischemic stroke
Study Objective	Assess whether a new nursing cooperation workflow is effective in reducing the time to perform thrombolysis in people with ischemic stroke.
Population	Total: 1401 people, divided into 2 groups. Group 0 (control): people with ischemic stroke who received conventional treatment, out of a total of 689. Group 1 (intervention): people with ischemic stroke submitted to the new workflow, in a total of 712 participants. Of these totals, only 88 of group 0 and 231 of group 1 were submitted to thrombolysis in the first 60 minutes (recommended time window). Inclusion criteria of the study participants: age between 18 and 80, persistent symptoms, clinical diagnosis confirmed by CE CT, NIHSS score between 4 and 25 and onset of symptoms until 4:30 a.m. People already admitted for stroke at the Hospital were excluded.
Interventions or phenomena of interest	The workflow/interventions contemplated are the application or not of thrombolysis, time from the symptoms to performing the CE CT, the needle door time itself and the presence of a nurse in the stroke unit and who collaborates in the performance of CE CT. The participants of group 0 were screened by a nurse, referred to the specialist in stroke in the emergency room, evaluated the NIHSS, nursing intervention to perform the complementary means of diagnosis and then referred to the stroke unit and, only there prepared by the team for thrombolysis. The participants of group 1 were submitted to the new workflow in which it is the team specialized in stroke, which after the complementary diagnostic and therapeutic examinations ended, has a kit for the administration of rt-PA, after placement of peripheral venous access and other catheters. To do this, a thrombolysis coordinator and a nurse from the stroke unit with 5 years of professional experience are required. Among the functions of this nurse, the study highlights the monitoring of vital signs, namely: AT every 15 minutes during 1 hour of thrombolysis, pain, state of consciousness, surveillance of venous access and hematic losses.
Results	The mean value of the time from symptom onset to CT was approximately 39 minutes in group 0 and 14 in group 1, and the time from TC to thrombolysis was 55 in group 0 and 30 in group 1, which shows the pertinence of nursing care. The needle-carrying time, estimated at about 105 minutes, thus determines the prognosis in ischemic stroke, reducing hospital delays and provides an increase in the rate of use of thrombolysis, of about 13% of group 0 para 33% of the intervention group.

Table 2 – Synthesis of study results.←↞

Article 5	Bluhmki E *et al*[22] (2020) / Alteplase for Acute Ischemic Stroke in Patients Aged > 80 Years: Pooled Analyses of Individual Patient Data
Study Objective	Risk assessment – benefit of administration of alteplase 0.9 mg/kg in people over the age of 80.
Population	Seven randomized clinical trials with a control group submitted to alteplase (0.9 mg/kg) and another placebo group (without alteplase) and subgroups (one aged 80 or less and the other aged 80) met the criteria for administering the medicine. Total participants of 6035. Of these, 3026 received alteplase – 1182 aged ≤ to 80 and 518 aged > and 3009 people received placebo – 1.223 aged ≤ to 80 and 510 aged >.
Interventions or phenomena of interest	The treatment guidelines of both the American Stroke Association and the European Stroke Association recommend only that thrombolysis be performed up to 4:00 a.m. and 30 minutes after symptoms begin, regardless of the person's age. It was used for the assay: age, severity of baseline stroke based on NIHSS. The two subgroups underwent treatment with alteplase respecting the time since the beginning of the symptoms, absent from hypo or hyperglycemia, systolic HTA > 185 mm/Hg, NIHSS > 25.
Results	At 90 days, the stroke result was evaluated and on this day it was possible to assess the improvement of deficits in people who used thrombolysis compared to the group that used placebo. About half of the people who received alteplase obtained this good result, provided that each person meets the conditions for administering the drug – whose inclusion criteria are initially analyzed by nurses. The earlier the administration the better results obtained, regardless of the subgroup as well. The occurrence of intracranial hemorrhage and bleeding phenomena have been reported in both subgroups and increased with increasing age. Mortality at 90 days was also lower in people aged ≤ to 80.
Article 6	Zhang X *et al*[23] (2021) / The risk factors of early hemorrhage after emergency intravenous thrombolysis in patients with acute ischemic stroke
Study Objective	Study the early warning rate of bleeding complications in people who perform emergency thrombolysis.
Population	The 237 participants aged between 24 and 92 were submitted to thrombolysis, according to the inclusion criteria, in the guidelines of the country in question, after analysis of pre-thrombolysis risk factors and collection of clinical data (NIHSS, Glasgow, cardiovascular risk factors and anticoagulants) and divided into 2 groups.
Interventions or phenomena of interest	**Application of intravenous thrombolysis at a dose of 0.9 mg/kg, with a maximum dose of 90 mg. Administration of 10% of the drug in the first minute and the remaining infusion dose for 1 hour, until 4:30 am after the onset of symptoms.** Bleeding was studied during the 24 hours following thrombolysis and were divided into one group without bleeding and in another group with cases of hemorrhage. Bleeding can be identified by signs such as headache and/or hypertension by nurses.
Results	AF with about 25% of cases, systolic blood pressure before thrombolysis, dosing of platelet antiaggregators and thrombocytopenia represented independent risk factors for hemorrhage after intravenous thrombolysis. In the group without bleeding there were 146 people and in the group with hemorrhage 91. Intracranial hemorrhage is the most frequent complication and, which determines worse clinical prognoses, having had 26 cases due to CE CT, of which only 6 were symptomatic. In the group with hemorrhage the hospitalization tee greater durability. Ischemic stroke is the most frequent type of stroke according to the analysis of this study, about 60%-80%, so thrombolysis is the most effective and safe treatment since it is performed up to 4:30 a.m. after the onset of symptoms, preferably with a needle-carrying time of 60 minutes.