MOBILIZAÇÃO PRECOCE EM PESSOAS SUBMETIDAS A VENTILAÇÃO MECÂNICA INVASIVA: REVISÃO INTEGRATIVA DA LITERATURA

MOVILIZACIÓN PRECOZ EN PERSONAS SOMETIDAS A VENTILACIÓN MECÁNICA INVASIVA: REVISIÓN INTEGRATIVA DE LA LITERATURA.

EARLY MOBILIZATION IN PEOPLE UNDERGOING MECHANICAL INVASIVE VENTILATION: INTEGRATIVE REVIEW OF LITERATURE

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Pedro Cerol[1]; Jorge Martins[1]; Luís Manuel Mota de Sousa[2]; Isabel Oliveira[3]; Teresa Silveira[3]

1 - Centro Hospitalar Universitário do Algarve, Unidade de Portimão, Portugal; 2 – Universidade de Évora, Escola Superior de Enfermagem S. João de Deus, Évora, Portugal; 3- Escola Superior de Saúde da Cruz Vermelha Portuguesa, Lisboa, Portugal

RESUMO

Introdução: A mobilização precoce na unidade de cuidados intensivos é considerada uma intervenção importante na prevenção de complicações relacionadas com a imobilidade e a ventilação mecânica, principalmente no desenvolvimento de fraqueza muscular generalizada.

Objetivo: Identificar os benefícios das várias modalidades terapêuticas utilizadas na mobilização precoce das pessoas em situação crítica, submetidas a ventilação mecânica invasiva.

Método: Realizou-se uma revisão integrativa da literatura. Formulou-se a seguinte questão através da estratégia PICo - o qual o estado do conhecimento sobre a mobilização precoce em pessoas em situação critica submetidas a ventilação invasiva? A pesquisa foi realizada na plataforma EBSCOhost em setembro de 2018, nas bases de dados eletrónicas CINAHL e MEDLINE e foi definido o período compreendido entre janeiro de 2010 e setembro de 2018.

Resultados: Dos 397 artigos identificados, foram incluídos 9 artigos. A mobilização precoce em pessoa submetida a ventilação mecânica invasiva é considerada uma prática segura, uma vez que a ocorrência de eventos adversos é reduzida. Os principais benefícios são melhoria da capacidade funcional, diminuição das complicações associadas à imobilidade e ventilação mecânica invasiva, redução do número de dias sob ventilação mecânica invasiva e, consequentemente, à diminuição dos dias de permanência na unidade de cuidados intensivos e de internamento hospitalar. Esta intervenção diminui a morbilidade e mortalidade hospitalar.

Conclusão: A mobilização precoce em pessoas submetidas a ventilação mecânica invasiva é segura e contribui para os ganhos em saúde quer a nível da pessoa/família, quer organizacional.

Descritores: Enfermagem em Reabilitação, Mobilização Precoce, Técnicas de Exercício e de Movimento, Ventilação Mecânica

RESUMEN

Introducción: La movilización precoz en la unidad de cuidados intensivos se considera una intervención importante en la prevención de complicaciones relacionadas con la inmovilidad y la ventilación mecánica, principalmente en el desarrollo de debilidad muscular generalizada.

Objetivo: Identificar los beneficios de las diversas modalidades terapéuticas utilizadas en la movilización precoz de las personas en situación crítica, sometidas a ventilación mecánica invasiva.

Identificar los beneficios de las diversas modalidades terapéuticas utilizadas en la movilización precoz de las personas en situación crítica, sometidas a ventilación mecánica invasiva.

Método: Se realizó una revisión integrativa de la literatura. Se formuló la siguiente cuestión: a través de la estrategia PICo: ¿cual el estado del conocimiento sobre la movilización precoz en personas en situación crítica sometidas a ventilación invasiva? La investigación se realizó en la plataforma EBSCOhost en septiembre de 2018, en las bases de datos electrónicas CINAHL y MEDLINE y se definió el período comprendido entre enero de 2010 y septiembre de 2018.

Resultados: De los 397 artículos identificados, se incluyeron 9 artículos. La movilización precoz en persona sometida a ventilación mecánica invasiva se considera una práctica segura, ya que la aparición de eventos adversos es reducida. Los principales beneficios son la mejora de la capacidad funcional, disminución de las complicaciones asociadas a la inmovilidad y ventilación mecánica invasiva, reducción del número de días bajo ventilación mecánica invasiva y, consecuentemente, a la disminución de los días de permanencia en la UCI y de internamiento hospitalario. Esta intervención disminuye la morbilidad y mortalidad hospitalaria.

Conclusión: La movilización precoz en personas sometidas a ventilación mecánica invasiva es segura y contribuye a las ganancias en salud tanto a nivel de la persona/familia, bien organizacional.

Descriptores: Enfermería en Rehabilitación, Movilización Precoz, Técnicas de Ejercicio y de Movimiento, Ventilación Mecánica

ABSTRACT

Introduction: Early mobilization in the intensive care unit is considered an important intervention in the prevention of complications related to immobility and mechanical ventilation, mainly in the development of generalized muscular weakness.

Objective: To identify the benefits of the various therapeutic modalities used in the early mobilization of critically ill people submitted to invasive mechanical ventilation.

Method: It was performed an integrative review. The following question was formulated through the PICo strategy - what is the state of knowledge about early mobilization in critically placed people submitted to invasive ventilation? The research was carried out on the EBSCOhost platform in September 2018, in the electronic databases CINAHL and MEDLINE and the period between January 2010 and September 2018 was defined.

Results: Out of the 397 articles identified, 9 articles were included. Early mobilization in person submitted to invasive mechanical ventilation is considered a safe practice, since the occurrence of adverse events is reduced. The main benefits are improvement of functional capacity, reduction of complications associated with immobility and invasive mechanical ventilation, reduction of the number of days under invasive mechanical ventilation and, consequently, the reduction of the days of ICU stay and hospitalization. This intervention reduces hospital morbidity and mortality.

Conclusion: Early mobilization in people undergoing invasive mechanical ventilation is safe and contributes to health gains at both the person/family and organizational levels.

Keywords: Rehabilitation Nursing; Early Mobilization; Exercise and Movement Techniques; Mechanical Ventilation.

INTRODUCTION

Currently in Europe, due to critical illness, around 990,000 and 1,500,000 people/year are subjected to invasive mechanical ventilation (IMV). In more developed countries, intensive care units (ICU) are responsible for around 13.4% of total hospital costs, around 4.1% of national expenditure on health and around 0.56% of gross national product. The aging of the population and the expansion of the so-called diseases of civilization will lead to an increase in intensive care needs over the next 10 years, which some estimates predict at 160%[1].

As a result of the need for intensive treatment, people in critical condition remain bedridden for long periods. Their serious condition and the administration of vasopressor, sedative and neuromuscular bloker therapy affect the mobility of these people, exposing them to complications inherent to immobility such as atrophy, muscle dysfunction and weakness, decreased functional capacity, orthostatic hypotension, tachycardia, among others[2]. The development of generalized weakness associated with people in critical condition, especially those who need mechanical ventilation, is a significant and common complication [3]. Therefore, an approximate incidence of between 30% and 60% in people hospitalized in the ICU is indicated, with a loss of 4% to 5% of peripheral muscle strength per week during the period of immobility [4]. Hogdson et al.[5] concluded that 52% of the patients in the study had muscle weakness associated with intensive care.

Immobility compromises the respiratory, cardiovascular, gastrointestinal musculoskeletal, genitourinary, metabolic, cutaneous and neurological systems. Disuse, rest or inactivity of limbs or body and the loss of enervation promote a decline in muscle mass, strength and endurance[6], leading to the development of several neuromuscular, pulmonary, cognitive and quality of life complications, which may last up to 5 years after discharge[7]. All these factors contribute to prolonging the length of stay in the ICU, resulting in an increased risk of complications, an increase in the morbidity and mortality rate and, consequently, higher costs[6]. Ågård et al.[8] report that, during the first year of convalescence, people in critical situations fight for independence, trying to recover their physical strength and functional capacity and resume their family roles. This functional decline is accentuated in the ICU where the person is confined to bed most of the time[7].

Rehabilitation of the person in critical condition initiated in the ICU is referred to as an important part of the care plan, being suggested as a relevant therapy in modifying the risk of developing sequelae in terms of physical and functional morbidity. Early mobilization, also called progressive mobility, refers to a pattern of increased activity starting with passive mobilization until ambulation, starting immediately after hemodynamic and respiratory stabilization, usually between 24 to 48 hours after admission in ICU[9]. The beginning of early mobilization is intended to prevent complications inherent to immobility in bed, minimize loss of mobility, optimize autonomy and facilitate weaning from the ventilator. Thus, its importance goes through the gains in functional capacity, but it has an impact on a higher level, on the person's independence and on the improvement of their quality of life[2].

Previous research has identified barriers to implementing early rehabilitation programs that include deep sedation, inadequate staff and multidisciplinary cooperation, safety concerns, and ignorance about the benefits of early rehabilitation. Some ICUs have overcome these barriers by successfully implementing early rehabilitation into their routine, but even so, continued widespread implementation reduced and only 8% to 12% of people on mechanical ventilation were mobilized out of bed [10].

Early rehabilitation is safe and well tolerated, but it is not without risks. One should be alert to potential safety problems such as the physiological response to exertion, the need to change treatment plans, sedation, administration of vasopressors, accidental extubation and exteriorization of other devices. The occurrence of the events mentioned is residual and appeared in less than 4% of all interactions with people, none of them considered serious[11].

The intervention of the rehabilitation nurse to the person undergoing IMV aims to improve the quality of life through the improvement of functionality (daily and instrumental activities), effort tolerance, reduction of complications of IMV and the success of weaning from the ventilator. Early rehabilitation, with regard to the person undergoing IMV, becomes increasingly essential, and this should be started within the first 24 hours [12]. In this perspective, we identified the intervention of the specialist nurse in rehabilitation nursing, in the context of the person undergoing IMV, as a pressing need.

The research question we formulated for this study was: "What are the benefits of early mobilization in people undergoing invasive ventilation?" In order to respond to this identified problem, we defined the general objective as: analyzing the nursing intervention in early mobilization; and as specific objectives: describe the rehabilitation interventions that can be implemented for the person undergoing IMV and identify the benefits of this same intervention.

MATERIALS AND METHODS

Ethical aspects

Because it is an integrative review and does not involve human beings, did not need to go through the appraisal of an ethics collision. The ethical procedures to be considered in a work of this type were met, namely, the rigor in referencing and respect for the perspective of the authors of the articles included

Type of study

An integrative literature review is one of the research methods used in Evidence-Based Practice that allows for the incorporation of evidence into the clinical situation. It is based on scientific knowledge, with quality and cost-effective results[13, 14].

Methodological procedures

According to the constituent steps of an integrative literature review, the following question that motivated interest and research was defined in the first step, which is "What are the benefits of early mobilization in people undergoing invasive ventilation?" based on the PICo acronym, derived from the PICO in which P (Population) I (phenomenon of interest) and Co (context), the inclusion and exclusion criteria expressed in the following table were defined taking into account the acronym:

	Inclusion criteria	Exclusion criteria
Population (P)	Adult person in critical situation;	Pediatric-age people and adults who are not in intensive care units;
Phenomenon of interest (I)	Benefits of early mobilization;	Interventions that are not related to early mobilization;
Context (Co)	Invasive ventilation;	People who are not undergoing invasive ventilation;

Table 1 – Criteria of inclusion and exclusion.

This study included articles referring to adults aged over 19 years-old, full text from January 2010 and September 2018, without geographic limitations, and articles in English, Portuguese and Spanish. After reading the abstract and analyzing the articles, those that did not refer to the topic under study were excluded. The following descriptors were found, previously validated as descriptors used in health sciences in the DeCs and MESH platforms: "rehabilitation", "rehabilitation nursing", "early ambulation", "exercise movement techniques", "respiratory therapy" and "mechanical ventilation", "Respiration, Artificial".

Data source, identification and selection of studies

The search was carried out on the EBSCOhost platform in September 2018, in all electronic databases there included, on the period between January 2010 and September 2018 was defined for the publication dates of the researched articles. The words selected for the search were combined using the Boolean expressions AND and OR, obtaining the following search equation:

1. [(Ventilator weaning) OR (mechanical ventilation) OR (respiration, artificial)] n=100812
2. [(rehabilitation nursing) OR (rehabilitation) OR (early ambulation) OR (exercise movement techniques)] n=621380

3. ((Ventilator weaning) OR (mechanical ventilation) OR (respiration, artificial)) AND ((rehabilitation nursing) OR (Rehabilitation) OR (early ambulation) OR (exercise movement techniques)) n=2537

The articles selected for full reading were independently evaluated by two investigators, according to methodological quality criteria proposed by the JBI[14]. Only articles with more than 75% of the criteria were selected and the quality of the systematic review was evaluated with the Carneiro e Bogalho grill[15].

Data extraction and analysis

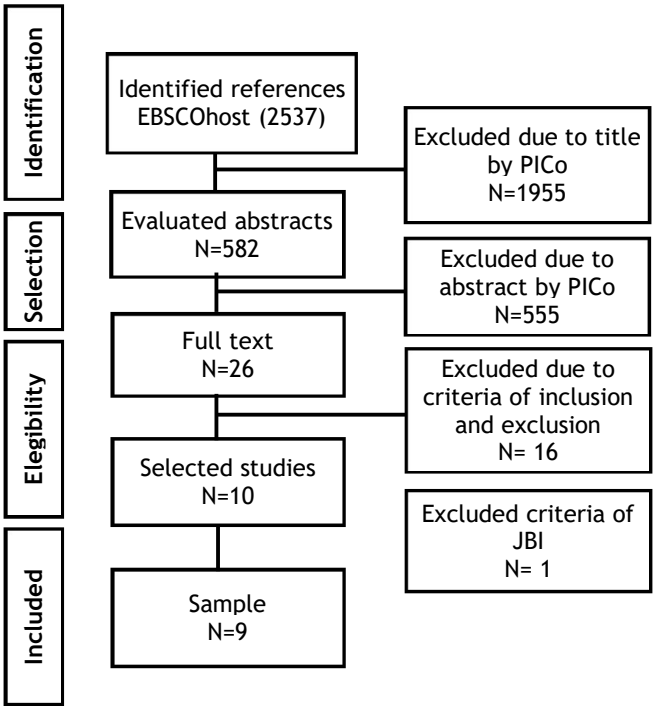
Information was extracted from the articles on authors, year, country, sample, data on metric properties, conclusions and level of evidence. The classification of the levels of evidence of the included studies was performed based on the criteria of the Registered Nurses Association of Ontario: 1A – systematic reviews (meta-analyses); Level 1B – prospective studies or experimental studies with randomly selected groups; Level II – quasi-experimental studies; Level III – descriptive studies and cohort studies; Level IV – expert opinion articles[17].

The information collected from the articles was based on the following criteria: author, year, country, participants, objectives, interventions, results and the level of evidence. Information about the intervention was organized according to the frequency, intensity, volume, duration and modality of the therapeutic activity/physical exercise.

RESULTS

2537 references were identified and 8 articles were included (figure 1). After applying the method of evaluating the quality of articles through the Johanne Briggs Insitute grids, an article with some limitations regarding the methodology used and the selection of groups was chosen, however it was included because it fits into the theme[17]. It was also decided to include a systematic review of the literature in order to enrich this work [18].

The samples of articles are heterogeneous with great variability in the selection of control and intervention groups (Table 2).



Fluxograma 1 - identificação, análise e seleção dos artigos.

Reference	Country	Authors	Year	Type of study	LE
Study 1 (19)	Australia	Hodgson C. et al.	2015	Prospective cohort	III
Study 2 (20)	USA	Castro E. et al.	2015	Descriptive	III
Study 3 (21)	Israel	Yousef-Brauner O. et al.	2013	Experimental (clinical trials)	1B
Study 4 (22)	USA	Clark D. et al.	2013	Cohort	III
Study 5 (23)	England	McWilliams D. et al.	2014	Cohort	III
Study 6 (24)	Italy	Enrico M. et al.	2011	Cohort	III
Study 7 (25)	Brazil	Toccolini BF. et al.	2014	Cohort	III
Study 8 (26)	USA	Amidei C. et al.	2013	Quasi-experimental	II
Study 9 (27)	Brazil	Azevedo PM. et al.	2015	Systematic review	1A

Table 2 – Identification of studies (LE - Level of Evidence)

Then, an individualized synthesis of the main data of the articles included will be presented: study identification, participants, objectives, interventions, results.

Refe-rence	Partici-pants	Objective	Intervention	Results
Study 1 (19)	N=192	To evaluate the relationship between early mobilization in people under IMV and the occurrence of muscle weakness acquired in intensive care and subsequent recovery	Modality: Exercises in bed, sitting position on the edge of the bed, passive transfer to the armchair, orthostatic position at the bedside, transference from the bed to the armchair by the foot and walking. Intensity: low to moderate;	Increased muscle strength was associated with early mobilization during IMV, home discharge and increased survival at 90 days. The relationship between the presence of muscle weakness acquired in intensive care and the decrease in survival at 90 days was also established.
Study 2 (20)	N=56 Nurses	To evaluate and to improve the mindset of nurses in a surgical ICU regarding early mobilization in people under IMV before, 6 months after and 1 year after the implementation of an early mobilization protocol.	Modality: Application of a questionnaire to nurses in an ICU about early mobilization in people under IMV before, 6 months and 1 year after the implementation of an early mobilization protocol.	There was a change in mentality on this topic. Nurses found that early mobilization of people under IMV shortens hospital stay, decreases ventilator-associated pneumonia, deep vein thrombosis, and pressure ulcers.
Study 3 (21)	N=18; N=9 control group, N=9 intervention group.	To evaluate the effect of an intensive care protocol in people who suffered from muscle weakness acquired in intensive care, namely in terms of muscle strength, breathing and functional indices.	Modality: 1st phase (passive): passive mobilizations of the upper and lower limbs, change of position, manual pulmonary hyperinflation and bronchial aspiration; 2nd phase (active): active exercises using all the joints of each limb, breathing exercises for those who were breathing spontaneously, sitting on the edge of the bed, balance training and trunk exercises; 3rd phase (functional): adds to the previous phase mobility training such as the transfer from the lying position to the sitting position and from the sitting position to the standing position and walking training Frequency: the intervention group twice a day, control group once a day; Intensity: progressive, from low to moderate (passive, active, functional); Volume: 6 times per movement in the first phase passive mobilizations; Duration: 15 minutes of active exercises in the second and third phase;	There was a significant improvement in muscle strength (MRC) and maximum inspiratory pressure (MIP), and less significant in sitting balance. Early mobilization and intensive care showed a decrease in days spent in the ICU (18.11±3.1 days in the control group vs 13±4.6 days in the intervention group) and in the number of days on IMV (16 .22±2 days in the control group vs 9±5 days in the intervention group). There was no difference between groups in the percentage of people able to walk during ICU stay.
Study 4 (22)	N=2176; N=1044 control group, N=1132 experimental group	To evaluate the application of an early mobilization protocol on complication rates, days on IMV and the number of days of hospitalization.	Modality: Mode 1: (Unconscious people/ contraindication for active mobilization and progression to a sitting position) passive mobilizations and positioning; Modality 2: active/assisted or active mobilizations, mobility training and sitting on the bed; Modality 3: Active resisted mobilizations and sitting on the edge of the bed; Mode 4: get up into the chair and walk around. Frequency: 2 hourly positioning in the first modality; Intensity: progressively low to moderate, depending on the modality;	Reduction of 2.4 days of hospital stay after the implementation of the early mobilization program. Airway complications that led to endotracheal re-intubation were reduced by 50%. There was a decrease in the occurrence of pneumonia, deep vein thrombosis, airway, pulmonary and vascular complications.
Study 5 (23)	N=582; N=290 control group, N=292 intervention group.	To evaluate the impact of an early rehabilitation program on people under IMV and admitted to an intensive care unit.	Modality: daily passive mobilizations and positions in the acute phase of the disease or if under sedation. Subsequently, the sitting position on the edge of the bed was used and balance was assessed. If balance was present, transfer to the armchair was performed. If balance was absent or if there was restriction to sit on the edge of the bed, a transfer to a stretcher chair was performed, keeping supine during the transfer, or to a vertical table. Later, more active exercise and lifting was performed. If the person was able to remain in the standing position, walking training was started. Frequency: A third of the people had 2 sessions a day, total study averaging 1.3 times a day; Duration: Transfer to highchair – 2 times/day for 1 to 2 h; Stretcher chair – 1h to 3 times/day; Intensity: progressive, low to moderate;	After the introduction of the early rehabilitation program, there was a reduction of 2.5 days of hospital stay, 2, 4 days of ventilatory support, a 7% reduction in ICU mortality and an 11% reduction in hospital mortality. During the study, a decrease of 584 days of ICU stay was estimated.
Study 6 (24)	N=77	To assess the degree of functional recovery after a rehabilitation program and the influence on hospital outcome in tracheostomized and chronically ventilated	Modality: active limb mobilizations, muscle strengthening to control the trunk and maintenance of body posture, activities of the upper and lower limbs to facilitate the transfer from the bed to the armchair and remain in an orthostatic position. Walking training, active-resisted mobilizations with	The success of ventilatory weaning and the in-hospital survival rate was 74% and 87%, respectively. A large percentage of people recovered in all domains of daily living activities at the time of discharge from the ICU. A higher degree of dependence on ADLs was also associated with a worse clinical outcome.

		people admitted for ventilatory weaning.	the use of weights and pedals (used in the upper and lower limbs) were performed. Pedal units and active-resisted mobilizations: Frequency: 6 times a week (at least 15 sessions), 2 times a day; Intensity: progressive, from low to moderate; Volume: Pedal unit - 30 revolutions per minute; Active-resisted mobilizations - 2 sets of 10 repetitions, load from 100g to 500g; Duration: Pedal unit - maximum of 30 minutes; Simultaneously, a ventilatory weaning protocol was applied with progressively longer periods of spontaneous breathing, regardless of physical training.	
Study 7 (25)	N=23	To evaluate the effects of passive orthostatism on various clinical and physiological parameters in the person in critical condition, through the use of the verticalization table	Modality: verticalization table Frequency: onde a day; Intensity: low, no hemodynamic repercussions; Duration: 1st day - 30th (5min.), 45th (5min.) and 60th (15min.); 2nd day and remaining - 30th (5min.), 45th (5min.) and 60th (5min.), 75th (5min.) and 90th (15min.); On average 5.2 days of this protocol were performed.	The greatest benefits were increased inspiratory muscle strength and increased level of consciousness. The increased level of consciousness can be explained by sensory stimulation due to the standing position. In this study, 5 people were extubated early due to the increased level of consciousness at the 90° position. Placing people in an orthostatic position did not reveal any physiological changes that could impede the procedure.
Study 8 (26)	N=30	To assess the physiological responses to the implementation of an early passive exercise protocol to prevent muscle weakness in people on IMV.	Modality: passive mobilization of each lower limb through a device that performed knee flexion/extension (5° to 70° flexion). The two lower limbs were mobilized simultaneously and alternately, simulating walking; Frequency: a single session; Intensity: low, without hemodynamic repercussions; Volume: 20 extensions/flexions per minute; Duration: 20 minutes;	No changes in vital parameters assessed at different stages of the intervention. There was a decrease in the level of pain (BPS) during and 60 minutes after the intervention.
Study 9 (27)	N=6 studies Total=806 participants	To determine the effects of early mobilization on the functional rehabilitation of ICU patients.	Analysis of 6 studies: 2 Cohort studies and 4 Controlled Randomized studies.	Less length of stay in the ICU and hospital. Shortest time under IMV. Increase in the number of people able to walk. Less time until the 1st rise, ability to carry out active transfer to the chair, greater functional capacity, more independence in carrying out activities of daily living and higher score on the Barthel Index. Greater capacity to perform resistance exercises, significant increase in muscle strength and maximal inspiratory pressure.

Table 3 – Information extracted from studies

DISCUSSION OF RESULTS

According to the selected studies, through this integrative literature review, the results obtained will be described according to different topics, namely the main interventions performed, which benefits come from early mobilization, safety, main barriers to proceed with the early mobilization of the person subjected to invasive mechanical ventilation, study weaknesses and, finally, recommendations for practice.

Rehabilitation interventions, Context

The data collection was carried out taking into account the frequency, intensity, duration, volume and modality in order to facilitate the prescription/application of therapeutic activities by specialist nurses in rehabilitation.

Several studies used protocols that were based on the progressive mobilization model, contemplating various levels of intervention, according to the clinical condition and capacity of the people, starting with passive mobilizations and culminating in standing up and walking[20-24]. Despite mentioning the modalities performed, they did not mention in detail their frequency, intensity, duration and volume, so we will only describe the available information.

Study 3 used an early mobilization protocol that included 3 phases of modalities (passive, active and functional). The passive mobilizations of the first phase were performed 6 times per movement and the active exercises of the second and third phases lasted 15 minutes. People included in the intervention group underwent 2 daily sessions of this protocol[21].

The early mobility protocol described by Morris et al. was used in Study 4, which consists of using 4 modalities of interventions. In this study, there was no reference to the frequency, volume, intensity or duration of the modalities performed; there was only reference to criteria necessary for the progression of the modality of interventions. The administration of vasopressor therapy was a condition for carrying out interventions related to modalities 3 and 4[22]. This protocol was also used in Study 2, describing only that, in the first modality, passive mobilizations were performed three times a day in the upper and lower limbs. In the

remaining three modalities, they only describe the interventions carried out, but without referring to their frequency, volume, intensity or duration. The administration of vasopressors was not a contraindication for early mobilization, as long as it was in reduced doses and there was no orthostatic hypotension[20].

The protocol used in Study 5 consisted of performing daily passive positioning and mobilizations, active mobilizations and sitting on the edge of the bed, and transfer to a chair twice a day for 1 to 2 hours. One of the restrictions for bedside sitting included reduced doses of vasopressors (noradrenaline between 0.1-0.2 mcg/kg/min). If the person was not balanced nor had restrictions to sit on the bedside, they were transferred to a stretcher chair, keeping the supine position during the transfer, for 1 hour up to 3 times a day or, if they had orthostatic hypotension, they were transferred to the verticalization table with progressive increase in inclination until reaching the orthostatic position. As people improved, more active exercise was performed and, progressively, lifting and walking were started. Approximately one third of people performed 2 sessions per day and the number of sessions per day was 1.3[23].

As for Study 6, it used a care program that worked at 3 different levels. The first level consisted of the application of a ventilatory weaning protocol in which progressively longer periods of spontaneous breathing were performed. The second level of intervention refers to physical training, in which pedaling and resistance training were performed 6 times a week, with at least 15 sessions. The intensity and duration of pedaling were progressively increased (maximum of 30 minutes twice a day), as well as active-resisted mobilizations (maximum of 2 sets of 10 repetitions and loads from 100g to 500g). The third level of action consisted of evaluating nutritional support taking into account the duration of the physiotherapy session[24].

Regarding Study 1, several interventions were described, but there was no reference to the frequency, volume, intensity or duration of the modalities performed[19].

Regarding the use of the verticalization table (Study 7), it was used on the first day up to 60º and on the second and remaining days up to 90º, as described in table 3. Vital parameters, Glasgow comas scale, Richmond Agitation Sedation Scale and the assessment of expiratory minute volume, tidal volume, rapid and shallow breathing index, and maximum inspiratory and expiratory peak pressure were evaluated at different degrees of inclination. On average 5.2 days of this protocol were performed. It should also be noted that the administration of vasopressor therapy was an exclusion criterion in the selection of participants[25].

Study 8 aimed to demonstrate the benefits of passive mobilizations with the use of the arthromotor. This intervention was performed once for 20 minutes at an intensity of 20 flexions/extensions per minute (flexion from 5º to 70º). Before starting this intervention, the person remained at rest for 30 minutes. At the end of the rest period, several parameters such as heart rate, mean arterial pressure, oxygen saturation, intracranial pressure, cerebral perfusion pressure and the Behavioral Pain Scale were evaluated. These vital parameters were evaluated 5 and 10 minutes after the beginning of the intervention and, after the end of the intervention, there was a 60-minute rest period and vital parameters were evaluated again[26].

Benefits

The gain in people's functional capacity was described by several studies through the application of several instruments, namely the Medical Research Council muscle strength scale and Kendall scale, Manchester Mobility Score, sitting balance test according to Stolov's criteria, Barthel Index, Functional Independence Measure and also in the ability to perform activities of daily living, demonstrating improvement in these parameters in the intervention group[21, 23, 24, 27]. On the other hand, a greater degree of dependence on activities of daily living was associated with a worse clinical outcome[24]. Studies have shown that early mobilization led to a decrease in the number of days of stay in the ICU and hospital admissions and to a reduction in morbidity and mortality[19,21-24,27]. These indicators of improvement in functional capacity, as well as the shortening of hospital stay days, translate into gains in health, for people and institutions, representing an important saving in resources.

Regarding respiratory function, studies have shown that there was a reduction in the number of days under IMV, an increase in maximum inspiratory pressure, a 50% reduction in endotracheal re-intubations due to airway complications, and another study reported that after the intervention was performed, people were extubated immediately due to the improved level of consciousness that the intervention provided[21-23, 24, 25, 27].

Implementing early mobilization in people undergoing IMV reduced the occurrence of ventilator-associated pneumonia, pulmonary and vascular complications, deep vein thrombosis, and pressure ulcers[20, 22]. These obtained results contributed to a significant change in the mindset of nurses involved in a study, noting the importance of early mobilization and that this can be done safely[22].

Other important benefits reported in the studies under analysis were the improvement in the level of consciousness through placing people in an orthostatic position using the verticalization table, explained by the increase in sensory stimulation, and the improvement in comfort during the performance of passive mobilizations. This comfort may last for 60 minutes after the intervention[25, 26].

All studies under analysis demonstrated numerous benefits of applying early mobilization to people in critical situations. These data obtained demonstrated health gains, both for the person and at the institutional level. Since the current policy is based on cost optimization in our National Health System, the application of early mobilization in intensive care units could have a significant impact.

Safety

In current clinical practice, patient safety has emerged as a key element in healthcare. The person hospitalized in the ICU is subject to several conditions that may increase the risk of carrying out early mobilization, as this may result in hemodynamic and ventilatory instability, accidental extubation or exteriorization of other medical devices. According to the studies, the implementation of early mobilization interventions is safe, with no reference to the occurrence of adverse events[19, 20, 22, 24, 25].

Hemodynamic and ventilatory stability was considered an essential criteria for the implementation of early mobilization. The use of the verticalization table and passive mobilizations did not reveal physiological changes that could interrupt its execution[25, 26]. The administration of vasopressor therapy was not always an impediment to early mobilization[21,26]. In one of the studies, vasopressor therapy was considered an exclusion criteria[25] and in other studies it was considered an absolute or relative contraindication, depending on the dose administered, thus adapting the type of intervention to which those patients were subjected[20, 22, 23].

If early mobilization is properly implemented through the use of protocols, continuous monitoring of hemodynamic and ventilatory parameters is ensured and appropriate interventions are identified to overcome the barriers that may exist, early mobilization is safe for people and the risk of their application in daily practice is minimal, corroborated by the opinion of those authors. On the other hand, the training of the multidisciplinary team on the early mobilization of the person undergoing invasive mechanical ventilation is essential for them to be properly informed and prepared for its implementation. All these factors are fundamental to guaranteeing people's safety.

Barriers to early mobilization

The main barriers identified that prevented early mobilization were sedation and endotracheal intubation[19]. The use of protocols allowing an adequate management of the level of sedation, as well as the need for appropriate analgesia and management of delirium, are essential components for the person's ability to mobilize early and to cooperate with the future interventions[28]. High levels of sedation make it impossible for the person to mobilize actively or out of bed, but they do not impede passive mobilizations, according to early mobilization protocols used in several studies[22, 23, 25, 26]. Some studies have changed sedation practices in order to reduce the impact of this barrier on early mobilization[20, 22]. With regard to endotracheal intubation, it is reported as a barrier to early mobilization due to the increased risk of extubation. One of the studies overcame this barrier through the acquisition of reinforcement devices for the fixation of endotracheal tubes[20]. In addition to the risk of extubation, the exteriorization of other medical devices such as arterial and central venous catheters have also been described as restrictive factors for early mobilization[19, 20, 22].

Hemodynamic and ventilatory stability is a fundamental component for early mobilization. If the person does not have adequate cardiovascular and respiratory reserve, it can influence the evolution of the early mobilization process[28]. Due to this fact, factors such as the need for high inspiratory oxygen fractions, high respiratory rates and unstable values of blood pressure or heart rate were considered exclusion criteria for early mobilization[19, 21-26]. The administration of vasopressors[19] was sometimes considered an exclusion criterion[25] or an absolute or relative contraindication, depending on the dosage administered, thus making it necessary to adjust the type of intervention to be carried out[20, 22, 23].

Mobilizing the person in critical condition, connected to several medical devices and in need of continuous hemodynamic and ventilatory monitoring, requires countless material and human resources, essentially when mobilization outside the bed is necessary. The need to strengthen human and material resources for the implementation of early mobilization protocols was confirmed by several studies, and these are not additional barriers in their implementation[20, 22, 23]. The involvement of the multidisciplinary team (doctor, specialist nurse in rehabilitation nursing, nurse, and physiotherapist) is essential for this practice to be effectively implemented.

Frailties of the studies

We would like to point out that some studies had a reduced number of participants[20, 21, 24-26], as well as the short duration of some studies, which could jeopardize the benefits obtained through the interventions carried out[25, 26].

Some studies, despite describing the modalities performed, do not specify their frequency, intensity, volume and duration. This information is essential to determine its impact on the results obtained[19, 22, 23]. Only 2 studies addressed the ventilatory component by performing breathing exercises or using a ventilatory weaning protocol[21,24]. It should also be noted that only one study took into account the assessment of people's caloric needs, which is an important factor to take into account in the person's ability to carry out interventions[24].

In most of the studies analyzed, there is no reference to the presence of specialist nurses in rehabilitation. The exercises performed were essentially performed by the physiotherapists, what we consider a limitation of this study, as the aim of the study was to analyze the rehabilitation nursing interventions, in addition to describing the benefits of mobilization, the latter fact having been achieved.

Practical implications and for future investigations

The use of early mobilization protocols is one of the strategies used by the multidisciplinary team to facilitate the progression of mobility gains during

people's hospitalization, as well as ensuring greater safety in the care provided to people[28]. We found that the use of a structured protocol is extremely important, in order to provide early uniformed mobilization for people in critical situations, with the aim of combating immobility and its sequelae[20-23].

The identification of barriers that make early mobilization impossible is essential for this to be a consolidated practice in intensive care units. Some studies used a quality improvement model to implement early mobilization protocols, identified barriers to their implementation, trained a multidisciplinary team, and identified appropriate interventions to overcome the identified barriers, so that they would not impede their implementation[20, 22].

Some studies were not exhaustive regarding the frequency, intensity, volume and duration of interventions performed, referring only to the different interventions performed. To better determine the impact of early mobilization interventions on the results obtained, further detailing these parameters is essential[19, 22, 23].

The use of protocols, the promotion of a culture of early mobilization, the training of a multidisciplinary team and the identification of barriers, as well as the appropriate interventions to overcome them, are fundamental issues for professionals to be more trained and aware, leading to a effective dissemination of early mobilization in the ICU.

Study limitations

Regarding the present review, this presents conditionings that can be considered as limitations, since only studies in Portuguese, English and Spanish, full-text articles, freely accessible and within a time frame of January 2010 and September 2018, were included in the research. Still as a limitation, we would like to mention the use of a reduced number of databases.

CONCLUSION

Early mobilization has been reported as a necessary and essential intervention in the daily practice of caring for people in critical situations, being a determining factor in their recovery. Through the analysis of the 9 studies included, we found that early mobilization leads to an improvement in functional capacity, decreases the time on IMV and reduces the occurrence of various complications. Consequently, it will lead to a reduction in the number of days spent in the ICU and hospital stay, reduces morbidity, mortality and the number of readmissions. All of this indicates that interventions for early mobilization of people in critical situations have a direct influence on short and long-term recovery, that is, intra-hospital and after hospital discharge, bringing countless health gains.

We believe that early mobilization in people undergoing IMV, and in critically ill people in general, is endowed with benefits that can be performed safely, with a minimum report of adverse events. The lack of training and action protocols was identified as the biggest gap in adherence to this practice, which is why we consider essential the creation of protocols for the implementation of these therapeutic measures.

The Specialist Rehabilitation Nurse plays a decisive role regarding the early mobilization carried out in the ICU. This should be considered a disseminator and promoter of a culture of early mobilization. With regard to this topic, there is a lack of studies carried out by nurses holding this specialty, which may be associated with the fact that they do not exercise their specific skills in intensive care units, which we consider a limitation of this integrative review.

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