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IMPACTO DOS PROGRAMAS DE MOBILIZAÇÃO PROGRESSIVA PRECOCE NO DOENTE CRÍTICO: REVISÃO SISTEMÁTICA DA LITERATURA

*EFFECTS OF EARLY PROGRESSIVE MOBILISATION PROGRAMMES IN CRITICALLY ILL PATIENTS:
A SYSTEMATIC REVIEW OF THE LITERATURE*

*EFFECTOS DE LOS PROGRAMAS DE MOVILIZACIÓN PROGRESIVA TEMPRANA EN PACIENTES
CRÍTICOS: UNA REVISIÓN SISTEMÁTICA DE LA LITERATURA*

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RESUMO

Objetivo: Conhecer o efeito dos programas de mobilização progressiva precoce nos resultados do doente crítico.

Métodos: Revisão sistemática, com recurso às bases de dados MEDLINE, CINAHL, CENTRAL, PEDro, Clinical Trials.gov, WHO International Clinical Trials Registry Platform e EU Clinical Trials Register.

Resultados: Do total de 813 publicações identificadas, 18 cumpriam os critérios de inclusão e foram incluídas nesta revisão. Verificou-se que estes programas estão relacionados com: redução do tempo de ventilação, redução do tempo de internamento em cuidados intensivos, menor probabilidade de readmissão e maior funcionalidade à alta dos cuidados intensivos. Parece verificar-se uma tendência para redução das infeções e maior probabilidade de alta para o domicílio. Não foram encontrados desfechos negativos.

Conclusões: Os programas de mobilização progressiva precoce, além de seguros, parecem trazer benefícios importantes ao doente crítico, reforçando a importância de intervir nesta área.

Descritores: Unidade de Terapia Intensiva; Estado Terminal; Reabilitação; Deambulação Precoce; Melhoria de Qualidade.

ABSTRACT

Objective: To know the effect of early progressive mobilization programs on the critically ill patients' outcomes.

Methods: Systematic review using MEDLINE, CINAHL, CENTRAL, PEDro, Clinical Trials.gov, WHO International Clinical Trials Registry Platform and EU Clinical Trials Register databases.

Results: Of the total 813 publications identified, 18 met the inclusion criteria and were included in this review. These programs were found to be related to: reduced ventilation time, reduced intensive care length of stay, reduced likelihood of readmission and increased functionality at discharge from intensive care. There seems to be a trend towards a reduction of infections and a higher probability of discharge to home. No negative outcomes were found.

Conclusions: In addition to being safe, early progressive mobilization programs may bring important benefits to critically ill patients, thus reinforcing the importance of intervention in this area.

Descriptors: Intensive Care Units; Critical Illness; Rehabilitation; Early Ambulation; Quality Improvement.

RESUMEN

Objetivo: Conocer el efecto de los programas de movilización progresiva precoz en los resultados de los pacientes críticos.

Métodos: Revisión sistemática utilizando las bases de datos MEDLINE, CINAHL, CENTRAL,

PE德罗, Clinical Trials.gov, WHO International Clinical Trials Registry Platform y EU Clinical Trials Register.

Resultados: Del total de 813 publicaciones identificadas, 18 cumplieron los criterios de inclusión y se incluyeron en esta revisión. Se comprobó que estos programas estaban relacionados con: reducción del tiempo de ventilación, reducción de la duración de la estancia en cuidados intensivos, reducción de la probabilidad de reingreso y aumento de la funcionalidad al alta de cuidados intensivos. Parece haber una tendencia a la reducción de las infecciones y una mayor probabilidad de alta a domicilio. No se encontraron resultados negativos.

Conclusiones: Además de ser seguros, los programas de movilización progresiva precoz parecen aportar importantes beneficios a los pacientes críticos, lo que refuerza la importancia de la intervención en este ámbito.

Descriptorios: Unidades de Cuidados Intensivos; Enfermedad Crítica; Rehabilitación; Ambulación Precoz; Mejoramiento de la Calidad.

INTRODUCTION

Prolonged immobility in bed is often related to critical illness and admission to an Intensive Care Unit (ICU). If in a person without critical illness, immobility has harmful consequences at various levels⁽¹⁾, in critically ill patients, these effects are potentiated by factors such as: multiorgan failure, mechanical ventilation, drugs (corticosteroids and muscle blockers), inflammatory cytokines and high catabolism, contributing to the development of generalized muscle weakness, which conditions the patient's recovery and discharge⁽²⁾. In addition to physical weakness, prolonged ICU stay is also associated with states of psychosocial weakness, compromising the future quality of life and hindering the social and professional reintegration of these patients, constituting the so-called post-intensive care syndrome⁽³⁻⁵⁾. By definition, this syndrome refers to the impairment, new or worsening, of the physical, cognitive or mental condition, which occurs after critical illness and persists after discharge from the intensive care unit⁽⁶⁾.

In this sense, Bundle ABCDEF was developed, which includes the following intervention bundles: pain assessment, prevention and treatment (A); coordination of awakening with spontaneous ventilation training (B); choice of sedation and analgesia (C); evaluation, prevention and treatment of delirium (D); early mobilization and rehabilitation (E); and family involvement and empowerment (F)^(7,8).

Although all bundles are important, in the context of rehabilitation nursing, mobilization and early rehabilitation are of particular interest. In this regard, the European Respiratory Society and the European Society of Intensive Care Medicine tell us that active or passive mobilization and muscle training should be instituted early and that techniques such as positioning, passive mobilization and muscle stretching should be used to preserve joint mobility and skeletal muscle length in patients unable to move spontaneously⁽⁹⁾. The German Society of Anesthesiology and Intensive Care adds that, in principle, early mobilization should be performed in all patients treated in intensive care, to whom exclusion criteria do not apply and that treatment should begin no later than 72 hours after admission to intensive care and be performed twice a day

with a duration of at least 20 minutes. It also recommends that mobilization be gradual and suggests the development of a specific algorithm for a unit or hospital⁽¹⁰⁾.

Despite the apparent benefits of early mobilization, a meta-analysis carried out in 2015⁽¹¹⁾ concluded that although early rehabilitation allows more patients to be discharged from the hospital independently, it does not offer proven benefits in the duration of mechanical ventilation, in the length of stay in the ICU or in the length of hospitalization, in the improvement of functionality, muscle strength or quality of life. Likewise, another systematic review, published in 2018⁽¹²⁾, mentions that there is not enough evidence of the effect of early mobilization on functionality, muscle strength, quality of life or the occurrence of adverse events. In opposition, another systematic review reinforced the benefits of an early mobilization program in respiratory and peripheral muscle strength, in the reduction of mechanical ventilation time and length of stay in patients mobilized early⁽¹³⁾.

Two other systematic reviews with meta-analysis, published in 2019, observed that patients mobilized early showed a reduction in hospital stay, increased muscle strength⁽¹⁴⁾, increased number of days free of ventilation, increased independent walking distance to hospital discharge and increased probability of discharge to home⁽¹⁵⁾. Although there are no significant differences in hospital mortality, mortality and adverse effects slightly increase in cases of early mobilization^(14,15). There were also no differences in terms of quality of life⁽¹⁴⁾.

As confirmed, this is still an open topic with inconsistent results for most outcomes. The cited reviews included different forms of mobilization (cycle ergometer, transcutaneous electrical neurostimulation and early rise, for example) which could have an influence on their results. Despite protocols or early progressive mobilization programs being more and more a reality^(16,17), and in previous research to this review, there is no synthesis of its possible benefits in the literature. In addition, the existing reviews are mainly focused on randomized studies, which are more robust but fewer in number, excluding a significant number of studies of less scientific relevance, such as analyzing quality improvement programs, but which gather a set of information that cannot be neglected.

Thus this review is necessary, which aims to: know the effect of early progressive mobilization programs on critically ill patients outcomes. The starting point for this investigation was: What is the effect of early progressive mobilization program, on critically ill patient outcomes, compared to the usual treatment. These mobilization programs or protocols should have several phases, tailored to the patient's condition, and should aim to progress to out-of-bed mobilization and active ambulation. Results were compared with groups with no intervention or under usual care, including their usual physical therapy regimen.

This review is the first to specifically address this type of program. In addition, by including several research designs, namely results from the implementation of quality improvement projects, it allows to gather many studies that do not integrate the previous reviews on the subject. By encompassing an important number of variables, or health outcomes, it constitutes an important synthesis of current knowledge on the subject.

This systematic review of the literature followed the Cochrane principles⁽¹⁸⁾, in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)⁽¹⁹⁾ and is registered in the international prospective register of systematic reviews (www.crd.york.ac.uk/prospero) with number CRD42020162101.

METHODOLOGY

RESEARCH STRATEGY AND SELECTION OF STUDIES

The research strategy obeyed the key concepts defined by the following PICO model(18):

- **Population** – Adult patients, aged 18 or older, admitted to the ICU, regardless of disease or severity;
- **Intervention** - Early progressive mobilization programs (or protocols) aimed at out-of-bed mobilization and active ambulation, regardless of provider. These programs must have several phases adjusted to the patient's condition;
- **Comparator** - No intervention or usual care (includes usual physiotherapy regimen);
- **Outcomes** – Mortality, duration of mechanical ventilation, ICU length of stay, number of readmissions, length of hospital stay (primary outputs), functionality at ICU discharge, muscle strength at ICU discharge, proportion of discharges to home, incidence of infections in the ICU, incidence of pressure ulcers in the ICU, incidence of thromboembolic events in the ICU (secondary outcomes).

The research was carried out, on January 20, 2022, in the databases PubMed (MEDLINE), Cumulative Index of Nursing and Allied Health (CINAHL), Cochrane Central Register of Controlled Trials (CENTRAL), Physiotherapy Evidence Database (PEDro), Clinical Trials.gov, WHO International Clinical Trials Registry Platform and EU Clinical Trials Register.

Table 1 - Research strategy

Database		Expression	Results
MEDLINE	#1	("Early Ambulation"[Mesh]) OR ("walking"[Mesh]) OR ("mobili*"[Title/Abstract])	270 997
	#2	("Intensive Care Units"[Mesh]) OR ("Critical Care"[Mesh]) OR ("Critical Illness"[Mesh])	140 507
	#3	#1 AND #2	1 139
CINAHL (via EbscoHost)	#1	MW Early Ambulation OR MW walking OR AB mobili*	51 182
	#2	MW Intensive Care Units OR MW Critical Care OR MW Critical Illness	88 816
	#3	#1 AND #2	863
CENTRAL (via EbscoHost)	#1	MW Early Ambulation OR MW walking OR AB mobili*	18 266
	#2	MW Intensive Care Units OR MW Critical Care OR MW Critical Illness	5 243
	#3	#1 AND #2	84
PEDro		Critical care AND mobility	14
Clinical Trials. gov	#1	Early Ambulation OR walking OR mobility	18 135
	#2	Intensive Care Units OR Critical Care OR Critical Illness	7 775
	#3	#1 AND #2	411
WHO Interna- tional Clinical Trials Registry Platform	#1	(Early Ambulation) OR (walking) OR (mobili*)	7 349
	#2	(Intensive Care Units) OR (Critical Care) OR (Critical Illness)	7 076
	#3	#1 AND #2	129
EU Clinical Trials Register	#1	(Early Ambulation) OR (walking) OR (mobili*)	757
	#2	(Intensive Care Units) OR (Critical Care) OR (Critical Illness)	222
	#3	#1 AND #2	8

The terms “*early ambulation*”, “*walking*” or “*mobility*” were searched, combined with “*intensive care units*”, “*critical care*” or “*critical illness*”, according to the strategy presented in table 1.

In order to gather as much information as possible, this review, in addition to including randomized studies, also included quasi-experimental, case-control and cohort studies (including quality improvement programs with before and after design) published in English, Spanish and Portuguese. An analysis period of 15 years prior to the research was defined, including studies published between 2004 and 2019, in order to include articles that may have been the basis of current recommendations for early mobilization.

Clinical cases, systematic reviews, review articles and any studies that analyzed the effect of mobilization programs in conjunction with other interventions (e.g. ABCDE bundle) were excluded. After eliminating duplicate articles through the Mendeley program, two

independent reviewers used the Rayyan application to analyze the title and abstract of the articles. The same reviewers subsequently analyzed the full text of articles that passed the first review phase to decide whether they met the defined criteria. The data relating to the studies to be included in the review were extracted into an Excel that also served as the basis for the risk of bias analysis of each one of them. Disagreements were resolved by discussion between reviewers.

RESULTS

The search strategy resulted in 813 publications, 49 of which were selected for full-text analysis, of which 18 were included in this review (Figure 1).

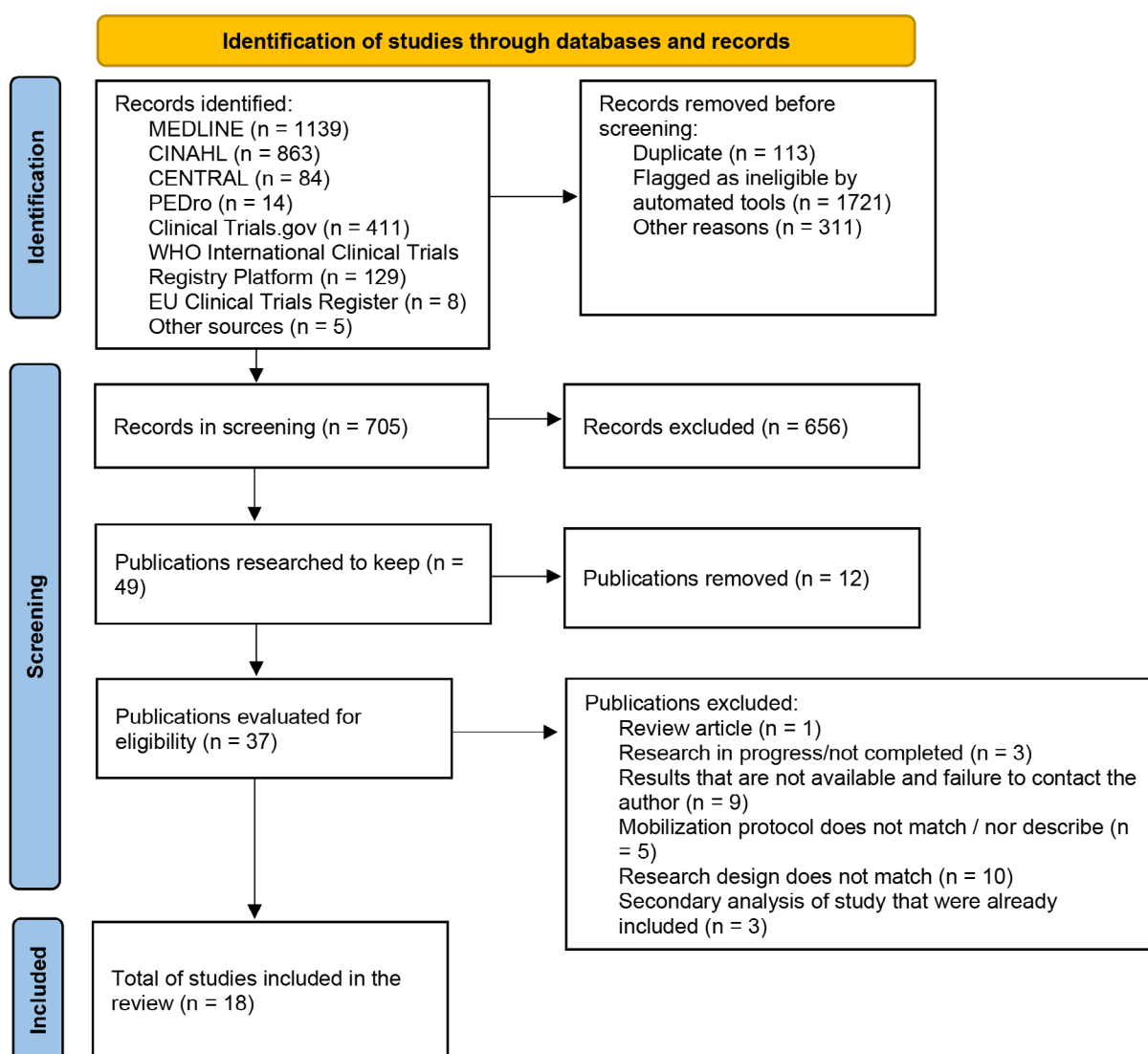


Figure 1 - PRISMA research flowchart

CHARACTERISTICS OF THE STUDIES

Of the 18 studies included in the review (20–37) (Table 1), 3 are randomized controlled trials (RCTs) and 15 are observational studies. Many of these observational studies are related to quality improvement programs and use a design that assesses patients before and after implementation of the early mobilization program. It should be noted that 15 of the 18 studies included in the review result from data collected in the United States of America (USA) and that only one includes data collected in Europe.

Table 1 Characteristics of the studies included in the review

Author (year)	Country	Type of study	Type of UCI	Sample size
Azuh et al (2016) (20)	USA	Prospective cohort with historical control	medical ICU	
Bahouth et al (2018) (21)	USA	Quasi-experimental study	neurotrauma ICU	Pre: 27 Post: 29
Booth et al (2016)(22)		Prospective cohort with historical control	Neurocritical ICU	Pre:184 Post:159
Clark et al (2013) (23)	USA	Retrospective cohort	ICU for trauma and burns	Pre: 1044 Post:1132
Crane (2017) (24)	USA	Quasi-experimental study	Medical-surgical ICU	Pre: 115 Post: 29
Dickinson et al (2013) (25)	USA	Retrospective cohort	Surgical ICU	Pre: 555 Post: 557
Floyd et al (2016) (26)	USA	Retrospective cohort	cardiothoracic ICU	Pre: 30 Post: 30
Fraser et al (2015) (27)	USA	Retrospective cohort	3 ICU (medical, surgical and coronary)	Pre: 66 Post: 66
Hodgson et al (2016) (28)	Australia and New Zealand	RCT	5 ICU (surgical and trauma medicine)	Int: 29 Ctrl: 21
Klein et al (2015) (29)	USA	Quasi-experimental study	Neurocritical ICU	Pre: 260 Post: 337
Lai et al (2017) (30)	Taiwan	Retrospective cohort	medical ICU	Pre: 63 Post: 90
Liu et al (2019) (31)	Japan	Retrospective cohort	Medical-surgical ICU	Pre: 204 Post: 187
Mah et al (2013) (32)	USA	Prospective cohort with historical control	Surgical ICU	Pre: 31 Post: 28
Morris et al (2008) (33)	EUA	Prospective cohort	7 medical ICUs from the same IC service	Int: 165 Ctrl: 165
Ronnebaum et al (2012) (34)	USA	Retrospective cohort	Medical surgical ICU	Pre: 15 Post: 13

Author (year)	Country	Type of study	Type of UCI	Sample size
Schaller et al (2016) (35)	Austria, Germany and USA	RCT	Surgical UCI	Int: 104 Ctrl: 96
Schweickert et al (2009) (36)	USA	RCT	medical ICU	Int: 49 Ctrl: 55
Winkelman et al (2012)(37)	USA	Quasi-experimental study	Medical ICU and surgical ICU	Pre: 20 Post: 55

USA– The United States of America; RCT – Randomized clinical trial; Int – Intervention group; Ctrl – Control Group; Pre – Pre-intervention group (control); Post – Post-intervention group (intervention); ICU - Intensive Care Unit

QUALITY AND RISK OF BIAS

The evaluation of the methodological quality and the risk of bias of the studies included in the review was independently performed by two researchers, using the criteria of the Newcastle-Ottawa Scale (NOS - Newcastle-Ottawa Scale)⁽³⁸⁾ for cohort studies (Table 3) and Risk of Bias 2 (RoB 2)⁽³⁹⁾ for randomized trials (Figure 2). Disagreement cases were resolved by discussion between the two evaluators.

Table 2 - Assessment of the Newcastle-Ottawa Scale for cohort studies

Author (year)	Selection	Comparability	Results	TOTAL
Azuh et al (2016) (20)	*	**	**	5
Bahouth et al (2018) (21)	**	**	**	6
Booth et al (2016)(22)	*	**	**	5
Clark et al (2012) (23)	***	**	***	8
Crane et al (2017) (24)	**		***	5
Dickinson et al (2013) (25)	***	**	***	8
Floyd et al (2016) (26)	***	**	***	8
Fraser et al (2015) (27)	***	**	***	8
Klein et al (2015) (29)	***	**	***	8
Lai et al (2017) (30)	**	**	**	6
Liu et al (2019) (31)	***	**	**	7
Mah et al (2013) (32)	***	**	**	7
Morris et al (2008) (33)	**	**	**	6
Ronnebaum et al (2012) (34)	**		**	4
Winkelman et al (2012)(37)	**	**	**	6

	<u>D1</u>	<u>D2</u>	<u>D3</u>	<u>D4</u>	<u>D5</u>	<u>Overall</u>
Hodgson et al (2016)	+	+	+	+	+	+
Schaller et al (2016)	+	+	+	+	+	+
Schweickert et al (2009)	+	+	+	+	+	+

D1 - Randomisation process

D2 - Deviations from the intended interventions

D3 - Missing outcome data

D4 - Measurement of the outcome

D5 - Selection of the reported result



Low risk



Some concerns



High risk

Figure 2 - Evaluation of Risk of Bias 2 (RoB 2)

Table 4 - Comparison of the results of early progressive mobilization programs

Author (year)	Mortality		T. of ventilation		T. of ICU		Readmission		Hospital Length		unc. ICU discharge		Discharge to home		fraction in the IC		PU in the ICU		Thromboembolism	
	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.	Mob.	Ctrl.
Azuhi et al (2016) (20)			10.7	11.7			11.3%*	17.1%**							6.1%*	9.2%*				
Balhouth et al (2018) (21)	24% (H)	4% (H)	6,1	4,5	11,3	11			38%	43%										
Booth et al (2016) (22)	15.1%	14.7%	6.5	7.41	5.68	6.52			9.85	13.63										
Clark et al (2013) (23)	11.8%	13.2%	7.8	8.9	10.4	11			16.8*	19.2*										
Crane (2017) (24)	17.2%	12.2%	5.03	7.97	5.76	3.97			8.58	7.73										
Dickinson et al (2013) (25)			6.16**	4.02**	16.59**	13.78**														
Floyd et al (2016) (26)			2.6	2.6	6.53	8.6	1	3	heart patients											
Fraser et al (2015) (27)	0 (H)	14% (H)	3.8	3.3	6.4	6.5	10.6%*	22.7%**	12.6	10.6										
Hodgson et al (2016) (28)	7%	5%	5.4	7	9	11			19	29										
Klein et al (2015) (29)	12% (30d)	16.5% (30d)	4.3**	7.8**	10.2**	15.2**														
Lai et al (2017) (30)			4.7**	7.5**	6.9**	9.9**			24	19.2										
Liu et al (2019) (31)	11%** (H)	24%** (H)	3**	5**	5.4**	6.5**			25.4	32.6										
Mah et al (2013) (32)			16,5	13	18	22			46,5	36										
Morris et al (2008) (33)	12.1% (H)	18.2% (H)	7.9	9	7.6	8.1			14.9*	17.2*										
Ronnebaum et al (2012) (34)			14.5**	30.9**	13.3**	24.9**			46.2%	33.3%										
Schaller et al (2016) (35)	16% (H)	8% (H)	7**	10**	15*	21,5*			51%**	27%**										
Schweickert et al (2009) (36)	14% (H)	25% (H)	3,4*	6,1*	5,9**	7,9**			42,9%	23,6%										
Winkelmann et al (2012) (37)	9.1%	0	9.131	12.4	14.6*	19.6*			Katz index	MRC index										
									2.2	1.7	22.4	26								
									3.6%	0	5%	9.1%	20.0%	20%	10%					

* Value of test (p) < 0.05
 ** Value of test (p) < 0.01
 (H) Hospital mortality
 (30d) 30-day mortality
 T. of ventilation: Mean ventilation time (days); ICU: Intensive Care Unit; ICU T.: Mean length of stay in the ICU (days); Hospital length: Average length of hospital stay (days); Func. ICU discharge: Functionality at ICU discharge; Strength ICU discharge: Muscle strength at ICU discharge; PU in the ICU: Incidence rate of pressure ulcers in the ICU; Mob.: Early mobilization group; Ctrl.: Control group; DVT: Deep vein thrombosis; SOMs: Surgical intensive care unit optimal mobilisation score; mmFIM: Mini-modified functional independence measure score; MRC: Medical Research Council.

MORTALITY

Of the studies included in this review, 12 analyzed the topic mortality. Of these, five ones refer to ICU mortality^(22–24,28,37), six to in-hospital mortality^(20,27,31,33,35,36) and one presents 30-day mortality results⁽²⁹⁾.

Analyzing Table 4, it can be seen that mortality in the ICU varied between 0 and 17.2%, with no significant differences being verified between the group of patients undergoing the mobilization program and the control group. Still, of the five studies that analyzed mortality in the ICU, four reported slightly higher mortality rates in the mobilization group.

With regard to hospital mortality, it varied between 0 and 25%. Only in an analysis of the results of a quality improvement project through the implementation of a progressive mobilization protocol⁽³¹⁾, a significant reduction in hospital mortality was identified in patients submitted to the early mobilization program (11 vs 24%, $p < 0,01$). In three studies^(21,27,35) hospital mortality was higher in the mobilization group and in another 3 it was higher in the control group^(31,33,36).

With regard to 30-day mortality⁽²⁹⁾, the mobilization group was 4.5% lower than the control group, although this difference cannot be considered significant ($p = 0.12$).

In none of the three RCTs under analysis^(28,35,36) there are significant differences in mortality between groups.

VENTILATION TIME

There are 12 articles that compare mean ventilation times between patients in an early mobilization program and usual treatment (Table 4). The mean ventilation times reported ranged between 3⁽³¹⁾ and 30.9⁽³⁴⁾ days, with no significant increase in ventilation time associated with the development of early progressive mobilization programs being verified in any of the studies analyzed. On the other hand, in 10 of the analyzed studies, there was a reduction in ventilation time in the early progressive mobilization group, in relation to the control group, with statistically significant difference in four of them^(30,31,34,36).

The two randomized studies that analyzed this outcome^(28,36) both show a reduction in ventilation time in the early mobilization group, but only in one⁽³⁶⁾ was this difference statistically significant.

ICU LENGTH OF STAY

The ICU length of stay presented by the different studies is quite heterogeneous, varying between 3.97⁽²⁴⁾ and 24.9⁽³⁴⁾ days.

In 15^(20,22,23,26–37) of the 18 studies analyzed (Table 4) there was a reduction in the length of stay in the group of patients included in the mobilization program, in relation to the control group. Of these, in seven studies this difference is statistically significant^(29–31,34–37). On the other hand, in three studies^(21,24,25) the group of patients included in the mobilization program had a longer hospital stay than the control group, although only in one⁽²⁵⁾ were these differences statistically significant.

In all three RCTs under analysis^(28,35,36) there was a reduction in the length of stay in the early mobilization group, compared to the control group, with this difference being statistically significant in one of the studies⁽³⁵⁾.

READMISSION IN ICU

The definition of readmission varies in the different studies analyzed, one of them refers to hospital readmission of critically ill patients⁽²⁰⁾, while the other two refer to readmission in the ICU within 30 days after discharge from that unit^(26,27). Despite this difference in concepts, in the three studies analyzed there is a reduction in the number of readmissions in the early mobilization group, with significant differences reported by two of them^(20,27).

LENGTH OF HOSPITAL STAY

The average length of hospital stay was quite heterogeneous in the different studies under analysis, varying between 6.5⁽²⁶⁾ and 46.5 days⁽³²⁾.

When the differences between groups were observed, it was also verified that the results are also heterogeneous. On the one hand, nine studies describe a reduction in the length of hospital stay in the early mobilization group^(22,23,26,28-31,33,35) and of these, four show significant differences in relation to the control group^(23,29,33,35). On the other hand, six studies^(21,24,25,27,36) report an increase in the length of hospital stay in the early mobilization group, although only one study⁽²⁵⁾ reports statistically significant difference.

Focusing the analysis on randomized studies^(28,35,36), the evidence remains inconsistent. Only one of the studies⁽³⁵⁾ reports a significant reduction in hospitalization time in patients mobilized early.

ICU HIGH FUNCTIONALITY

Functionality upon discharge from the ICU, in addition to not being a frequently analyzed outcome, was measured in different ways in the various investigations that included it.

When evaluating the functionality through the Barthel index⁽²⁷⁾, significantly better results were verified in the group of patients mobilized early (85 vs 63 points, with $p < 0.001$). It was also found that more patients in the early mobilization group improved their sitting balance, from a first assessment to discharge (75% vs 36.7%, with $p = 0.008$)⁽³²⁾.

In the study that evaluated functionality through the Katz index⁽³⁷⁾, there was also better functionality at discharge in the early mobilization group, however the differences were not statistically significant.

Regarding the only RCT that evaluated this outcome⁽³⁵⁾, it was found that significantly more patients in the intervention group achieved the ability to walk, which corresponds to a score on the SOMS scale (*Surgical intensive care unit Optimal Mobilization Score*) equal to or greater than a 4 (52% vs 25%, with $p < 0.001$) and that, on average, the levels of functionality at discharge, assessed by the mmFIM scale (mini-modified functional independence measure score) were significantly higher in patients included in the mobilization group early, a difference also observed by the authors at the time of hospital discharge.

In common, all studies identify functional improvements in the early mobilization group, in relation to the control.

MUSCLE STRENGTH AT ICU DISCHARGE

Only one of the studies included in this review⁽³⁷⁾ evaluated muscle strength at ICU discharge. For this purpose, the MRC Index was used from the bilateral evaluation of four muscle groups, in which strength was scored from 0 to 5, with a final score variable between 0 and 40. The average score did not show significant differences between the groups. of early mobilization (22.4 points) and the control (26 points), with $p=0.643$.

DISCHARGE TO HOME

Of the 11 studies included in the analysis, only one⁽³⁷⁾ analyzed the destination for discharge from the ICU and not the destination for hospital discharge like the other investigations. Comparing the intervention groups with the respective controls, we found that in most studies the number of patients discharged home is greater in the early mobilization group, with two studies^(29,35) reporting significant differences.

INCIDENCE OF ICU-ACQUIRED INFECTIONS

The articles included in this review, all of them using non-randomized groups, analyze possible effects of early mobilization on the incidence of the following infections: pneumonia^(22,23,33), ventilator-associated pneumonia^(29,37), urinary catheter-associated infection⁽²⁷⁾, bloodstream infection⁽²⁹⁾ and sepsis⁽²³⁾. In all areas analyzed, the early mobilization group had a lower rate of infection compared to the control group, with significant differences in the incidence of pneumonia⁽²³⁾, urinary catheter-associated infection⁽²⁷⁾ and bloodstream infections⁽²⁹⁾.

INCIDENCE OF PRESSURE ULCERS

The incidence of pressure ulcers (PU) was an outcome evaluated in seven of the investigations included in this review, all of them non-randomized. Of these, four studies^(20,27,29,37) report a reduction in the incidence of PU in the early mobilization group, and two of them^(20,29) identify significant differences in relation to the control group. In addition, an article⁽²⁷⁾ mentions a significant reduction in “quality outcomes” (which include: falls, ventilator-associated events, PU and urinary catheter-associated infections).

Otherwise, three studies^(23,25,26) refer to an increase in the incidence of PU in the group of patients mobilized early, and one of them⁽²⁵⁾ identifies a significant increase in relation to patients in the control group.

INCIDENCE OF THROMBOEMBOLIC PHENOMENA

Of the studies included in this review, six analyzed the incidence of thromboembolic phenomena, all of them non-randomized. Some studies analyzed thromboembolic events as a whole^(22,37), others analyzed the incidence of deep venous thrombosis and pulmonary embolism separately^(26,33), and other studies analyzed only the incidence of deep venous thrombosis^(23,29).

From the analysis of the results, three studies that report a non-significant increase in thromboembolic events^(29,33,37) and three that report a reduction^(22,23,26). In two cases^(22,23) there were statistically significant differences, both favoring the early mobilization group.

DISCUSSION

If in the beginning of this review the benefits of early mobilization programs for critically ill patients were not clear, we have found in this article that programs can contribute to reducing ventilation time; reduction in the ICU length of stay; greater functionality at ICU discharge, regardless of the assessment instrument used. Although further research is needed, there also seems to be a trend towards increased likelihood of discharge to home, reduced readmissions and reduced ICU-acquired infections, namely urinary catheter-associated infections and bloodstream infections. No negative outcomes were found, which supports the idea that it is a safe practice, as long as it is adequate to the condition of each patient and the existing recommendations⁽⁴⁰⁾.

Regarding ventilation time, the results of this review are in line with other reviews, which, although including different forms of mobilization and only RCTs, reached identical conclusions^(11,41). Also, a meta-analysis conducted by Wang, in 2020⁽⁴²⁾, including different mobilization strategies and only RCT, shows a significant reduction in ventilation time in patients mobilized early.

The ICU length of stay is also an outcome included in other reviews, which tend to identify reductions without statistical significance^(11,15,41,43,44). Once again Wang⁽⁴²⁾, including a larger number of studies in his meta-analysis, manages to show an important reduction in the length of stay in the ICU in patients mobilized early.

With regard to functionality, two reviews consulted^(11,12) cite only one study⁽³⁶⁾ demonstrating significant improvements in the early mobilization group, but at hospital discharge and not at ICU discharge, as advocated in this review. Only the meta-analysis by Wang⁽⁴²⁾ analyzed this outcome, reporting a significant increase in the Barthel index in the early mobilization group.

Two RCT reviews, both with meta-analysis, support the increase in home discharges in patients mobilized early^(41,45). Readmission was not considered in any other review consulted.

With regard to infections acquired in the ICU, the meta-analysis by Wang⁽⁴²⁾ once again supports the results of this review, showing a significant reduction in the risk of ventilator-associated pneumonia in the group of patients undergoing early mobilization.

In this review, some contradictory results were detected between the included studies, namely with regard to the effect of early progressive mobilization programs on the incidence of thromboembolic phenomena, PU and also their effects in terms of mortality and length of hospital stay. In comparison, the review with meta-analysis conducted by Wang⁽⁴²⁾ shows a significant reduction in the risk of deep venous thrombosis, in the incidence of PU and in the length of hospital stay, in patients mobilized early. With regard to mortality, it also does not identify significant differences between the groups. Still regarding the length of hospital stay, although in a meta-analysis involving patients after cardiac surgery⁽⁴⁴⁾ no significant differences were detected between the early mobilization group and the usual treatment, another meta-analysis⁽¹⁴⁾ reports a significant reduction in this outcome in patients who start

mobilization in the first week of ICU stay, reinforcing the importance of early mobilization.

Although the effect of early progressive mobilization programs on the muscle strength of patients at ICU discharge is not clear in this review, given that only one of the included studies reported this outcome, in the available literature, regarding early mobilization, its benefit in reducing generalized muscle weakness acquired in the ICU, especially in patients with longer hospital stays, usually associated with a significant incidence of this problem^(41,42). This is another outcome, which was not considered in this review and strictly related to early mobilization and the incidence of delirium, with mobilization considered a factor that contributed to the prevention of the occurrence of this phenomenon⁽⁴⁶⁾.

In view of these results, it is clear that there is a need to change mentality and assume mobilization as a priority in the care of critically ill patients. There will certainly be more or less barriers in each service ⁽⁴⁷⁻⁴⁹⁾, but nurses and in particular rehabilitation nursing specialists, as experts in this area, must develop or streamline early mobilization protocols. In the international literature, the mobility champion is referred to as someone who performs these functions^(50,51). Looking at the national reality, at the availability and competence of rehabilitation nurses in the ICUs^(52,53), they should assume themselves as champions of mobility in their units.

STUDY LIMITATIONS

This study had several limitations. First, the low proportion of randomized studies included in the analysis compared to observational studies. A significant number of historically controlled studies were included, and the results could be due to factors other than just the mobilization program. We also found discrepancies in the level of care provided to patients in the different control groups, which may give greater or lesser emphasis to the benefits of the program under analysis.

CONTRIBUTIONS TO THE AREA

When it is compared with other previous reviews, this research, in addition to presenting an update of knowledge, is innovative for it concretely analyzes the effect of early progressive mobilization programs. Previous reviews refer to early mobilization more broadly, including different forms of early mobilization or rehabilitation.

As it's evident in this article, early progressive mobilization programs are safe for patients, with no negative outcome resulting from their application.

The benefits found reinforce the importance of investing in this type of program and permanently change the paradigm of mobilization vs. immobilization of critically ill patients, where the rehabilitation nurse plays an important role. It is advisable to associate them with a wider range of interventions, such as the well-known ABCDEF bundle.

CONCLUSION

This review demonstrates the benefits of isolated early progressive mobilization programs in terms of reducing ventilation time and length of stay in intensive care. Patients included in these programs are also more functional at discharge and less likely to be readmitted. Allied to these benefits, no negative outcomes were found, reinforcing that this is a safe and beneficial practice.

In the complex care plan for critically ill patients, early mobilization should be included, preferably through a multidisciplinary program or protocol, consisting of several steps appropriate to their condition.

It is equally important to support this practice with results, which, in addition to making known what is done in each service, contribute to improving knowledge on this important topic.

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Investigation: RMGM

Methodology: RMGM; MLN; MCB

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