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NURSING INTERVENTIONS FOR PEOPLE WITH SEIZURES IN THE EMERGENCY DEPARTMENT: SCOPING REVIEW

INTERVENÇÕES DE ENFERMAGEM À PESSOA COM CRISE CONVULSIVA NO SERVIÇO DE URGÊNCIA: SCOPING REVIEW

INTERVENCIONES DE ENFERMERÍA PARA PERSONAS CON CONVULSIONES EN EL SERVICIO DE URGENCIAS: SCOPING REVIEW

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ABSTRACT

Introduction: Convulsive seizures are a disturbance in the normal functioning of the brain, characterized by a change in the electrical conduction of brain cells. Any crisis can be prolonged, leading to status epilepticus. Nurses must improve their knowledge to prevent complications and perform adequate treatment.

Objective: To map recent evidence regarding nursing interventions to be instituted for people with seizures in the emergency department.

Methodology: This is a scoping review conducted using the Joanna Briggs Institute protocol. For the research, the EBSCOhost and B-on platforms were used, with a temporal limitation of studies published between 2018 and 2022. The selection was based on the application of inclusion and exclusion criteria, resulting in a total of eight articles.

Results: Nursing interventions include patient safety; the distinction of crises; the evaluation and stabilization of the patient through the ABCDE methodology; interruption of the convulsive activity through pharmacological treatment, if it does not stop spontaneously; and identifying and treating the underlying cause.

Conclusion: Nurses have a preponderant role in assisting people with seizures, verifying the need for an adequate protocol and management. Nursing care in the emergency service is preponderant, since this systematization can improve the quality of care for people with seizures. It is also considered pertinent to develop new studies, with higher levels of evidence, in order to contribute to greater knowledge in this area and to improve nursing care.

Keywords: Nursing; Seizures; Status Epilepticus; Urgency.

RESUMO

Introdução: As crises convulsivas são um distúrbio no normal funcionamento cerebral, caracterizado por uma alteração da condução elétrica das células cerebrais. Qualquer crise pode prolongar-se, levando a estado de mal epilético. Os enfermeiros devem aprimorar os seus conhecimentos para prevenir complicações e realizar um tratamento adequado.

Objetivo: Mapear a evidência recente relativa às intervenções de enfermagem a instituir à pessoa com crise convulsiva no serviço de urgência.

Metodologia: Trata-se de uma revisão *scoping* conduzida pelo protocolo da Joanna Briggs Institute. Para a pesquisa utilizaram-se as plataformas EBSCO*host* e B-on, com limitação temporal de estudos publicados entre os anos 2018 e 2022. A seleção baseou-se na aplica-

ção de critérios de inclusão e exclusão, resultando num total de oito artigos.

Resultados: As intervenções de enfermagem incluem a segurança do doente; a distinção de crises; a avaliação e estabilização do doente através da metodologia ABCDE; interrupção da atividade convulsiva através de tratamento farmacológico, caso esta não cesse espontaneamente; e identificação e tratamento da causa subjacente.

Conclusão: Os enfermeiros têm um papel preponderante na assistência à pessoa com crise convulsiva, verificando-se a necessidade de um protocolo e gestão adequados. Os cuidados de enfermagem no serviço de urgência são preponderantes, uma vez que esta sistematização pode melhorar a qualidade da assistência à pessoa com crise convulsiva. Considera-se ainda pertinente o desenvolvimento de novos estudos, com maiores níveis de evidência, a fim de contribuir para um maior conhecimento nesta área e melhorar os cuidados de enfermagem.

Palavras-chave: Convulsões; Enfermagem; Estado Mal Epilético; Urgência.

RESUMEN

Introducción: Las crisis convulsivas son una alteración en el funcionamiento normal del cerebro, caracterizadas por un cambio en la conducción eléctrica de las células cerebrales. Cualquier crisis puede prolongarse y conducir al estado epiléptico. Las enfermeras deben mejorar sus conocimientos para prevenir complicaciones y realizar un tratamiento adecuado.

Objetivo: Mapear la evidencia reciente sobre las intervenciones de enfermería a ser instituidas para personas con convulsiones en el servicio de urgencias.

Metodología: Esta es una revisión de alcance realizada utilizando el protocolo del Instituto Joanna Briggs. Para la investigación se utilizaron las plataformas EBSCO*host* y B-on, con limitación temporal de estudios publicados entre 2018 y 2022. La selección se basó en la aplicación de criterios de inclusión y exclusión, resultando un total de ocho artículos.

Resultados: Las intervenciones de enfermería incluyen seguridad del paciente; la distinción de crisis; la evaluación y estabilización del paciente mediante la metodología ABCDE; interrupción de la actividad convulsiva mediante tratamiento farmacológico, si no cesa espontáneamente; e identificar y tratar la causa subyacente.

Conclusión: Los enfermeros tienen un papel preponderante en la asistencia a las personas con convulsiones, verificando la necesidad de un adecuado protocolo y manejo. La atención de enfermería en el servicio de emergencia es preponderante, ya que esta sistematización puede mejorar la calidad de atención a las personas con convulsiones. También se considera pertinente desarrollar nuevos estudios, con mayores niveles de evidencia, para contri-

buir a un mayor conocimiento en esta área y mejorar la atención de enfermería.
Descriptores: Convulsiones; Enfermería; Estado Epiléptico; Urgencia.

INTRODUCTION

About 10% of the population worldwide has at least one seizure episode during their lifetime[1]. However, a single seizure does not mean epilepsy. Epilepsy is diagnosed after two unprovoked seizures that occur more than 24 hours apart or after a single event that occurs in a person considered to be at high risk of recurrence (> 60% risk over a 10-year period)[2].

In addition to intrinsic central nervous system dysfunction, seizures may result from systemic damage or documented brain damage. In adults, common causes may be ischemic or hemorrhagic stroke, subdural hematoma, subarachnoid hemorrhage, cerebral venous thrombosis, traumatic brain injury, or meningitis/encephalitis. They may also be caused by acute medical illness such as metabolic disorders (hypoglycemia/hyperglycemia, hyponatremia, hypocalcemia, hypomagnesemia, uremia, hyperthyroidism), ingestion or withdrawal of alcohol or drugs[2].

Thus, seizures are a common cause of emergency medical evaluation, accounting for 1% of emergency room admissions[3].

Convulsive crises are defined as a disturbance in normal brain functioning, characterized by an alteration in the electrical conduction of brain cells, which can generate a spectrum of associated symptoms, from brief lapses of attention or muscle spasms to severe and prolonged seizures[1].

These electrical conduction changes can occur in different parts of the brain. Seizures, considering their onset, are divided into focal, generalized or of unknown onset, with subcategories: motor and non-motor, depending on whether there is motor activity or not[4].

Although most seizures end spontaneously within 2 to 3 minutes, any seizure can be prolonged, leading to status epilepticus of the seizure type in question[4].

Any continuous seizure activity lasting longer than 5 minutes is defined as status epilepticus, as after this duration seizure activity is unlikely to stop spontaneously. Thus, the International League Against Epilepsy (ILAE) defines status epilepticus as a condition that results from the failure of the mechanisms responsible for the termination of the seizure or the initiation of mechanisms that lead to abnormally prolonged seizures (after the time point t1). This condition can have long-term consequences (after the t2 point), including neuronal

death, neuronal damage and alteration of neuronal networks, depending on the type and duration of seizures[5].

In this way, the time point t1 determines the time at which the treatment must be started, preventing the seizures from persisting until t2, the moment after which neurological damage and long-term consequences may occur[6].

Status epilepticus is a severe neurological emergency and is associated with high morbidity and mortality[7].

The principle "time is brain" applies not only to stroke, but also to status epilepticus since its prognosis worsens with increasing duration of seizures[8].

Nursing care is preponderant since treatment, when started early, is much more effective and presents better results[9]. It is crucial to improve nurses' knowledge so that they can promote quality care, based on evidence scientific, allowing the prevention of complications and the realization of an adequate treatment.

In this sense, this study aims to identify and map recent evidence regarding nursing interventions to be instituted for people with seizures in the emergency department.

Investigation question

The initial question was formulated from the PCC acromion (P – population, C – concept and C – context). Thus, the guiding research question for the present study was: what nursing interventions (C) should be instituted for the person with a seizure (P) in the emergency service (C)?

METHODOLOGY

The present study is a scoping review. This type of review aims to identify and to map the breadth of evidence available on a given topic, field, concept or issue, regardless of the source (primary research, reviews, non-empirical evidence) in specific contexts[10]. This study is conducted in accordance with the methodology proposed by the Joanna Briggs Institute (JBI), identifying inclusion and exclusion criteria for participants, Concept and Context, considering the items of the research question. This review considers studies that include adult people, aged 18 years old, or older, with seizures as participants. Regarding the concept, studies that evaluate nursing interventions in emergency departments will be considered. As for the context, studies carried out in urgent or emergency hospital services will be included. This scoping review considers studies published in scientific journals, with a publication date between 2018 and 2022.

To answer the research question, a survey was carried out on the EBSCOhost and B-on platforms. On the EBSCOhost Platform, the CINAHL Complete databases were selected; MEDLINE Complete; Nursing & Allied Health Collection: Comprehensive; Cochrane Central Register of Controlled Trials; Cochrane Database of Systematic Reviews; Cochrane Methodology Register; Cochrane Clinical Answers; Library, Information Science & Technology Abstracts and MedicLatina. As research terms, the DeCS/MeSH descriptors were used: seizures, status epilepticus, epilepsy, nursing, emergencies, pediatrics and child. The word nursing was truncated to nurs* in order to expand the search to retrieve variants of the same term. In addition to these, despite not being a descriptor at the level of health sciences, it was essential to use the term management to direct the search specifically to articles related to the topic and because it was frequently found in the literature during the preliminary research.

The Boolean operators AND, OR and NOT were used, combined with natural language descriptors and terms in the following search formula: seizures OR status epilepticus OR epilepsy [Title] AND management OR nurs* [Abstract] AND emergencies [Abstract] NOT pediatrics OR child [Full Text].

The application of the Boolean phrase on the EBSCOhost and B-on platforms, with a time limitation to the years between 2018 and 2022, resulted in a total of 160 articles on the EBSCOhost platform and 189 on the B-on platform. The first phase of exclusion was based on the repetition of articles within the platform itself. After this selection, a total of 157 articles were obtained on the ESBCOhost platform and 174 on the B-on platform. After this selection, a total of 331 articles were obtained, of which 148 were excluded due to repetition

between the two platforms. Of the 183 articles, 141 articles were excluded after reading the title due to its inadequacy to the research question, leaving 42 articles for reading the abstract. Of these articles, 22 were excluded for not meeting the defined inclusion criteria, so only 20 articles were selected for full reading. After this process, 12 articles were excluded: 2 of which because it was not possible to access the full content of the study and the remaining 10 because they focused only on medical aspects. In this way, the analysis and selection process ended with a total of 8 articles included in this scoping review. The process described above is represented in Figure 1↗, through the flow diagram PRISMA 2020[11].

RESULTS

Relevant data from the articles included in this review are summarized in Chart 1↗.

DISCUSSION

The analysis of the various studies demonstrates that, at the level of the emergency department, interventions for people with seizures are aimed at stabilizing the patient, a fast interrupting clinical and electrographic seizure activity and identifying and treating the underlying cause[12,13]. Nurses play an important role in caring for people with a seizure, both at the beginning and at the end of the seizure, collaborating with the treatments and tests to be carried out.

With regard to patient stabilization, all studies support an initial treatment strategy that includes first aid according to an ABCDE approach, which meets the 2016 guidelines of the American Epilepsy Society[14].

This systematized approach, although not explicit in all articles, ends up being directly or indirectly referenced throughout them. In this way, all articles clearly refer to airway permeability, optimization of ventilation and oxygenation and optimization of circulation, and less obviously to neurological dysfunction and exposure with temperature control.

With regard to airway permeability, Crawshaw & Cock[15] point out that during seizures, muscle spasm restricts air entry, advocating placing the patient in a semi-sitting position or the placement of airway adjuvants, more specifically a tube nasopharyngeal. They also advocate that in the post-ictal period, airway maneuvers such as head tilt and jaw lift may be useful. Bank & Basil[3], on the other hand, defend the position of lateral decubitus instead

of dorsal decubitus to avoid aspiration. The same authors consider aspiration if the patient's airway is obstructed and, if the patient has low oxygen saturation, cyanosis, decreased respiratory rate or insufficient respiratory effort, ventilation with a manual insufflator until a stable airway is obtained. through orotracheal intubation. With regard to status epilepticus that does not respond to first- and second-line therapy, all authors agree on the need for orotracheal intubation, so nurses must be prepared to collaborate with care in placing and maintaining the airway. advanced.

The assessment of breathing and oxygenation is recommended in all studies. Although all authors agree on the administration of oxygen, the amount to be administered is not consensual. Several studies refer to the administration of supplemental oxygen without, however, mentioning quantities[12,15,16,17]. Schiefer & Surges[18] considered administering oxygen in small amounts (2 l/min) while Harris & Angus-Leppan[13] reported that oxygen should be administered in high flow. Bank & Basil 3 consider that respiratory rate should be assessed and that, even if the airway is patent, supplemental oxygen should be administered if necessary to maintain peripheral oxygen saturation above 92%. Sutter *et al* [19] refer that the respiratory function can be worsened both by the persistence of the seizures and by the administration of therapy to control the seizures and that respiratory failure requires immediate endotracheal intubation and mechanical ventilation.

Cardiac dysfunction frequently occurs in patients with status epilepticus. In the early stages, heart rate and mean arterial pressure increase due to the release of catecholamines resulting in increased peripheral vascular resistance. This situation can lead to a decrease in cardiac output and cardiac arrhythmias, such as sinus tachycardia/bradycardia, atrial fibrillation/flutter, atrioventricular block or ventricular tachycardia/fibrillation[19]. Crawshaw & Cock[15] also refer that cardiac complications are common and that some of the medications given to control seizures have cardiac side effects. Thus, optimizing the circulation is essential, which is why the monitoring of vital signs and cardiac monitoring is agreed by all authors, as well as the establishment of one or two peripheral venous accesses.

The post-ictal phase can last several hours and is characterized by a significant decrease in the state of consciousness, which may be followed by disorientation, agitation and aggressive behavior. In the assessment, the nurse must consider the person's state of consciousness by performing a neurological examination[12,18].

Schiefer & Surges[18] report that hypoglycemia is a common cause of acute symptomatic seizures. For this reason, in all studies there is reference to performing a rapid blood glucose test. Meziane-Tani *et al*[16] add that in cases of alcoholism, treatment with thiamine should be started before glucose so as not to precipitate Wernicke's encephalopathy. Thus, the admi-

nistration of 50 ml of 50% glucose is recommended, preceded by 100 mg of thiamine in cases of blood glucose below 60 mg during the initial stabilization phase, which is in accordance with the 2016 guidelines of the American Epilepsy Society[3,12,15,16,17].

Exposure with temperature control is essential both during the seizure and in the post-ictal period. During a seizure, one of the nursing interventions is to protect the patient from injury, so any objects or jewelry that could hurt the person should be removed. Clothes must be loosened[3,18]. Observing the clinical characteristics of seizures allows the distinction of other diseases that are associated with symptoms that can be confused with seizures, as well as the area of the brain involved, so nurses must be aware of the symptoms for a quick identification[3,15,17,18]. Crawshaw & Cock[15] also emphasize the importance of checking the time of onset of the seizure and estimating its duration, since, although most seizures end spontaneously in less than 5 minutes without the need to administer therapy, seizures that last longer than 5 minutes require treatment.

In the post-ictal period, exposure of the patient is important to identify possible injuries. Massive seizures can cause serious physical injury. Prolonged seizures can also lead to falls and fractures, head trauma being the most common trauma[19].

Temperature control is part of exposure care. Sutter *et al*[19] reported that hyperthermia is common in prolonged seizures/status epilepticus, and it is generally explained by prolonged motor activity. Temperature assessment is mentioned by Sutter *et al*[19] and Bank & Basil[3] although in other studies it may be included in the monitoring of vital signs.

With regard to the interruption of seizure activity, all authors emphasize its importance for the prevention of neurological damage. Crawshaw & Cock[15] add that the earlier the treatment of status epilepticus, the greater the probability of success. The pharmacological treatment in these studies meets the pharmacological treatment recommended by the 2016 guidelines of the American Epilepsy Society and the 2022 guidelines of the National Institute for Health and Care Excellence (NICE)[20], which consists of 3 lines. Thus, if the convulsive crisis does not stop spontaneously within 5 minutes, a benzodiazepine should be administered. This can be repeated just one more time if the seizure does not stop within 5 to 10 minutes. If there is no response to treatment, second-line treatment consisting of the administration of an anticonvulsant should be started. The introduction of a second alternative anticonvulsant drug may also be considered if the seizure persists. If, despite first-line and second-line treatments, the seizure does not stop, third-line treatment should be started, consisting of the administration of general anesthetics, therefore requiring, at this stage, orotracheal intubation and transfer to a care unit. intensive care, preferably with the possibility of continuous electroencephalogram.

Another objective, no less important, of nursing interventions is the identification and treatment of the underlying cause, with regard to carrying out anamnesis, collecting blood for analysis and carrying out complementary diagnostic tests.

Galizia & Faulkner[17] consider that history is essential. A complete history, both of the patient and the description of witnesses, may help to make a diagnosis. Elements such as prodromal symptoms, triggering factors, time and environment of the seizure, duration, progression, ictal and post-ictal events and history of drugs, alcohol and family can be useful[13]. Alcohol withdrawal is a common cause of seizures. Other triggering factors are hypoglycemia/hyperglycemia, intoxication with cocaine and opiates and abstinence from benzodiazepines[3].

It is also important to understand whether it was the first seizure or, in the case of known epilepsy, what the therapeutic adherence was. All patients with a first seizure should be investigated[17]. Laboratory tests can provide diagnostic information about the nature of the seizure and contribute to the symptomatic treatment of the cause[18]. Thus, laboratory tests of glucose, electrolytes, complete blood count, functional kidney and liver, infection parameters and toxicological analyses. In the case of known epilepsy, blood levels of anticonvulsants should also be monitored to detect possible poor adherence or the need to adjust doses[12,13,15,18]. Nurses play a key role in collecting blood for the requested analyses.

Depending on the clinical suspicion, complementary diagnostic tests should also be requested, such as computed tomography (CT)/magnetic resonance imaging (MRI) or lumbar puncture[12]. In patients without a known history of epilepsy, or in the case of head trauma resulting from seizures, CT of the head or MRI of the brain is performed if possible[16]. Bank & Basil[3] add that CT should be performed right away in the emergency department in order to rule out hemorrhage or other injury that requires immediate treatment.

Lumbar puncture should be considered in case of suspected infection, namely encephalitis[12,16,18].

The electroencephalogram (EEG) is essential to detect electrical seizures and assess their duration and response to therapy[12]. The EEG should be obtained as soon as possible after the seizure, ideally within 12 hours after the seizure, as the probability of identifying any epileptiform abnormality decreases with time[3].

In refractory status epilepticus, in which the duration of the seizure is longer than 30 minutes, most studies refer that continuous EEG monitoring should be established[3,12,15,16,17,18].

Complementary diagnostic tests are fundamental for identifying the cause of the seizure and the nurse must be prepared to collaborate in carrying them out.

As we have seen in this study, the interventions to be instituted for people with seizures in an emergency context are based on different levels: life support measures, pharmacological treatment and determination of the cause. However, although the literature has many articles on epilepsy and status epilepticus, with regard to nursing interventions and, particularly in an emergency context, there is a large lack of studies.

Surprisingly, there are nursing studies developed but in contexts other than emergencies, namely in community health that address nursing interventions related to education for people with epilepsy and in mental and psychiatric health that study the impact and stigma of the disease in person's social life.

Therefore, we consider it pertinent to carry out more nursing studies with a focus on nursing interventions for people with seizures in an emergency context, in order to improve the quality of care provided.

CONCLUSION

The present study made it possible to identify the nursing interventions to be instituted for people with seizures in the emergency department. These interventions include patient assessment and stabilization using the ABCDE assessment methodology; interruption of seizure activity through first-, second-, or third-line pharmacological treatment, if it does not cease spontaneously; and identification and treatment of the underlying cause, through anamnesis and carrying out laboratory and complementary diagnostic tests.

It is concluded that seizures require an appropriate protocol and management, with nursing care in the emergency department being predominant, since this systematization can improve the quality of care for people with seizures. Nursing care, in addition to being fast and effective due to the imminent risk to the person's life, should be humanized and holistic, meeting all the needs of the person and his family.

However, it is clear that there is a great lack of scientific studies on nursing care for people with seizures in urgent and emergency services, which is why we consider it necessary to develop new studies, with higher levels of evidence, in order to contribute for greater knowledge in this area and to improve nursing care.

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Authors' contributions
AC: Study coordination, study design, data collection, storage and analysis, review and discussion of results.
AP: Study design, data analysis, review and discussion of results.
All authors read and agreed with the published version of the manuscript.

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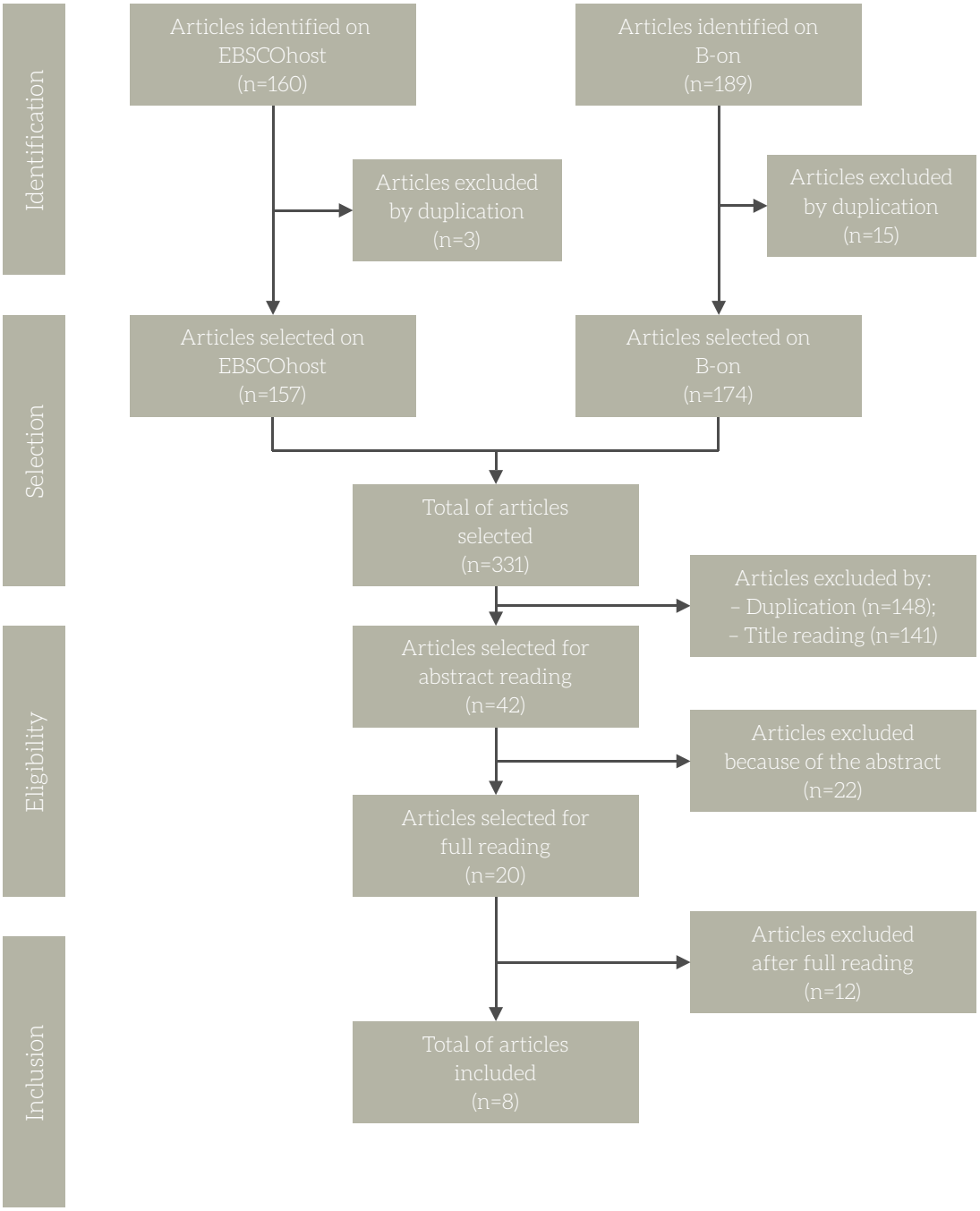

Figure 1 – PRISMA flow diagram.
Adapted from BMJ (2021)[11].

Chart 1 – Synthesis chart.

Article	Title	Author	Type of study	Results
1	Acute systemic complications of convulsive status epilepticus – a systematic review.	Sutter *et al*, 2018.	Literature review.	Definition and acute complications of convulsive status epilepticus. Treatment of status epilepticus and the complications of status epilepticus: • Initial stage: protection of the airway, protection of the patient from trauma, evaluation of vital signs, venous access, blood tests, temperature; • Established stage: orotracheal intubation of compromised airway, patient history, fluid resuscitation; • Refractory stage: diagnostic tests, check for trauma and possible fractures, transfer to ICU.
2	Emergency Management of Epilepsy and Seizures.	Bank & Basil, 2019.	Clinical cases.	Emergency management of first seizures and status epilepticus: Patient safety; Assessment of the airway, breathing and circulation: airway aspiration, administration of oxygen and orotracheal intubation if necessary; assessment of heart rate, respiratory rate, blood pressure and temperature; checking blood glucose and treating hypoglycemia; Symptoms of seizure crisis; Investigation of the cause: History, laboratory tests, complementary diagnostic tests; Pharmacological treatment.
3	Update on the management of status epilepticus.	Paris & Reddy, 2021.	Narrative review.	Classification, etiology and complications of status epilepticus; Initial management of status epilepticus: assessment of airway, breathing, circulation and neurological examination: oxygen, venous access, cardiac monitoring, orotracheal intubation if necessary; Diagnostic investigation: blood glucose, blood tests, toxicological screening; Pharmacological treatment (first line, second line and third line); Transfer to ICU and electroencephalogram monitoring.

Chart 1 – Synthesis chart.

Article	Title	Author	Type of study	Results
4	Medical management of status epilepticus: emergency room to intensive care unit.	Crawshaw & Cock, 2020.	Narrative review.	Initial management of convulsive status epilepticus: ABC approach: maintenance of airway patency (semi-sitting position, placement of nasopharyngeal tube), administration of oxygen for adequate saturations, monitoring of vital signs, placement of venous access, collection of blood for analyses, treatment in case of hypoglycemia, alcoholism and malnutrition, complementary diagnostic tests. Patient history; Distinction of epileptic seizures from dissociative seizures; Pharmacological treatment (first line, second line and third line); Assessment of the need for orotracheal intubation and transfer to the ICU.
5	Status Epilepticus: Work-Up and Management in Adults.	Meziane-Tani, Foreman & Mizrahi, 2020.	Narrative review.	Definition and classification of status epilepticus; Initial management: airway assessment, supplemental oxygen, monitoring of vital parameters (oxygen saturation, heart rate and blood pressure), venous access, blood glucose and treatment of causes such as hypoglycemia and alcoholism; Investigation of causes: carrying out blood tests and complementary exams; therapeutic approach for early, stabilized and refractory stages.
6	Epilepsy: diagnosis, classification and management.	Harris & Angus-Leppan, 2020.	Narrative review.	Definition of seizure, differential diagnosis and classification of epilepsy; Investigation of the cause: history of the patient/witnesses, neurological examination, blood tests and complementary tests; Emergency treatment of status epilepticus: high-flow oxygen, blood glucose, venous access; Pharmacological treatment; Transfer to ICU.
7	Seizures and epilepsy in the acute medical setting: presentation and management.	Galizia & Faulkner, 2018.	Narrative review.	Crisis distinction; Investigation of causes: blood collection for analyses, complementary diagnostic tests; Classification of seizures and epilepsy; history; treatment of status epilepticus: securing an airway, administering oxygen, monitoring vital signs and cardiac monitoring, venous access, glycemia and treatment in case of hypoglycemia; Pharmacological treatment.
8	Emergency management and medical care of adults with first epileptic seizures.	Schiefer & Surges, 2019.	Narrative review.	Clinical signs of epileptic seizures; Emergency management of seizures: removal of dangerous objects, airway protection, venous access, oxygen administration, cardiac monitoring and oxygen saturation, blood glucose; Patient's history.