FUNCTIONAL IMPACT IN PATIENTS WITH ACUTE BRAIN INJURY

https://doi.org/10.56238/sevened2024.029-050

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ABSTRACT

Acute brain injury (ABI) affects about 100 million individuals annually, which interferes with the length of hospital stay of these individuals. The most visible complication of the hospital stay is ICU-acquired muscle weakness (FAUTI), which has a negative impact on functionality. The objective of this study was to observe the pattern of neurocritical individuals hospitalized in an adult intensive care unit, its relationship with the impact that the pathology has on strength and, respectively, on functionality. This is a cross-sectional, retrospective and descriptive research, with a quantitative approach, 41 medical records of individuals who were admitted between January and December 2022 at Hospital Regional do Baixo Amazonas Dr. Waldemar Penna (HRBA) were analyzed. In the study, it was observed through the IMS scale that the sample obtained a prevalence of score 3 (sitting by the bedside) in 25 individuals (61.0%), indicating a low level of functionality. However, when the mobilization protocols were initiated, the clinical outcome for these patients was discharge from the unit, even with the delay in the beginning of mobilization.

Keywords: Functionality. Muscle weakness. Early ambulation.

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INTRODUCTION

Acute brain injury (ABI) affects about 100 million individuals annually, and is named by the Seattle Consensus on Traumatic Brain Injuries (SIBICC) (2019) as a severe neurological and neurosurgical condition that can present as impairments of traumatic origins, pathologies linked to the brain or cerebrovascular diseases, with a predominance of cases of traumatic brain injury (TBI) and cerebrovascular accident (CVA). These injuries can result in a variety of neurological symptoms, such as loss of motor function, changes in consciousness, cognitive deficits, and other complications, depending on the area and severity of the brain injury, substantially affecting health and function, resulting in high mortality rates of the population (Frisvold et al., 2023; Hawryluk et al., 2019).

The length of hospital stay of neurocritical individuals is generally longer in the intensive care unit (ICU), they need support for several organ systems, favoring prolonged hospitalization (Ribeiro et al.; 2021). In this context, individuals with neuroinjury need constant monitoring and specific measures in order to avoid secondary injuries that progress over a certain period of time, this neuroprotection includes tools that measure intracranial pressure (ICP), blood oxygenation, and gas levels in the arterial bed, in addition to checking temperature as well as vital signs (Veldeman et al., 2021). There is also protective mechanical ventilation (MV) and care with the artificial airway, for those individuals in need of advanced ventilatory support and at risk of bronchial aspiration, this tool has a significant contribution in this scenario, since it makes it possible to adjust the level of carbon dioxide (CO^2) in blood plasma, which when dysregulated is extremely harmful to brain tissue (Asehnoune et al., 2023).

In the same way that controlled ventilation has its benefits for neuroprotection, its extended time may generate complications intrinsic to prolonged pressurization, which will include infections, the need for tracheostomy for weaning, immobility, among others. In this way, the MV time, when minimized, reduces the number of pulmonary, functional, and cognitive disorders (Feliciano et al., 2019).

Among the risks mentioned, immobility has a high incidence in individuals with ICA, where they have a significant reduction in the ability to move or respond to motor stimuli. This can be caused by damage to the areas of the brain responsible for motor control, such as the primary motor cortex, the premotor cortex, or the descending motor pathways. The most visible complication of the hospital stay is muscle weakness acquired in the ICU (FAUTI), which becomes noticeable after the first week of bed restriction and, combined with the use of sedatives and corticosteroids, atrophies muscle fibers in the various body segments. The estimated muscle loss is around 30%, caused by disuse, which contributes

negatively to the increase in the mortality rate and decreased mobility (Santos et al., 2017). There is a certain degree of difficulty in mobilizing individuals with this profile, given that in these cases sedation is done routinely, restricting the application of therapeutic exercises (Costa; silva; silva, 2020; Paiva et al., 2018). However, such measures, when implemented, prevent possible weaknesses and recover degrees of strength that are already absent, which influence the individual's hospitalization phase and post-hospital discharge (Feliciano, 2019).

In this context, the present study aims to observe the pattern of neurocritical individuals hospitalized in an adult intensive care unit, its relationship with the impact that the pathology employs on strength and respectively on functionality.

METHODOLOGY

The present study is based on a cross-sectional, retrospective and descriptive study, with a quantitative approach, with data collection from the medical records of neurocritical patients of an adult intensive care unit of both sexes, carried out at the Regional Hospital of Baixo Amazonas do Pará Dr. Waldemar Penna (HRBA). The collection was carried out during the year 2023 in the months of January and February and 41 medical records of individuals who were admitted in the period between January and December 2022 were analyzed. This study was submitted to the Research Ethics Committee (CEP) of the State University of Pará – Campus XXII – Tapajós (UEPA) with pacerer number 5,727,678 through attachment to Plataforma Brasil.

The inclusion criteria were medical records with information on neurocritical adult individuals (15-90 years) admitted to the ICU on mechanical ventilation with data on a minimum invasive ventilation time of 24 hours; individuals who were discharged improved or cured and also those whose final outcome was death. Considering that 41 medical records immersed in the collection period were evaluated, data related to age, diagnosis, clinical profile, sedation analgesia, functionality scale, sedation and agitation level scale, gait, dynamometry, mobilizations and outcome were noted in a specific protocol for research. The results were obtained using frequencies and percentages for the qualitative characteristics; measures of central tendency (mean and median) and measures of dispersion (standard deviation) for quantitative measures. The study adhered to the guidelines established in Resolution No. 466/12 CNS/CONEP, which regulates the conduct of research involving human beings. This legal regulation reinforces the importance of the ethical and moral principles inherent to research, including the guarantee of the anonymity of participants and the confidentiality of the information collected. In addition, the study

followed the provisions of the July 2017 Resolution, specifically article 2, which stipulates the commitment to maintain the confidentiality and privacy of research data, as well as the guarantee that such data will be used exclusively for the purposes of the study in question.

RESULTS

A total sample of 41 medical records of individuals admitted to the ICU was obtained. Table 01 showed a predominance of the age group of individuals between 50 and 59 years old (31.7% (p-0.0236). The cause of hospitalization with the highest incidence was oncological diagnosis (51.2%) (p-0.0005), cerebrovascular diseases with 43.9% and hypoxic ischemic encephalopathy with 4.9%.

Table 01 - Description of the characteristics and clinical conditions of the individuals

Sociodemographic profile and diagnosis	**N**	**%**	**p-value**
Age group			0.0236*
Under 20 years old	2	4,9%	
From 20 to 29 years old	5	12,2%	
From 30 to 39 years old	3	7,3%	
From 40 to 49 years old	6	14,6%	
From 50 to 59 years old	13	31,7%	
From 60 to 69 years old	4	9,8%	
From 70 to 79 years old	5	12,2%	
From 80 to 90 years old	3	7,3%	
(Mean ±Standard Deviation)	51.8±18.3 years		
Diagnosis			0.0005*
Cerebrovascular Diseases	18	43,9%	
Hypoxy Ischemic Encephalopathy	2	4,9%	
Oncological	21	51,2%	

*significant result for the Chi-square test.
Source: Survey data

Regarding sedation analgesia in table 02, all of them used it, with Midazolam and Fentanyl being the most used, due to the fact that they are the drugs commonly administered by the hospital. Regarding the level of Richmond sedation and agitation (RASS), there was a superiority of -5 score, totaling 39 individuals (95.1%).

Table 02 - Characteristics of the clinical profile of the individuals

Clinical profile	n	%	p-value
Analgesia			
Fentanyl	41	100,0%	< 0.0001*
Remifentanil	0	0,0%	
Sedation			
Midazolan	41	100,0%	
Ketamine	0	0,0%	< 0.0001*
Dexmedomiomidina	0	0,0%	
Propofol	0	0,0%	
Level of sedation (Rass Scale)			
-3	1	2,4%	
-4	1	2,4%	< 0.0001*
-5	39	95,1%	

*significant result for the Chi-square test.
Source: Survey data

The data analyzed in table 03 show the distribution of the components of the mobilization group, where 38 (92.7%) of the individuals underwent the protocol, with this, only 3 (7.3%) were not submitted to it. Regarding the time to start the mobilization, the predominance was 2 to 3 days (24.4%) and 4 to 7 days (39.0%). Among the analysis, it was noticed that 31 (75.6%) individuals did not perform out-of-bed mobilization, because when compared to the ICU Mobility Scale (IMS), used to assess functionality, the predominance was the score of 3 points obtained by 61.0% of the individuals, thus justifying the relationship with out-of-bed mobilization. Regarding gait, the data indicated that 82.9% (34) of the individuals did not walk, 14.6% (6) performed the same and only 1 (2.4%) patient did not apply the walking protocol. Peripheral muscle strength was assessed using dynamometry, which obtained a predominant result between 6 and 10 kg/f, totaling 16 individuals (39.0%), the second highest percentage reached a score of 0 kg/f, which totaled 22.0%, observed in 9 individuals, thus justifying the low functionality index in the above predictors.

Table 03 – Protocols for mobilization and functional level assessment

Mobilization	n	%	p-value
Mobilization			
Not applicable	1	2,4%	< 0.0001*
No	2	4,9%	
Yes	38	92,7%	
Time to start the mobilization			
Not applicable	2	4,9%	0.0003*
Up to 01 day	2	4,9%	
From 02 to 03 days	10	24,4%	
From 04 to 07 days	16	39,0%	
From 08 to 14 days	8	19,5%	
Above 14 days	3	7,3%	
Out of bed			
No	31	75,6%	0.0018*
Yes	10	24,4%	
IMS (ICU Mobility Scale)			
0	7	17,1%	< 0.0001*
1	2	4,9%	
3	25	61,0%	
5	3	7,3%	
6	2	4,9%	
8	2	4,9%	
March			
Not applicable	1	2,4%	< 0.0001*
No	34	82,9%	
Yes	6	14,6%	
Dynamometry (kgf)			
0	9	22,0%	0.0023*
From 1 to 5	5	12,2%	
From 6 to 10	16	39,0%	
From 11 a.m. to 3 p.m.	5	12,2%	
From 16 to 20	4	9,8%	
From 9 to 25	2	4,9%	

*significant result for the Chi-square test.
Source: Survey data

Table 4 shows that during the study, 39 individuals were discharged from the intensive care unit (95.1%) and only 2 died (4.9%).

Table 04 – Outcome analysis

Denouement			
Loud	39	95,1%	< 0.0001*
Death	2	4,9%	

*significant result for the Chi-square test.
Source: Survey data

COMPARISONS

In the present study, the routine use of fentanyl and midazolam was observed as the most prevalent sedation analgesia during the hospitalization of neurocritical individuals with

a percentage of 100% in both medications, and when compared with the RASS scale, the index with the highest superiority was the score of -5 (95.1%), this index with excessive sedation analgesia correlates with the current study where a high time for the beginning of mobilization is observed with a percentage of 4 to 7 days in 16 individuals (39.0%), thus inferring a delay in the protocol; when this topic is discussed about the barriers to its application, the literature shows that sedation has its participation in a common way in this context, even though sedated patients with no level of consciousness can still be submitted to passive mobilizations, but without presenting as many significant benefits as in assisted or active active training (Carol et al., 2023). Thus, studies present neuromuscular electrical stimulation (NMES) for those cases where there is no way to stimulate the individual in a conventional way, this resource shows potential to increase muscle mass in addition to reducing the appearance of pressure injuries with increased blood circulation, and can also be applied in cases of individuals with RASS -5, going against the present study where mobilization is not applied to individuals without a level of consciousness (Baron et al., 2022).

Regarding peripheral muscle strength presented through evaluation with handgrip dynamometry, the highest incidence was 6 kg/F to 10 kg/F in 39.0% of the sample, presenting considerable muscle weakness acquired in the ICU in individuals with ICA, since the cut-off values are 11 kg/F for men and 7 kg/F for women, lower numbers than those mentioned above refer to the confirmation of severe weakness (Roque, Souza, Taveira., 2017). According to Zudin (2017), reduced strength and decreased muscle mass is a common complication in critically ill patients, occurring in 25% to 50% of cases, especially in individuals undergoing MV, corroborating the present study, since the daily loss of muscle mass averages 2 to 3% in the first 10 days, and this decrease is inferred in the lower rate of mobilizations outside the bed reported in the analysis with a product of 75.6% of the cases, and can be correlated with the results of the IMS scale that observes the highest degree of functionality performed by the subject with or without assistance, where in his sample a prevalence of score 3 (sitting by the bedside) was obtained in 25 individuals (61.0%), followed by a score of 0 (restricted to bed) in a total of 7 (17.1%) of the individuals in the study. Such results of this score can also be inferred in gait, thus justifying the cause of the high prevalence of individuals who did not walk during hospitalization, which resulted in a total of 34 individuals in the analysis (82.9%), in similarity with the allegation that low scores on the IMS scale indicate that patients have mobility restrictions and may require greater assistance in their daily tasks, which is not aligned with walking ability (Hodgson et al., 2022).

In the present study, 39 individuals were discharged (95.1%) and only 2 died (4.9%), and no statistical correlation between the mobilization protocol and mortality was evaluated.

FINAL CONSIDERATIONS

Therefore, this synthesis presents significant data on the functional impact on patients with ABI, where it points out indices of patients in an adult intensive care unit in relation to strength and functionality, correlating with patient mobilization and its clinical outcome. The impact was on neurocritical patients on mechanical ventilation and sedation analgesia who had the onset of mobilization postponed due to coma, so the findings demonstrated the high rate of muscle weakness acquired in the ICU and consequently the decrease in functionality, where the highest value found was bedside sedation. However, when the mobilization protocols were initiated, the clinical outcome for these patients was discharge from the unit, even with the delay in the beginning of mobilization.

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