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NURSING PREVENTIVE INTERVENTIONS IN MECHANICAL RESTRAINT IN THE PERSON IN CRITICAL SITUATION

INTERVENÇÕES DE ENFERMAGEM PREVENTIVAS DA CONTENÇÃO MECÂNICA NA PESSOA EM SITUAÇÃO CRÍTICA

INTERVENCIONES PREVENTIVAS DE ENFERMERÍA EN LA CONTENCIÓN MECÁNICA EN LA PERSONA EN SITUACIÓN CRÍTICA

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ABSTRACT

Context: Mechanical restraint is among the most commonly used methods of restraint in intensive care units. Non-pharmacological and pharmacological person-centered interventions should be used whenever possible to prevent or reduce mechanical restraint and improve nursing care.

Objective: Identification of preventive interventions for mechanical restraint in the critically ill.

Methodology: This Scoping Review followed the recommendations of the Joanna Briggs Institute. During the last two weeks of September 2023, an online search was carried out on the PubMed® and ScienceDirect platforms, using the descriptors "Physical Restraint", "critical care", "Nursing care", "Adult", previously validated in the Medical Subject Heading [MeSH] and in the Health Sciences Descriptors [DeCS], with a time interval from 2019 to 2023. The inclusion criteria were articles written in English, Portuguese and Spanish, which provided full text with free access. Articles that did not answer the initial question, articles without full text, duplicates and articles under the age of 18 were excluded.

Results: 12 studies were included in the Scoping Review, allowing for the development of non-pharmacological and pharmacological interventions to prevent the use of mechanical restraint in the critically ill.

Conclusion: Nurses in intensive care units face different organizational challenges. Pharmacological and non-pharmacological interventions have the potential to prevent and reduce the use of mechanical restraint. However, there is a lack of standardized, evidence-based guidelines for multidisciplinary teams. There is a need for more research into interventions in the future and for guidelines to be drawn up globally.

Keywords: Adult; Intensive Care; Nursing Care; Physical Containment.

RESUMO

Contexto: A contenção mecânica está entre os métodos de restrição mais utilizados em unidades de cuidados intensivos. Intervenções não farmacológicas e farmacológicas centradas na pessoa devem ser usadas sempre que possível para prevenir ou reduzir a contenção mecânica e melhorar os cuidados de enfermagem.

Objetivo: Identificação das intervenções preventivas da contenção mecânica na pessoa em situação crítica.

Metodologia: A presente *Scoping Review* seguiu as recomendações da Joanna Briggs Institute. Ao longo das últimas duas semanas de setembro de 2023 foi realizado uma pesquisa

online, nas plataformas *PubMed*® e na *ScienceDirect*, utilizando como descritores "*Physical Restraint*", "*critical care*", "*Nursing care*", "*Adult*", previamente validados na *Medical Subject Heading* [MeSH] e nos Descritores em Ciências da Saúde [DeCS], com um intervalo de tempo de 2019 a 2023. Os critérios de inclusão foram, artigos escritos em idioma inglês, português e espanhol, que disponibilizassem o texto integral com acesso livre. Foram excluídos os artigos que não respondessem à questão inicial, artigos sem texto completo, duplicados e com idade inferior a 18 anos.

Resultado: 12 estudos foram incluídos para realizar a *Scoping Review* permitindo elaborar intervenções não farmacológicas e farmacológicas para prevenir o uso de contenção mecânica na pessoa em situação crítica.

Conclusão: Os enfermeiros de unidades de cuidados intensivos enfrentam diferentes desafios organizacionais. As intervenções farmacológicas e não farmacológicas têm o potencial de prevenir e reduzir o uso da contenção mecânica. No entanto, há uma carência de diretrizes padronizadas e baseadas em evidência para as equipas multidisciplinares. É necessário no futuro realizar mais pesquisas sobre as intervenções e posteriormente elaboração de diretrizes globalmente.

Palavras-chave: Adulto; Contenção Física; Cuidados de Enfermagem; Cuidados Intensivos.

RESUMEN

Contexto: La contención mecánica es uno de los métodos de contención más utilizados en las unidades de cuidados intensivos. Las intervenciones nas farmacológicas y farmacológicas centradas en la persona deben utilizarse siempre que sea posible para prevenir o reducir la sujeción mecánica y mejorar los cuidados de enfermería.

Objetivo: Identificación de intervenciones preventivas para la sujeción mecánica en enfermos críticos.

Metodología: Esta *Scoping Review* siguió las recomendaciones del Instituto Joanna Briggs. Durante las últimas dos semanas de septiembre de 2023, se realizó una búsqueda en línea en las plataformas *PubMed*® y *ScienceDirect*, utilizando los descriptores "*Physical Restraint*", "*critical care*", "*Nursing care*", "*Adult*", previamente validados en el *Medical Subject Heading* [MeSH] y en los Descriptores de Ciencias de la Salud [DeCS], con un intervalo de tiempo de 2019 a 2023. Los criterios de inclusión fueron artículos escritos en inglés, portugués y español, que proporcionasen texto completo con acceso libre. Fueron excluidos los artículos que no respondían a la pregunta inicial, los artículos sin texto completo, los duplicados y los artículos con edad inferior a 18 años.

Resultados: Se incluyeron 12 estudios en la *Scoping Review*, lo que permitió el desarrollo de

intervenciones nas farmacológicas y farmacológicas para prevenir el uso de la restricción mecánica en los enfermos críticos.

Conclusión: El personal de enfermería de las unidades de cuidados intensivos se enfrenta a diferentes retos organizativos. Las intervenciones farmacológicas y no farmacológicas tienen el potencial de prevenir y reducir el uso de la contención mecánica. Sin embargo, faltan directrices estandarizadas y basadas en la evidencia para los equipos multidisciplinares. Es necesario investigar más las intervenciones en el futuro y elaborar directrices a escala mundial.

Descriptores: Adulto; Contención Física; Cuidados de Enfermería; Cuidados Intensivos.

INTRODUCTION

The literature in Europe shows that between the 17th and 19th centuries mechanical restraint was used in individuals with behaviour alterations[1]. Since the ancient times until the present moment there have been developed and used actual arsenals of instruments for the restraining of people with behaviour alterations, among which straitjackets, chains and iron belts, ropes, leather collars, handcuffs, fabric strips and leather sheets[2]. In the suburbs of Paris, the Bicêtre hospital was created with the goal of supporting the poor, the homeless, and became the main hospital centre for people with behaviour alterations, mainly during the French Revolution, leaving the people with behaviour alterations restraint with rings fastened around the neck connected to chains fixed to the wall[3]. In 1794 the use of chains in the mechanical restraint [MC] in the person with behaviour alterations, giving space to restraints with ropes where the individual would be standing up, held by the waist, feet and arms to a wooden log or iron bars with the technical term of the time (Waist of Haslam), other instruments were used *tranquiller* and bag of *horn*, *tranquillizer*, known as Rush chair which was applied to individuals in dark and soundless places[1].

In the 19th century the chains and handcuffs were replaced by straitjackets with the goal of being less traumatic, painful, with less exclusion of the individual before society[4].

The MC is defined by the use of instruments or equipments that restraint the movements of the patient (Directorate-General of Health [DGS])[5]. The individuals with behaviour alterations are spread through nursing wards and MC is still used constantly to avoid the exteriorization of medical devices and reduce the risk of fall, or flee, however, the restraint can minimize some risks, but its execution can cause lesions to the person[4]. This is a frequent intervention of nurses and has been showing a prevalence rate of 33% to 68% in hospitals[6]. In Portugal, the topic of restrain is not yet studied as it should, given political, educational

and sociodemographic factors. In the available evidences it can be verified the generalized perception of loss of dignity suffered by the person that underwent the restraint and the use of force inherent to this practice, which can carry a high risk of damages and interferences in the human dignity[7].

The nurses in Portugal practice their profession according to the Code of Ethics, being one of the general principles of this code "the nursing interventions done with the concern of defending the liberty and dignity of the human person and the nurse"[8]. The excessive use of MC has been linked to physical, psychological and/or cognitive consequences with negative effects in the relation of people with the health professionals given the low hospital satisfaction and the increase in the exposure of the professional to occupational risks, psychological duties and significant economical charges[7].

The PCS (Person in Critical Situation) in the ICU many times is in pain, agitation, consciousness state alterations, time and state disorientation, connected to medical devices like arterial line, central catheter and continuous perfusion therapy[9]. The *delirium* is a cognitive disorder with an acute beginning, characterized by reduced capacity of attention to the surroundings, with disorientation, impaired language and perception, with alterations and impairment in decision making, with a rate of 20% and 90% in hospitalised patients in the ICU and with a duration of 1 to 5 days[9]. The PCS hospitalised in the ICU undergoes aggressive measures like, mechanical ventilation for long periods, application of invasive medical devices and many times present agitation, *delirium*, pain, anxiety, fatigue and fear. This being the case, the risk of removal of devices is significantly high[10,11,12]. Pain is considered the fifth vital sign and its occurrence has been related with physical and psychological stress, capable of worsening the underlying disease[13]. Agitation in ICU can be as disturbing for the healthcare professionals as much as for their relatives, presenting periods of restlessness, aggressiveness, irritability. Doctors tend to equate agitation to *delirium* but, it is important to differentiate the two conditions[14]. The PCS can become agitated without being delusional, for many other factors like, discomfort, medicine withdrawal, alcohol or drugs, deficient gas exchanges, metabolic disorders and traumatic brain injury, being this associated with pain given the partial or totally dependent physical conduction, being dependent or unable to communicate or move[13]. The medical procedures and the nursing care cause pain, the application of exams, intra-hospital transfers, invasive procedures like the application of arterial line, removal of drain tubes, aspiration of secretions in the oropharynx, in TET and the mechanical ventilation are classified as painful procedures[15].

For the diagnosis of pain in the PCS with VMI in the ICU there is the Behavioural Pain Scale BPS with a total score that varies between three to 12 points considering that, an increase in score means an increase in pain[15]. For people that can express verbally the numerical

scale or analogic visual scale is used and there is also the [ESCID] that is originated in the Pain Assessment Behaviour Scale, a unidimensional scale elaborated by M. Campbell because of the necessity of evaluating the intensity of pain in people unable to self-examine due to the seriousness of the disease or cognitive dysfunction[13]. The inadequate management of pain can in short time increase the consumption of oxygen, increase the risk of heart failure, worsen the shock, affect the result of rehabilitation therapy which renders the pain in the ICU unique in people with VMI.

In the ICU most of the PCS suffer from mental confusion, hallucinations, restlessness and agitation, they can present behaviours like restlessness, removal of devices or even, try to leave the bed. Therefore, it is the medical team's job to decide the application of MR (Mechanical Restraint), knowing that it is associated with multiple problems. According to a study, 56% of the people in the ICU underwent application of MR and this presented no benefit, nor reduced the problems, having worsened the physical and psychological effects such as, acute lesions and even death[16]. Nurses should consider the scientific evidences and the risk of using restraint when approaching insecure behaviours in the PCS[17]. The restraint in the ICU is considered not only inadequate, sometimes humiliating and ineffective and its use increases the agitations, anxiety and pain[12].

In accordance with the literature, tackles physical and psychological complications, with unfavourable effects in the PCS, after the MR, translating into agitation, confusion processes with the need of administration of sedative therapy during the hospitalisation in the intensive care[10,12].

METHODOLOGY

The Evidence Based Practice [EBP] is a safe and organized way of establishing professional conducts with focus in identifying and solving problems, basing in the best scientific evidences[18]. The healthcare professionals should use scientific evidences with rigor to adopt conducts during the application of health care.

When making decisions, they should worry about adopting a Viable, Appropriate, Significant and Effective approach, according to the Joanna Briggs Institute [JBI]. The FAME structure, appears in the current health assistance model, supporting the importance of EPB.

This practice, is based in the capacity of building clinically relevant questions with the goal of acquiring, applying and evaluating multiple sources of knowledge in the context of caring for a certain group or community, being this considered a central demand for the development of the nursing practice[20].

The Review of Literature Scoping Reviews [ScR], was our option, because it represents an instrument of evidence synthesis which identifies and maps the range of available evidence in a given topic, field, concept or question, many times independently from the source, in or through particular contexts[21]. It was the selected method to guide the current investigation research, having been formulated the question attending the mnemonic PCC (Population, Concept, Context)[22]. The PCC approach was as follows: Person in Critical Situation (Population), Prevention of Mechanical Restraint (Concept), Intensive Care Unit (Context). In order to review the effectiveness of the Nursing Interventions, the following investigation question was outlined: "What are the preventing nursing interventions of Mechanical Restraint in the PCS in the ICU?"

The research was developed online in the last two weeks of the month of September 2023, in the PubMed® platform and in the ScienceDirect, using as keywords "Physical Restraint", "critical care", "Nursing care", "Adult". These keywords have been previously validated in the Medical Subject Heading [MeSH] and in the Health Science Keywords [DeCS] and used to restrict the research and answer to the investigation question. The used boolean operators were AND, combined in the following boolean equation: "Physical Restraint" AND "Critical Care" AND "Nursing Care" AND "Adult".

The inclusion criteria were: Portuguese, Spanish and English idiom articles, that made available the full text with free access scheme, peer reviewed and that were related to the topic in question. The research originated a total of 310 articles (PubMed®: 150 and in ScienceDirect: 160), we applied an exclusion criteria, removing all the duplicated articles in the data base and we were given a total of 210 articles, right afterwards we established the exclusion criteria referring to the articles that did not include free access text and articles with an age range under 18 and we were given 69 articles. After reading the title and the full reading of these we concluded a total of 12 articles to elaborate the ScR (Chart 1↗).

The present review was developed according to the PRISMA for the selection of the articles. In Figure 1↗ we present the Flowchart of the Selection Criteria of Studies, illustrated by the Flow Diagram (adapted from PRISMA Statement, 2020)[22].

The ScR presented in this research, a selection of topics from a heterogenic and unlimited research, involving irrevocably subjective choices about the chosen topic and an article search was initiated proceeding to the evaluation of said articles to guarantee the reliability and the evidence level according to the JBI[22]. An elusive table to the type of studies analysed and their level of scientific evidence was elaborated according to the criteria of JBI (Chart 2↗).

In the quality analysis of the above referred studies, it was concluded that they are indicative of quality in the evidence to base the investigation question of the ScR. The studies were reviewed by two revisors to verify possible bias. Each article was reviewed, in a full reading, to obtain an extraction of the evidence of relevant information to answer the investigation question and other literature sources were also consulted.

RESULTS

The MR in ICU context has been broadly used by the healthcare teams of professionals all over the world, due to the scarcity of protocols and guidelines to prevent its use through measures to avoid complications with its application[13].

The published studies give limited information about the reality and the connected factors of using MR[23]. MR is justified regardless of capacity or consent, if it is being used to maintain a life support treatment, but, on the other hand, it can be a moral error if applied without informed consent, being thus considered an inadmissible violation of the person's liberty, according to the bioethics committee, given the autonomy and dignity violation[12]. The studied performed in different countries give back rates of MR variable depending on the geographical area being that, in the United Stated of America the rate is of 87%, in Canada 76%, in Iran 47.6%, in France 50%, in England 48.6%, in Brazil 20.8% and lastly, with less prevalence in Spain 19.11%, in Norway 14.36%, in Germany 11% and in Australia varies between 7% and 13%[15,23,2,11,12]. There are no studies with known percentages of MR in Portugal. MR varied according to cultural norms and the current legal system[12,17]. The more common restraints observed are, the bed rails and bilateral restraint of upper limbs (wrists). The decision of MR most of the time is up to the nurses although it needs medical prescription[17]. When the nurse is faced, they can use their competence in care and intervene to prevent behaviour alterations that by themselves, can lead to need of MR[2]. Studies indicate that 90% of the restraint decisions were done by the nursing team, without the medical team's consent, although the protocols advise otherwise, and two thirds of the nurses have not asked for permission to the respective families and medical teams[12]. The safety of the PCS is a significant concern for the nurses. The indications or prescriptions of MR are normally given after solicitation from the nursing team and the younger less experienced doctors report less knowledge of restraint than the older more experienced doctors[10,17].

The application of MR involves short- and long-term complications in the ICU like: oedema and mobility difficulty in the restrained limbs, neurovascular complications, anxiety increase, agitation, confusion, *delirium*, increase in the occurrence of pressure ulcers, increase of

the hospitalisation time, increase in the administration of medicines like benzodiazepines, opioids and antipsychotics that can cause higher agitation and *delirium*[24]. The secondary complications of the restraint increase significantly after the first 24 hours and the nurses should guarantee the safety of the PCS and give quality care based in evidence, without ever affecting the physical and psychological health of the person[15]. The MR in hospitalisation, in turn, is associated with: high blood pressure, tachycardia, hyperthermia, vomit aspiration risk, increase in the hair filling time, skin and nerve lesion risk, depression, self-confidence decrease, autonomy deficits, rage, dignity loss and social isolation[16]. Given the inadequate use of restraint in the PCS, about a hundred people die yearly in the United States of America[24].

The ICU face a series of barriers because of the use or MR, and by the lack or scarcity of studies and in the development of guidelines and clinical practices in its application. The DGH refers that when the time comes for the application of restraints first all the preventive measures like non-pharmacological and pharmacological should where possible be used up[5].

The use of MR is still a problem in the ICU and the nurses play an important role in the use of said practice, since they can increase interventions that approach safe behaviours and care centred in the PCS to reduce MR.

In Chart 3↗ are the results extracted in each of the twelve studies, including the identification of the authors, the year, the country of origin, study goal, type of participants, context where they were included and derived results in each of them.

DISCUSSION

MR in the context of ICU has been broadly used by the healthcare professional teams all around the world, due to the lack of protocols and guidelines about restraint[23]. The use of MR is considered an anti-ethical practice which affects negatively the liberty, well-being, the person's comfort, has physical and psychological implications and even in certain cases people show scars and fear of being back in the same situation one day[16,25,12]. A pilot study shows nine evaluations of nursing after the application of MR in the PCS which are: evaluation of the maceration/developed lesion, like friction in the bed; evaluation of skin colouring in the distal side of the restrained limb; mobility evaluation in the PCS, sedated and unconscious is difficult, thus it is advised to do painful stimuli in the nail bed and observe the person's reflexes; evaluation of temperature in the restrained limb; evaluation of hair filling; evaluation of oedema and lastly evaluation of the position of the restrained limb, which should be in supine position to allow lower blood flow[10,25,12]. In ICU the rates of res-

traint were higher during the night period rather than in the daily one, due to less night activity and evidence shows that the appropriate proportions of professionals in the ICU are crucial to maintain the security and treatment of the person. MR is more used in men than in women[12]. Studies about MR show that the knowledge, attitude and perception of nurses are low, with the existence of people referring a high prevalence of complications during hospitalisation[10].

Nurses need to perform a full evaluation to the PCS, evaluating the treatable and reversible causes of unsafe behaviours, including physical, psychological and environmental causes. The identification of underlying factors in the behaviour of the PCS can lead to non-pharmacological and pharmacological interventions to reduce or eliminate MR[17]. In pharmacological intervention in the PCS in the ICU it is advisable to evaluate the agitation/sedation, *delirium* and pain, and if necessary, start therapy[25].

Traditionally, agitation in ICU has been mitigated with pharmacological therapies, such as sedatives, antipsychotics and opioids, though those medicines still have a prevalent part in the units, especially in the ventilatory weaning and extubating. Nevertheless, these should be used with caution due to their secondary effects like respiratory depression and hemodynamic instability, which in some cases can worsen or increase *delirium*, mental confusion and agitation[14]. One of the most used scales in the ICU to diagnose *delirium* is CAM-UCI. The scale is highly reliable, being the first and the most important step to identify and correct the underlying cause, in which it is advisable to dispose of electrolytic and metabolic alterations, infection, alcohol or sedatives withdrawal that contribute to the increase of *delirium*. Acute or chronic pain disable the PCS from the pathophysiological view point, and it can be classified as nociceptive or neuropathic and the treatment base is painkillers[13]. The hospitalised person in the ICU lacks evaluation of pain characteristics, its duration, location and seriousness. The level should be classified in numeral scale, visually analogic scale and BPS scale[13]. The pain evaluation should be followed by a suitable multimodal treatment strategy based in evidences, that includes pharmacological and non-pharmacological control therapies according to standard procedures[13].

The pharmacological interventions in agitation, pain and *delirium* advise the multidisciplinary teams to use non-pharmacological interventions due to the need to protect the vulnerability of the PCS and afterwards, if shown ineffective, pharmacological interventions should be started as referenced (Chart 4↗)[15,26].

To involve the family can be most useful and facilitating to deal with inevitable restraints. The team should follow an existent protocol, asking the family for authorization, explaining the need, which is the goal, they should register in the clinical process, according to the protocol and colocation, reevaluating the necessity every two hours[14].

Nurses play a crucial part in evaluation, intervention and treatment of the PCS with the alteration of their behaviour. Since they are the professionals that spend the most time with the hospitalised person, they are the ones that more quickly detect alterations, intervene and prevent complications. As important as identifying an alteration in the behaviour of the hospitalised it is also the capacity to identify the underlying causes of this alteration. An alteration in the behaviour can have one or multiple causes related with the person in itself (behaviour history), physical factors, psychological factors, given medication (analgesia and/or sedation) and the environment in the ICU[14,13,16]. In (Chart 4↗) can be found the descriptions of the nursing interventions that aim to reduce or avoid the causes that can trigger unsafe behaviours.

When all these measures are not enough to control the unsafe behaviour, there might arise the necessity to restrain mechanically the person. This decision should be multidisciplinary, lacks medical prescription and its effectuation tends to extra care by the nursing team, namely concerning to the vigilance of the person.

Organizational and political recommendations aim towards a change in organizational culture that guarantees the rights of the PCS and safety of teams, through the implementation of risk management systems, safe appropriations of professionals and organizational support to implement guidelines that reduce the use of MR[24]. The guidelines are mainly directed to approaches implemented by nurses to reduce restrictions and recommendations include physical/physiological changes, and also psychological and environmental.

CONCLUSION

Mechanical restraint is still used very frequently in many countries, having it been already quite studied. Evidences show that MR should be avoided to the maximum, implementing pharmacological interventions and non-pharmacological to avoid negative consequences for the PCS, like psychological and physical effects. Nurses in the ICU often face ethical dilemmas when deciding over the use of MR. In other words, they need to evaluate the results of using MR concerning its application and decide about the best option based in interests and conditions of the PCS. It is worrisome that there is no consensus about which pharmacological and non-pharmacological strategies, due to the lack of guidelines, protocols based in clear evidences for the prevention of MR. The need for guidelines is essential for the prevention of MR in an international level, its existence will reduce the use of restraint, if applicable, teams should respect rights and ethical and legal questions associates with the use of MR.

The development of flowcharts for acting allied with PBE is essential for the conjugation of safe strategies to standardize pharmacological and non-pharmacological interventions, anticipate the worsening of the PCS regarding agitation, pain and *delirium*.

Continuous training and qualification of the multipurpose teams about the use of MR should be implemented to improve the practices of nurses in the ICU. Summarizing, non-pharmacological and pharmacological interventions should always be used to prevent or avoid the use of MR.

Solving behavioural complications in the PCS requires a careful evaluation of its cause and of equating alternative measures to avoid MR, with the aim of improving the quality of the given care and the satisfaction of the multipurpose team.

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FA: Study coordination, study design, data collection, storage, and analysis, review and discussion of results.
LP: Study design, data analysis, review, and discussion of results.
AP: Study design, data analysis, review, and discussion of results.
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Chart 1 – Criteria of inclusion and exclusion.↖

PCC Question	*What are the preventing nursing interventions of Mechanical Restraint in the PCS in the ICU?*	Keywords	*"Physical Restraint", "critical care", "Nursing care", "Adult".*	
		Research Strategies	Exclusion Criteria	• Articles that did not answer the question; • Articles without the full text; • Articles with population under 18 years old; • Duplicated articles.
			Inclusion Criteria	• Full text; • Articles in English, Portuguese and Spanish; • Articles with free access; • Peer reviewed.
			Timeline	2019-2023.
		Data base	PubMed® ScienceDirect.	

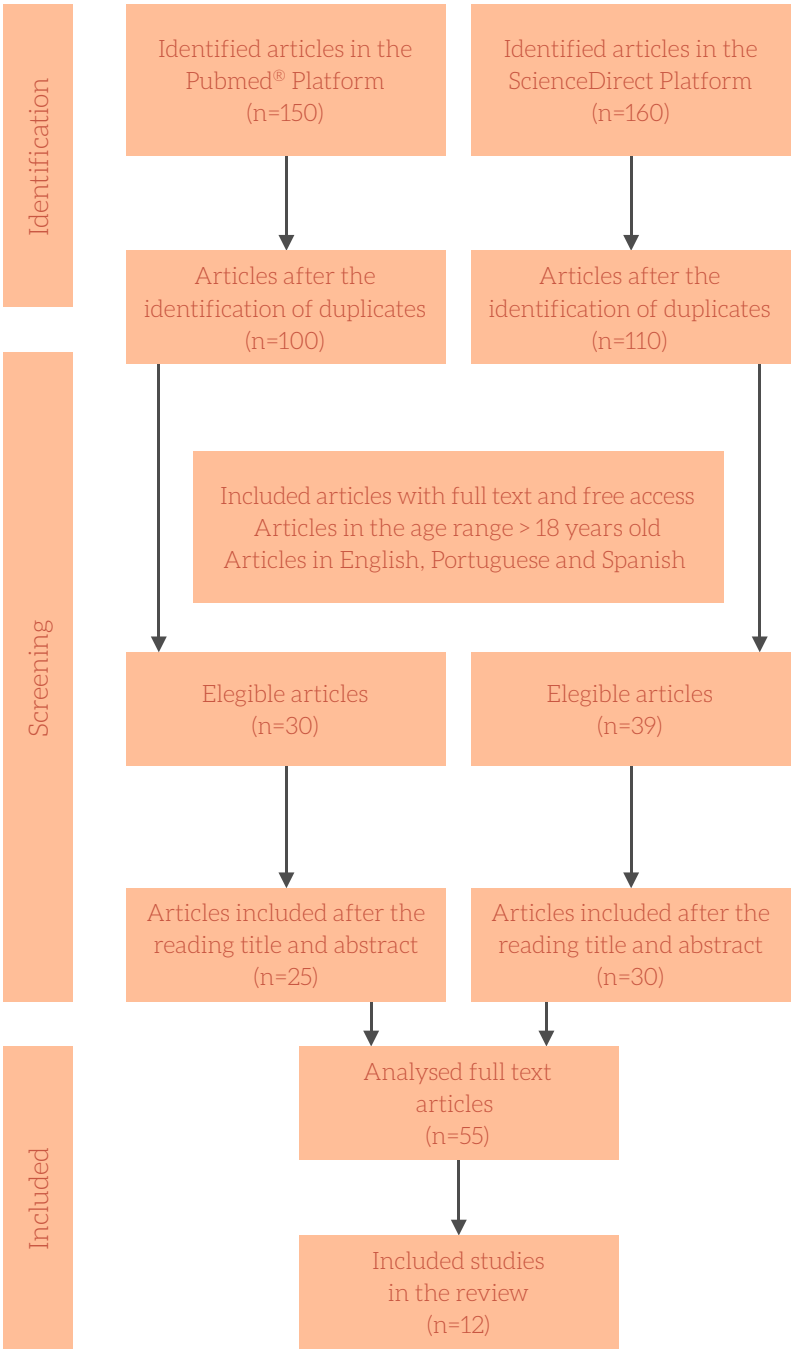

Figure 1 – Flow chart according to the Prisma methodology.

Chart 2 – Characterization and identification of included studies according to the JBI.

Studies	Year	Authors	Type of studies	Evidence level
E1 – Nonpharmacological interventions for agitation in the adult intensive care unit. https://doi.org/10.1016/j.aucc.2022.02.005	2023	Adams *et al*	Observational projects, Analytical, Systematic review of comparable cohort studies.	3a
E2 – Individualised analgesia, sedation, delirium and comfort management strategies in the ICU. https://doi.org/10.1016/j.redare.2023.03.003	2023	Lucendo *et al*	Nearly-experimental projects, Systematic review of nearly-experimental studies.	2a
E3 – The use of mechanical restraint in critical care units: Characterisation, application standards and related factors. Results of a multicentre study. https://doi.org/10.1016/j.enfie.2021.12.003	2022	Neuvo *et al*	Observational – Descriptive study Cross study.	4b
E4 – Physical restraint in the critical care unit: A Narrative Review. https://doi.org/10.1080/20502877.2021.2019979	2022	Smithard *et al*	Observational projects, Analytical, Systematic review of comparable cohort studies.	3a
E5 – The effect of non-pharmacological interventions on physical restraint reduction in intensive care units. https://doi.org/10.21037/apm-21-626.	2021(a)	Cui *et al*	Observational projects, Analytical, Cohort study with control group.	3c
E6 – Protocol for the adaptation of clinical practice guidelines for the management of physical restraints in critically ill patients. http://dx.doi.org/10.21037/apm-20	2021(b)	Cui *et al*	Observational – Descriptive study, Systematic review of descriptive studies.	4a
E7 – The challenges of using physical restraint in intensive care units in Iran. https://doi.org/10.1177/1751143719892785	2021	Salehi *et al*	Observational projects, Analytical, Case – controlled study.	3d
E8 – Factors behind ethical dilemas regarding physical restraint for critical care nurses. https://doi.org/10.1177/0969733019858711	2022	Salehi *et al*	Observational projects, Analytical, Case – controlled study.	3d
E9 – The effect of physical restraint on neurovascular complications in intensive care units. https://doi.org/10.1016/j.aucc.2019.03.002	2019	Ertuğrul *et al*	Observational projects, Analytical, Systematic review of comparable cohort studies.	3a
E10 – The importance of mechanical content and the permanent evaluation of the nursing team. https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/1324	2019	Maxino *et al*	Observational – Descriptive study, Cross study.	4d
E11 – Effect of Interventional Educational Programs on Intensive Care Nurses Perception, Knowledge, Attitude, and Practice About Physical Restraints. https://doi:%2010.1097/CNQ.0000000000000244%20	2019	Abmadi *et al*	Nearly-experimental projects, Systematic review of nearly-experimental studies	2a

Chart 2 – Characterization and identification of included studies according to the JBI.

Studies	Year	Authors	Type of studies	Evidence level
E12 – Evidence-Based Practice Guideline: Changing the Practice of Physical Restraint Use in Acute Care. https://doi.org/10.3928/00989134-20160113-04	2016	Lach *et al*	Observational – Descriptive study, Systematic review of descriptive studies.	4a

Chart 3 – Synthesis table of the extraction of data in the full review articles.

Study/Author	Study Goals	Participants/Context	Results	Period/Origin Country
Study 1 (Adams *et al*, 2023)	The goals of this study were to review systematically studies that evaluate the effectiveness of non-pharmacological interventions destined to control agitation in the intensive care unit.	A research in the data phase of MEDLINE was done from where 11 articles were extracted with the topic of non-pharmacological interventions for agitation in the adult in the intensive care unit.	The eleven studies that were included showed significantly lower levels of agitation in the group that received non-pharmacological interventions. The studies show a significant effect of sounds from nature, music, foot reflexology, healing touch and aromatherapy and no side effects were detected in the performed interventions.	February 2022 Denmark
Study 2 (Lucendo *et al*, 2023)	To guarantee the comfort of the patient that suffers or is recovering from a critical disease, avoiding complications associated to the measures, namely pharmacological, taken to guarantee said comfort.	The Intensive Medicine Society of Madrid SOMIAMA and the anaesthesiology society, reanimation and pain therapy of Madrid SAR agreed to create work groups centred in the improvement of the care to critical patients.	The obtained results were the performance of several recommendations illustrated by the specialists during the study in the approach of pain, *delirium* with the elaboration of timelines, guidelines in the treatment of the person in critical situation.	September 2023 Madrid/Spain
Study 3 (Neuvo *et al*, 2022)	To describe and characterize the use of mechanical restraint in the intensive care, units in terms of frequency and application quality and to study its relation with pain/agitation-sedation/*delirium*, relation, nurse, patient and institutional involvement.	An observation was done of 96 continuous hours in 17 units where 1070 patients in intensive care were included in which the main variables were the prevalence of restraint and the degree of adherence to the mechanical restraint recommendations, monitorization of pain, agitation-sedation and *delirium*.	The results were that the general prevalence of restraints was of 19.11% in patients with endotracheal tube [TET], of 42.10% in patients without TET or artificial airway, of 13.92%. Adherence values are obtained of 0 and 40% for the recommendations related to the non-pharmacological management and between 0 and 100% related to the surveillance of ethical-legal aspects.	February 2022 until May 2022 Madrid/Spain
Study 4 (Smithard *et al*, 2022)	The goal is to explore the reasons, evidences and justifications behind the use of restraint in intensive care environment.	Research was done about the topic in the electronical data base and a systematic review was done according to the Joanna Briggs Institute.	Restraint is still used in intensive care units separately or jointly. The evidences do not support its continuous use, without reduction in the removal of medical devices.	January 2022 London
Study 5 (Cui *et al*, 2021, a)	Broadly review the results in the SRMAs for non-pharmacological interventions to reduce the restraint.	Research was done about the topic in the electronical data base and a systematic review was done according to the Joanna Briggs Institute.	The results concluded that the various non-pharmacological interventions can reduce directly the physical restraints, like personnel education or to reduce indirectly the physical restraint, like the prevention of *delirium*, however, its effectiveness remained inconclusive.	May 2021 China

Chart 3 – Synthesis table of the extraction of data in the full review articles.

Study/Author	Study Goals	Participants/Context	Results	Period/Origin Country
Study 6 (Cui *et al*, 2021, b)	The goal of the call for action stage is to clarify the driving forces of the adaptation of guidelines and the organizational context.	It was to follow the definition of the guideline of the Institute of Medicine, the guideline will be adapted according to the CAN-IMPLEMENT. The scope of the guidelines and the clinical questions will be established according to an integrative review, retrospective study and interviews.	A protocol was done for the adaptation of the guidelines in the clinical practice about physical restrain in the critical patient. The guideline will help the healthcare professional, especially nurses in intensive care units.	March 2021 China
Study 7 (Salehi *et al*, 2021)	The goal of the study is to explore the experiences of nurses about the challenges of physical restraint in intensive therapy units.	20 intensive care nurses were recruited from four hospitals in Teheran and semi structured in depth interviews were done, analysed concomitantly.	Three main topics are identified: 1: Organizational barriers to the effective use of physical restraint (lack of standard guidelines for the use of physical restraint); 2: To ignore the wholeness of patients (their health and rights); 3: Suffering due to the use of physical restraint (emotional and mental suffering, moral conflict and incapacity in finding an appropriate alternative to physical restraint).	September 2018 until March 2019 Teheran Iran
Study 8 (Salehi *et al*, 2022)	The goal of this study was to explore the factors behind the ethical dilemmas for intensive care nurses about the use of physical restraint in patients.	17 intensive care nurses were recruited for the study and semi structured and in-depth interviews were performed and concomitantly analysed through means of analysis.	The factors behind the ethical dilemmas for the intensive care nurses about the use of physical restraint were categorized in three main categories, namely the results of the use of physical restraint, the results of the non-use of physical restraint and the emotional suffering for the nurses. The result of the non-use of physical restraint fell in two categories: the risks associated with the non-use of physical restraint and the legal issues for the nurses.	March 2020 Teheran Iran

Chart 3 – Synthesis table of the extraction of data in the full review articles.

Study/Author	Study Goals	Participants/Context	Results	Period/Origin Country
Study 9 (Ertuğrul *et al*, 2019)	The goal of this research was to investigate the effect of physical restraint in the occurrence of neurovascular complications and its rate.	A total of 90 patients of anaesthesia units and internal intensive therapy participated in the study, the patients were evaluated in a period of 24 hours during 4 days through means of the following instrument: individual characteristics forms, RASS scale, behavioural BPS and daily record of diagnosis of complications.	The redness and oedema increased in physically restrained patients with all types of matters. The duration of the physical restraint increased the neurovascular complications and the nurses did not check regularly the restrained fist and did not see the peripherical circulation. The daily rate of neurovascular complications is of 19%.	March 2019 Turkey
Study 10 (Maxino *et al*, 2019)	To identify the understanding of the use of mechanical restraint by the nursing professionals.	Survey application was performed to 60 nursing professionals, these being nurses, technicians and assistants with acting time of 2 to 37 years that work in the areas of first-aid/medical clinical emergency, surgical clinic and ICU.	The results were obtained through the answers to the surveys they were grouped, analysed and presented in the form of tables. It was highlighted between the interviewed that the main indications for mechanical restraint are to protect the team and the patient, avoid falls, lesions and trauma. It refers that there is a lack of knowledge about protocols of mechanical restraint and low participation in training courses about the topic in discussion.	March 2019 until April 2019 Brazil
Study 11 (Ahmadi *et al*, 2019)	The goal of this study was to report results of an educational program developed to modify negative attitudes of intensive care nurses regarding the use of physical restraint.	Application of survey to 33 nurses with experience higher than 1 year of work in intensive care units.	The results revealed that the increase in knowledge about the proper use of various types of restraints had a positive impact on perceptions, attitudes and practices of service which improved the practices of nurses in the intensive care unit.	February 2019 Iran
Study 12 (Lach *et al*, 2016)	Update in the previous guideline about how to reduce the use of mechanical restraint in intensive care environment.	A bibliographical research was done to evaluate the current evidences, where 112 articles that provided evidences were included.	The use of restraints is still a problem in the intensive care facilities.	May 2016 United Stated of America

Chart 4 – Evaluation, interventions and approach to reduce the necessity of MR in the PCS
adapted from (Adams *et al*, 2023; Lucento *et al*, 2023; Lach *et al*, 2016).[→↖↖]

Nursing interventions to reduce the necessity of MR

Physical/Physiological	
Approach	Interventions
Evaluate, prevent and treat the Pain Justification: Pain in the hospitalized person in the ICU is frequent, has multiple aetiologies and presents interindividual variability. Pain in the person in critical situation is common in rest and during procedures, including regular activities (e.g.: mobilization) or simple procedures (e.g.: insertion of arterial catheter).	– Evaluate the Pain through validated scales every 2 hours and SOS, through the BPS scale (Behavioural Pain Scale) or numeral/visual pain Scale; – Non-pharmacological interventions for pain relief (Positioning, massage, heath or cold therapy when located the pain); – Pharmacological interventions to deal with the pain: • Opioids should be the 1st line for non-neuropathically pain; • The 1st line opioid is Fentanyl; • Morphine should be used in bolus for analgesia in the transition of the person to the nursing ward, after suspension of Fentanyl (avoid withdrawal syndrome); • Non opioid painkillers should be associated (Paracetamol and/or metamizole) to reduce the opioid dose and reduce adverse events; • Associate to the opioids, gabapentin or carbamazepine in case of neuropathically Pain; • Epidural Analgesia in the presence of thoracic trauma, pancreatitis, abdominal surgeries; **Always administrate analgesia, before any invasive or painful procedure.**
Sedation choice Justification: the goals of analgesia and sedation, the means of administration and the used medicines should be customized and according to the base pathology and with the acute situation that motivated the hospitalization.	– A level of sedation appropriate to the clinical situation of the person should be prescribed daily; – Monitor through the Scale of Agitation/Sedation of Richmond – RASS; – Sedation should be monitor 2 x shift; – Daily suspension of sedation: • The sedative of **1st line will be Propofol** 2% (< 4 mg/kg/h); • If this dose is not enough to reach the desired RASS level, associate Ketamine (varies with context); • Midazolam – 150 mg (3 ampoules of 50 mg/10 ml) until 50 ml of SF (3 mg/ml); – Recommendations in the Sedative therapy for Rass targets – 3/0: • The sedative of 1st line will be Propofol 2% (< 4 mg/kg/h) • When Rass of -3, **Dexmedetomidine should be associated** (8 mcg/ml) • When hit Rass 0, start weaning of Dexmedetomidine slowly through the course of 24 to 48 hours (according to therapeutical protocol); • In case of necessity of suspension of Dexmedetomidine without weaning time, this can be replaced by clonidine, its maximum effect is between 2 to 4 hours. After 6 hours reduce dexmedetomidine by 25% (varies with context);

Chart 4 – Evaluation, interventions and approach to reduce the necessity of MR in the PCS
adapted from (Adams *et al*, 2023; Lucento *et al*, 2023; Lach *et al*, 2016).[↔↖↖]

Nursing interventions to reduce the necessity of MR

Physical/Physiological	
Approach	Interventions
Daily suspension of sedation with spontaneous ventilation training. Justification: promote ventilatory weaning as soon as possible and allow the person to be awake and conscious.	– Use protocols of Daily Sedation Interruption with Spontaneous Respiratory Tests; – Suspend sedation in the morning period; • If not tolerated restart in 50% of dose; • **Reduce sedation to 50% in the morning period (MICU protocol).**
Sleep Promotion Justification: sleep in integrated in the sleep-vigil system, in which there is a state of immobility and partial disconnection, towards the involving environment. This is a key part in the life of the human being, thus being a basic necessity indispensable in the physical and psychological restoring, contributing to the well-being.	– Reduce light in the room/unit: • Regulate light near the person; • Decrease intensity of light in the unit; • Provide eye mask; • Regulate the levels of melatonin (maximum excretion during night, due to the absence of light). • Allow the person to understand it is night and to be able to start the sleeping cycle. – Reduce Noise: • Moderate conversations between the multipurpose team; • Provide ear plugs; • Open and close doors and drawers slowly; • Reduce the sound of the phone in the night period; • Adjust the limit in the screen alarms, ventilators and infusing pumps. – Reduce Care Service: • Modify the medication schedule (if possible); • Avoid analytic sampling tests during the night period; • Avoid hygiene care, mouth hygiene, eye hygiene. – Control Pain, anxiety and discomfort: • Evaluate and control pain; • Perform relaxation techniques (sound therapy and massage); • Clean, straightened and wrinkles free sheets. Provide sleep Inducers, antipsychotics.

Chart 4 – Evaluation, interventions and approach to reduce the necessity of MR in the PCS
adapted from (Adams *et al*, 2023; Lucento *et al*, 2023; Lach *et al*, 2016).[↔↖↖]

Nursing interventions to reduce the necessity of MR

Physical/Physiological	
Approach	Interventions
Early Mobilization Justification: essential in recuperation of functionality and autonomy gain after being discharged.	**Rehabilitation is suggested** – group of interventions destined to optimize the functionality and reduce incapacity in people with a health problem. **Mobilization is suggested** – a type of intervention in rehabilitation that enables movement with the purpose of improving outcomes for the person. **Mobilization specially during the waking up periods with spontaneous respiratory training is suggested.** Vasoactive infusions or mechanical ventilation are not barriers to start rehabilitation/mobilization, if stabilized.
Remove invasive devices as soon as possible. Justification: the presence of invasive medical devices can cause pain and discomfort, as well as prone to infection.	– Evaluate daily the need for the permanence of invasive devices; – Explain to the person the need for said devises, what they are, what they are for and the benefits of their cooperation; – Appropriate maintenance of devices to reduce risk of infection; – Remove them as soon as they are no longer needed.
Psychological	
Effective communication Justification: an effective communication makes the person feel part of their illness process as well as building trust in the team.	Treat the person by their name; – The professional should always present themselves and be identified; – Provide orientation to the person in time and space (clocks, calendar in visible places); – Have an empathic and relaxed relation towards the person; – Always explain the procedures before performing them; – Use translators and relatives to ease communication.
Family engagement Justification: engage the family in the care during an illness has a positive impact in quality and safety and can decrease anxiety, confusion and agitation.	– Engage the family in the Care Plan for the Hospitalised Person in the ICU; – To engage the family is extremely important in gathering the history of the hospitalized person (background, usual therapy, habits/consumptions, behaviour, preferences…); – Facilitate the adaptation process of the family to the critical illness of their relative; – Reduce the impact of hospitalization in ICU in the family's dynamic; – Promotion of daily reunion between family, nurse and doctor; – Flexibilization of visits, optimization of schedules; – Customization of the unit of the hospitalized person.

Chart 4 – Evaluation, interventions and approach to reduce the necessity of MR in the PCS
adapted from (Adams *et al*, 2023; Lucento *et al*, 2023; Lach *et al*, 2016).

Nursing interventions to reduce the necessity of MR	
Psychological	
Approach	**Interventions**
Cognitive and Sensory Stimulation Justification: stimulate cognitive function of the person as well as provide occupation and distraction, helping in setting apart day from night.	– Implement daily techniques of cognitive stimulation: reading, listening to music, watching TV, mobilization, family visit; – Provide aiding vision and hearing means; – Keep a calm environment, controlling noise and behaviour of professionals; – Motivate visit and engagement of relatives in Nursing care; – Installation of curtain and preservation of privacy; – Guarantee access to outside space.
Evaluate, prevent and treat *Delirium* Justification: Monitor *delirium* allows a differential diagnosis from other syndromes such as Confusion.	– *Delirium* identification should be performed using the CAM-ICU scale (Confusion Assessment Method – in ICU) and the ISDCS scale; – CAM-ICU should be applied 2 x per day, in the morning and afternoon; – ISDSC scale should be performed 1 x per day in the afternoon; – Non-pharmacological interventions to prevent *delirium* (every intervention mentioned previously); – Pharmacological interventions to treat **Agitation**: • Benzodiazepines should not be used as sedation of 1st line (except in particular situations like the treatment of *delirium* tremens, benzodiazepines, alcohol or drug deprivation syndrome); • Haloperidol bolus 0.5 up until 5 mg EV 20-30 min if mild agitation (RASS +1, +2); • Haloperidol bolus 5 up until 20 mg EV 20-30 min if intense agitation (RASS +3, +4); • Quetiapine 25 mg oral 2 x day (12/12 hours); • Olanzapine < 60 years old – 10 mg oral 2 x day or > 60 years old – 5 mg oral 1 x day (varies with context); • Sedation with Dexmedetomidine according to protocol.
Environmental	
Promote a safe environment	– Remove devices or equipments that can put in danger the integrity or life of the person or the professionals; – Promote a calm environment; – Encourage presence of a relative to calm the person; – Whenever possible the appropriation Nurse-Person should be 1:1.