

# Patients with cervical spondylotic myelopathy and dependency in activities of daily living during hospitalization – descriptive and correlational study

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## Abstract

**Background and Aim:** Cervical spondylotic myelopathy (CSM) causes progressive spinal cord compression and consequent functional decline. Surgical decompression is considered effective in halting disease progression, producing improvements in neurological prognosis. During hospitalization, several conditions may alter these patients' dependency levels. This study aimed to describe patients with CSM and their evolution regarding dependence in activities of daily living (ADL), from hospital admission to discharge.

**Methods and Materials:** Descriptive and correlational study based on document analysis.

**Results:** Included 96 files of patients with CSM who were admitted to Neurosurgery Department. The sample was 58.3% men, with a mean age of 64.4 years. Of the participants, 96.9% had surgery, mainly an anterior cervical approach. Hygiene was the ADL involving most dependence, both at admission (39.6%) and at discharge (71.9%). Worsening of dependence levels in ADLs was found at the midterm evaluation (mean 13.34; SD 5.59) and at discharge (mean 11.59; SD 5.28) in relation to the functional condition at admission (mean 9.77; SD 6.06). Gender was not associated with any differences, but age and days of hospitalization were associated with variations in participants' dependency levels ( $P < .05$ ).

**Conclusion:** The level of dependence on ADLs increased during the hospitalization of patients with CSM.

**Keywords:** cervical spondylotic myelopathy, perioperative, activities of daily living, dependence, nursing records

## Introduction

Worldwide, cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in the adult population and results from progressive spinal cord compression due to degenerative spinal changes typical of aging.<sup>1-4</sup> It appears mainly in men between the fifth and seventh decade of life.<sup>1-5</sup> The exact prevalence is unknown; however, it is estimated that 1.6 in 100,000 people have clinically symptomatic CSM requiring surgery and that these values will increase significantly in the coming years as the population ages.<sup>6,7</sup>

The level of neurological impairment with CSM is directly related to the degree of stenosis of the spinal canal,<sup>8</sup> and the disease course involves upper motor neuron alterations characterized by hyperreflexia, gait, and coordination disorders. In a later stage of evolution, the loss of bladder and bowel control can

occur in 20–50% of people with CSM.<sup>5</sup> CSM usually presents subtly and insidiously, with short periods of symptomatic progression followed by long intervals of relative stability of symptom progression.<sup>9</sup> The disease's progressive nature is associated with significant loss of autonomy, functional decline, and quality of life.<sup>8</sup>

There is no single approach or clear clinical consensus for managing and treating CSM. Evidence for the effectiveness of conservative treatment is scarce and points to less symptomatic cases.<sup>2,10,11</sup> However, surgical decompression is considered effective in halting disease progression and is associated with a substantial improvement in neurological prognosis, improved functional outcomes, and quality of life in patients with CSM.<sup>12-15</sup>

In the perioperative period, a multidisciplinary team is essential to ensure the surgical outcome and provide complex care directed

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Ethical statement: The study was subjected to the evaluation of the Ethics Committee of the institution, which issued a favorable opinion no. 2020.285 (217-DEFI/229-CE) for its conduct.

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to the multiple needs of people with CSM.<sup>4</sup> The importance of the various aspects of rehabilitation cannot be underestimated because they contribute to neuroplasticity in this critical recovery period in addition to enhancing neurological and functional gains and minimizing the onset of secondary complications.<sup>16</sup>

Nurses can develop and implement programs that aim to reduce the levels of dependence associated with activities of daily living (ADLs) and empower the person, maximizing autonomy and quality of life.<sup>17</sup> The concept of ADLs refers to the fundamental skills necessary for the person to care for themselves independently and includes actions, such as eating, bathing, and mobilization.<sup>18</sup> The inability to perform ADLs causes different levels of dependence and may be related to the various stages of natural development associated with the life cycle and also to critical events such as disease and hospitalization.<sup>19</sup> The assessment of functional competencies using ADLs allows the planning and implementation of more effective health interventions, ensuring the appropriate support and continuity of care for each situation for each person. It also makes measuring the outcome of specific treatment programs possible and may be used as a health indicator.<sup>18</sup>

Literature is very scarce on nursing care for patients with CSM, particularly in the perioperative phase. Therefore, considering all the above, this study was developed to describe the characteristics of patients with CSM and analyze the evolution in ADLs in terms of dependence from hospital admission to hospital discharge.

## Methods

### Study design

This descriptive and correlational study uses a postfacto document analysis with a quantitative approach to data. For this research, data from the information and management systems were collected from the clinical records of health professionals, namely, physicians and nurses. It should be noted that health information systems are important tools for the diagnosis of health situations.<sup>20</sup>

### Setting and recruitment

The inclusion criteria were patients treated in the Neurosurgery Department of a university hospital with the diagnosis code of cervical myelopathy in 2018 and 2019. This time period was considered and chosen, as it included years before the pandemic, when the hospital had regular surgical activity and normal functioning. The effective validation of the diagnosis was performed by a multidisciplinary team, namely, by expert neurosurgeons. In addition, files of patients whose clinical picture was framed in another pathology were excluded, for example, radiculopathy without myelopathy.

We also excluded the files of patients admitted to the Neurosurgery Department in 2018 whose surgery had already taken place in 2017, those corresponding to patients who had been admitted to other departments, cases that resulted from outpatient surgery, and those related to people who declined surgical treatment and were discharged on request.

Data collection was carried out in May 2021. Data collection considered three moments of assessment—M1) at admission to the Neurosurgery Department, M2) on the first postoperative day, or in cases where conservative treatment was proposed halfway through the hospitalization period, and M3) at discharge.

## Variables

The following variables were considered: ADLs, age, gender, and length of hospital stay. The variable “ADLs” emerges from the diagnostic interventions performed by nurses using a scale available in the information system that assesses the participants’ level of dependence in each domain—originally entitled “Self-Care Dependency Evaluation Form” published in 2009.<sup>21</sup> The scale includes a set of items or indicators that make it possible to accurately assess the type and level of dependence according to four degrees of dependence. A set of actions that operationalize a specific ADL is defined for each area (Supplementary Document 1, <http://links.lww.com/PBJ/A38>). The ADLs hygiene, toilet use, dressing, feeding, positioning, transferring, and walking were considered for analysis in summation, for the valuation of the variable “ADLs,” whose score ranged between seven points for totally independent patients and 24 for those who presented dependence in all domains to a high degree. Gender was dichotomously classified as male and female. Age was presented in years, and length of stay was presented in days. The variables—profession, health history, onset of symptoms, signs and symptoms on admission, therapeutic orientation, and postdischarge destination—were not operationalized, considering that they were only intended to characterize the population.

## Research ethics

The study was subjected to the Ethics Committee of the institution’s assessment, with favorable assent nr. 2020.285 (217-DEFI/229-CE). All criteria of anonymity and confidentiality were followed.

## Data analyses

Data were systematically organized and classified using the ATLAS.Ti software, later exported and subjected to statistical analysis. For the statistical treatment of the data, the IBM SPSS® program was used, using descriptive and inferential statistics, adopting a confidence interval of 95%, with *P* value of <.05. The Kolmogorov–Smirnov test was conducted to evaluate the adequacy of the data to the normal distribution, obtaining a *P* value of <.05. Nonparametric statistics were used because the ADLs variable did not present a normal distribution in the three moments. Pearson  $\chi^2$  test and Friedman test were used according to the nature of the variables. In the descriptive analysis, nominal and ordinal variables were analyzed as frequencies and percentages, whereas continuous variables were analyzed as mean and standard deviation.

## Results

Of 168 cases identified, only 96 cases were eligible for inclusion in the study, ensuring full compliance with the defined inclusion and exclusion criteria. The mean age of the participants was 64.43 years, with a standard deviation of 11.65, and a range of 35 years–88 years (Table 1).

It was also possible to verify a higher incidence of CSM in men, with a representation of 58.3%. In terms of profession, approximately 50% of the patients in the study were already retired, and it was not possible to obtain information about their preretirement profession by consulting the file. Professions requiring heavy loads and repetitive effort, including farmers, construction workers, and truck drivers, were grouped together

**Table 1**  
**Characterization of the participants.**

Variables	N	%	Mean	SD
Gender (N = 96)				
Male	56	58.3		
Female	40	41.7		
Age, years (N = 96)			64.43	11.65
Professional activity (N = 96)				
Retired	48	50.0		
Sedentary job	12	12.5		
Job that requires physical effort	36	37.5		
Health background (N = 96)				
No background	12	12.5		
Arterial hypertension, diabetes mellitus, dyslipidemia	51	53.1		
Spine disease	13	13.5		
Other background	20	20.8		
Onset of symptoms (N = 96)				
Less than one month	12	12.5		
More than one month and less than one year	29	30.2		
More than one year	16	16.7		
Unknown	39	40.6		
Therapeutic orientation (N = 96)				
Conservative treatment	3	3.1		
Surgery	93	96.9		
Surgical approach (N = 93)				
Anterior	70	75.3		
Posterior	23	24.7		
Spinal levels (N = 93)				
One level	48	51.6		
Two level	32	34.4		
Three or more levels	13	14.0		
Discharge destination (N = 96)				
Home	36	37.5		
Outpatient rehabilitation	47	49.0		
Inpatient rehabilitation department	7	7.3		
Rehabilitation center	1	1.0		
Regional hospital	3	3.1		
Nursing home	1	1.0		
Omitted	1	1.0		
Length of stay, d (N = 96)			6.79	9.73

and made up 37.5% of the sample. The professions associated with more sedentary jobs, such as administrative and domestic workers, comprised 12.5% of the study sample. In this study, it was possible to verify that men with CSM had heavier/more physically demanding occupations and that this relationship is statistically significant (Pearson  $\chi^2 P < .05$ ).

Considering participants' health history, 53.1% had arterial hypertension, diabetes mellitus, or dyslipidemia. Of note, cardiometabolic diseases are very common in this age group. Of the total number of participants, 12.5% had no relevant history, and 13.5% already had spinal pathology at another level before this event.

The onset of symptoms was analyzed from the medical admission note records. However, it was not possible to determine for all participants, as 40.6% of the files did not contain this information. In 12.5% of the cases, the onset of symptoms was recent and was equal to or less than 1 month. The remaining cases reported a gradual onset of symptoms, with 30.2% appearing between one month and one year, and 16.7% over a period of more than one year.

Regarding signs and symptoms at admission, only 10.4% of the participants had milder symptoms or signs, such as hyper-reflexia, pain, and/or other sensory changes. Gait difficulty,

imbalance, and/or loss of fine motor skills were observed in 89.5% of the participants. Motor deficit was diagnosed in 52% of the cases. Sphincter changes, associated with more severe cases, were reported in 13.5%.

In terms of therapeutic orientation, three participants were referred for conservative treatment. Surgical treatment was recommended for the remaining patients, and an anterior cervical approach was chosen in 75.3%. The most frequently performed surgeries were anterior discectomy and fusion (62.5%) and laminectomy (19%). The most commonly approached cervical level was C5-C6 (19.4%). Surgical approaches involving multiple levels constituted 49.5% of the procedures—four surgeries were performed simultaneously on four levels of cervical approaches.

Participants were hospitalized for an average of 6.79 days with a standard deviation of 9.73, ranging from 2 to 72 days. Recognizing that treatment does not end with surgery, 33.3% of patients had an inpatient physiatrist consultation while still in the neurosurgery ward. Home was the postdischarge destination for 87.4% of the patients treated for CSM, and 49% left the hospital with a plan to maintain outpatient rehabilitation. Approximately 7.4% of patients were admitted to the rehabilitation department, and 3.1% were transferred to nearby hospitals to continue their rehabilitation programs.

ADL hygiene was identified in 96.9% of the files under analysis. At admission, 59.1% of patients with CSM were independent in hygiene, but only 19.4% maintained this state in the immediate postoperative period. However, the level of dependence increased from 40.9% at admission to 80.62% in the immediate postoperative period, maintaining values of 74.2% dependence in this ADL at the time of discharge.

In 97.9% of the nursing records, verifying diagnostic activity related to toilet use was possible. Of the 62.8% of independent patients at admission, only 33% remained independent at discharge. In the immediate postoperative period, 80.82% of patients required assistance in this ADL.

ADL clothing was documented in 84.4% of the files under analysis. At admission, 59.2% of the patients were independent in this domain, and 40.8% already had some degree of dependence. The postoperative period changed the condition of independence for 35.8% of these patients, with 76.5% requiring nursing intervention.

The level of dependence for “feeding” was found in 93.7% of the cases and indicated that 73.4% of the patients were independent at admission. Although 68.9% of patients needed nursing assistance to eat in the immediate postoperative period, by the time of discharge, 46.8% were again independent.

Regarding “positioning,” only 59.4% of the files recorded this diagnosis. In the files identified, it was possible to observe that 54.4% of patients with CSM were independent at admission. Surgery increased the level of dependence, with 84.2% requiring nursing care in this domain postoperatively.

The focus “transferring” was found in 58.3% of the nursing processes. At the time of admission to the neurosurgery department, 60.7% of patients were able to perform their transfers autonomously. Once again, there was an increase in the level of dependence in this domain in the postoperative period, with 64.9% of patients needing help for transfers. At discharge, 51.8% of the patients still maintained some degree of dependence in this domain.

The ability to walk, often compromised in patients with CSM, was recorded in 63.5% of the cases. At admission, 55.8% were no longer autonomous with walking. This value increased on the

first postoperative day to 73.7%, and at the end of hospitalization, only 31.7% of the patients were independent.

Although a walking impairment was present at admission, only 4% of the patients used a walking aid. This value increased to 13% during hospitalization, maintaining the need for a walking aid at hospital discharge. Moving in a wheelchair was identified in 2% of the study participants. The rehabilitation nurses worked on the acquisition of walking ability with and without support equipment in 18.7% of patients with CSM (Table 2).

Regarding ADL for hygiene, more patients were dependent at admission (39.6%), followed by toilet use (36.5%), clothing, and walking, both involving 35.4% of the participants. At discharge, more patients were dependent for hygiene (71.9%), toileting (65.7%), and dressing (56.3%).

A high degree of dependence in ADLs was not a very frequent diagnostic status in this sample of CSM patients. The highest value for this level of dependence was in the intermediate assessment for hygiene and toilet use, which involved 6.3% of participants.

Considering the already described variation from 7 to 24 points in the variable “ADLs,” CSM patients showed, on average, slightly high dependence values throughout hospitalization. The level of dependence (mean 13.34; SD 5.59) is confirmed at the time of the intermediate assessment in relation to the functional condition at admission (mean 9.77; SD 6.06). At discharge, there was some recovery in the level of dependence (average 11.59 SD 5.28), although the average remained higher than at admission. The Friedman test confirmed that there are differences in the level of dependence between the three moments ( $P < .001$ ). The analysis of variance between the first and last evaluations shows that 13.54% ( $n = 13$ ) of patients improved, 36.45% ( $n = 35$ ) maintained their condition, and 50% ( $n = 48$ ) worsened their level of dependence throughout hospitalization.

Finally, we tried to understand the relationship of ADL dependence at the three moments of assessment with other variables such as gender, age, and days of hospitalization in the perioperative phase. The results are shown in Table 3.

**Table 2**  
Nursing diagnoses related to the life activities of patients with CSM.

Activities of daily living	Hospital admission	Intermediate evaluation	Hospital discharge
Hygiene, N (%)			
Not found	3 (3.1)	3 (3.1)	3 (3.1)
Independent	55 (57.3)	18 (18.8)	24 (25.0)
Dependent to a reduced degree	7 (7.3)	12 (12.5)	24 (25.0)
Moderately dependent	28 (29.2)	57 (59.4)	42 (43.8)
High degree of dependence	3 (3.1)	6 (6.3)	3 (3.1)
Dressing, N (%)			
Not found	15 (15.6)	15 (15.6)	15 (15.6)
Independent	48 (50.0)	19 (19.8)	27 (28.1)
Dependent to a reduced degree	2 (2.1)	14 (14.6)	16 (16.7)
Moderately dependent	28 (29.2)	44 (45.8)	35 (36.5)
High degree of dependence	3 (3.1)	4 (4.2)	3 (3.1)
Using the toilet, N (%)			
Not found	2 (2.1)	2 (2.1)	2 (2.1)
Independent	59 (61.5)	18 (18.8)	31 (32.3)
Dependent to a reduced degree	2 (2.1)	8 (8.3)	11 (11.5)
Moderately dependent	29 (30.2)	62 (64.6)	50 (52.1)
High degree of dependence	4 (4.2)	6 (6.3)	2 (2.1)
Feeding, N (%)			
Not found	6 (6.3)	6 (6.3)	6 (6.3)
Independent	66 (68.8)	28 (29.2)	42 (43.8)
Dependent to a reduced degree	3 (3.1)	16 (16.7)	25 (26.0)
Moderately dependent	14 (17.7)	41 (42.7)	20 (20.8)
High degree of dependence	4 (4.2)	5 (5.2)	3 (3.1)
Turning, N (%)			
Not found	39 (40.6)	39 (40.6)	39 (40.6)
Independent	31 (32.3)	9 (9.4)	20 (20.8)
Dependent to a reduced degree	4 (4.2)	10 (10.4)	11 (11.5)
Moderately dependent	20 (20.8)	34 (35.4)	25 (26.0)
High degree of dependence	2 (2.1)	4 (4.2)	1 (1.0)
Transferring, N (%)			
Not found	40 (41.7)	40 (41.7)	40 (41.7)
Independent	34 (35.4)	21 (21.9)	27 (28.1)
Dependent to a reduced degree	4 (4.2)	11 (11.5)	11 (11.5)
Moderately dependent	17 (17.7)	23 (24.0)	17 (17.7)
High degree of dependence	1 (1.0)	1 (1.0)	1 (1.0)
Walking, N (%)			
Not found	35 (36.5)	35 (36.5)	36 (37.5)
Independent	27 (28.1)	16 (16.7)	19 (19.8)
Dependent to a reduced degree	15 (15.6)	16 (16.7)	17 (17.7)
Moderately dependent	17 (17.7)	15 (26.0)	22 (22.9)
High degree of dependence	2 (2.1)	4 (4.2)	2 (2.1)

**Table 3**  
**Association of being or not being dependent ADL and gender, age, and length of stay.**

Variables	Time	Chi-square test	Decision
Gender	Hospital admission	F = 0.490; <i>P</i> = .533	Support null hypothesis
Male (N56)	Intermediate evaluation	F = 2.502; <i>P</i> = .174	Support null hypothesis
Female (N40)	Hospital discharge	F = 0.369; <i>P</i> = .650	Support null hypothesis
Age	Hospital admission	F = 8.749; <i>P</i> = .005	Reject null hypothesis
<70 years old (N47)	Intermediate evaluation	F = 0.000; <i>P</i> = 1.000	Support null hypothesis
>70 years old (N49)	Hospital discharge	F = 0.810; <i>P</i> = .483	Support null hypothesis
Length of stay	Hospital admission	F = 12.635; <i>P</i> < .01	Reject null hypothesis
<3 days (N47)	Intermediate evaluation	F = 9.830; <i>P</i> = .003	Reject null hypothesis
>3 days(N49)	Hospital discharge	F = 2.186; <i>P</i> = .179	Support null hypothesis

As can be seen, gender does not bring statistically significant differences in the levels of dependence on ADLs throughout hospitalization. However, we can verify the existence of a significant association between the age of the patient with CSM and the ADL score at admission ( $P < .01$ ). The difference between the days of hospitalization and the level of ADL performance was also studied. The  $\chi^2$  test found a statistically significant relationship between the length of stay and the level of ADL dependence at hospital admission and intermediate evaluation, with values of  $P < .05$ . A multiple linear regression was performed to predict the behavior of the dependent variable ADL; however, the model does not assume the assumptions of linear regression, so this analysis cannot be considered.

## Discussion

CSM is a prevalent condition, causing progressive functional disability and impairment covering several health domains.<sup>4,5</sup> A multidisciplinary approach guarantees comprehensive and personalized treatment directed to the multiple needs of these patients in different stages of their care pathway, from assessment and diagnosis to therapeutic decision making to the perioperative period and rehabilitation.<sup>4</sup>

With an average age of 64.43 years (SD 11.65) and predominantly men (58.3%), the participants of this study fit the characterization of patients with CSM highlighted in the literature, which is between fifty and seventy years of age.<sup>1,5,22</sup> Although this pathology is related to degenerative causes, some studies find average ages around fifty years, involving people at the peak of their working career, reinforcing the importance of effective management of the disease, not only to improve function and quality of life but also to reduce the costs to society and the global economy.<sup>13</sup>

Lifestyle and occupational factors, such as exposure to frequent axial loads and repeated physical efforts, are described in the literature as predictors of CSM,<sup>14</sup> and in this study, 37.5% of patients had this type of work activity. A limitation of this study is the fact that it was not possible to obtain information on the patients' professional activity before retirement to characterize the participants better. Comorbidities and frailty have also been associated with prognostic factors and lower recovery rates.<sup>2,4,14,23</sup> In this survey, medical histories were diverse, but diseases such as arterial hypertension, dyslipidemia, or diabetes mellitus were present in the majority of participants (53%).

The onset of symptoms in less than one year was confirmed in 42.7% of the cases analyzed, with evidence that this short period of symptom evolution is associated with a substantial improvement in neurological prognosis.<sup>15</sup> Better therapeutic results are associated with shorter periods of evolution, and for each month

added to the total time without treatment, there is an estimated 1% reduction in the recovery rate.<sup>14</sup> Conversely, there is consensus that a worse previous neurological condition is associated with less functional recovery.<sup>1,15</sup> In this study, symptoms were grouped in increasing order of severity; however, validated instruments with worldwide acceptance, such as the Japanese Orthopedic Association (JOA) scale<sup>23</sup> and the Nurick scale,<sup>24</sup> were not used and therefore did not allow a standardized stratification of symptoms or the comparison of data, which constitutes another limitation of this study.

Conservative treatment of CSM may include a multifaceted rehabilitation program, immobilization with a cervical collar, and medication, but evidence for the effectiveness of nonsurgical treatment is scarce.<sup>2,3</sup> In this study, only three patients were referred for conservative treatment, which is naturally explained by the fact that this is a neurosurgery department with surgical objectives. In cases with milder symptoms, an initial rehabilitation program may be indicated, ensuring the possibility of surgical treatment in case of neurological deterioration or lack of recovery.<sup>2,3,11</sup>

Surgical intervention is strongly recommended in cases with moderate to severe symptoms and is recognized as the most effective way to stop disease progression in CSM.<sup>2,3,11,13</sup> Surgery is necessary to decompress the neural elements, restore lordosis, and stabilize the spine to prevent further degeneration to the levels already involved. However, there is no full consensus on whether the surgical approach should be anterior or posterior. Nonetheless, the concept of decompression being performed according to the location of the main foci of compression seems to be well accepted.<sup>2</sup> In this study, an anterior cervical approach was performed in 75.3% of the surgeries. The literature shows that both techniques are effective in producing neurological improvement; however, although the anterior cervical approach brings significant improvement in symptoms and less instability and kyphosis, it is associated with complications such as dysphagia, dysphonia, poor positioning of graft and plates, pseudoarthrosis, and a higher rate of surgical reoperation.<sup>2,15</sup>

Despite the advantages of surgery, not all people achieve a complete recovery because of possible damage already existing in the spinal cord, and it is important to start a postoperative rehabilitation program early.<sup>16,25</sup> Almost half of the sample (49%) has a record of a short hospital stay—two to three days of hospitalization. Although hospitalization days at this stage are limited, it is an essential and critical time in the rehabilitation care continuum.<sup>25</sup>

The impact that CSM has on participants' ADL dependence was possible to assess in the records produced by the nurses. The most commonly documented ADLs were hygiene, clothing, toilet use, and eating. In the institution under study, some of these

activities are mandatory for all inpatients and are regularly audited. Dependence was also identified in the ADLs of positioning, transferring, and walking. The fact that the level of dependence in all ADLs was not systematically documented in the processes was another limitation found.

Naturally, the impact on neurological function translated by pain, paresthesia, muscle weakness, loss of manual function, difficulty walking, imbalance, and incontinence contribute to the functional decline of patients with CSM.<sup>8</sup> Therefore, it is also not surprising that the activities with the highest degree of dependence are those that require a greater range of motion, muscle strength, coordination, better fine and gross motor function, and body balance. Such activities include personal hygiene, dressing, eating, toileting, using a wheelchair, and walking.<sup>26</sup>

Nursing plays a relevant role by intervening in the integration of care and the adaptation to a changed lifestyle, as well as helping the person prevent, alleviate, solve, or deal positively with actual or potential problems related to ADLs.<sup>19</sup> Despite the importance of these concepts, only diagnoses related to gait training were found in the analyzed ADL processes, indicating little investment by nurses in this area of care documentation.

The second objective of this study was to analyze the evolution of dependence in ADLs from admission to hospital discharge. It was possible to verify variations in the level of dependence on ADLs at admission (mean of 9.77; SD 6.06), at the intermediate assessment (mean 13.34; SD 5.59) and at hospital discharge (mean 11.59; SD 5.28). Surgery and hospitalization brought about a significant worsening of the participants' level of dependence for ADLs. This does not conflict with the evidence that surgery is associated with better clinical outcomes, functional status, and quality of life<sup>13</sup> because they refer to a later assessment of the results of surgery. The postoperative period also encompasses the prevention of complications, pain management,<sup>4,27</sup> and the use of orthotics, positioning, resting, and lifting indications,<sup>27</sup> which may compromise ADLs and require specific nursing interventions.

Conversely, hospitalization is related to a substantial reduction in physical activity and consequent loss of functionality, particularly in the older population. Previous research highlights that older adults with walking ability on admission, when admitted to a medical department, spent 17 hours a day in bed.<sup>28</sup> Another study involving hospitalized older adults verifies worsening functional condition between preadmission and discharge in 63.7% of the participants.<sup>29</sup>

The relationship between age and the level of dependence was identified in this study, especially at the time of admission, showing that neurological deficits can exacerbate the dependence associated with aging. Although there is no consensus, advanced age has been mentioned as influencing surgical outcomes. Some studies indicate that age older than 70 years is related to worse recovery after surgery, with some even worsening later.<sup>14</sup> A review involving 91 studies concluded that age was a non-significant predictor of functional outcome after surgery.<sup>1</sup> Although age is not a modifiable factor, preoperative optimization, namely, the reduction of fragility associated with aging, may positively impact surgical outcomes by using preoperative rehabilitation programs that include individualized therapeutic exercises, nutritional reinforcement, and strategies for anxiety control.<sup>4</sup>

A randomized study developed by nurses regarding the postoperative rehabilitation of patients with CSM showed that nursing intervention and encouragement increased out-of-bed activity time, improved neurological and functional status,

reduced pain, reduced the incidence of complications, and also significantly decreased the length of hospital stay.<sup>25</sup> Like other neurological disorders, such as stroke and traumatic spinal cord injury, timely, and strategic rehabilitation, has been shown to be indispensable for maximizing functional outcomes. Hence, perioperative rehabilitation interventions must accompany surgical approaches ensuring the best outcomes.<sup>16</sup>

In this study, the increased level of dependence of participants during hospitalization makes it necessary for nurses to invest in ADL training. With a limited period of hospitalization, it makes sense to plan support and rehabilitation care in advance during the preoperative period to address the worsening level of dependence of patients with CSM upon hospital discharge.

### Limitations

There was a need to go back to 2018 and 2019 for data collection, as these were years of regular surgical activity before the pandemic. The nonuse of specific assessment scales for patients with CSM limited the analysis and effective comparison of some results. The fact that the information was incomplete in some files was another limitation of this study. Finally, another limitation is related to the need to clarify concepts such as life activities and activities of daily living from the perspective of nursing care in future studies.

### Conclusion

This study made it possible to identify the characteristics of patients with CSM admitted to a Neurosurgery Unit of a University Hospital. More patients were dependent on hygiene ADLs at admission, followed by toilet use, dressing, and walking, both involving 35.4% of the participants. At the time of discharge, 71.9% of the participants still needed some help for ADLs. It was also possible to notice a worsening in the levels of dependence in the ADLs during the intermediate evaluation and at hospital discharge compared with the functional condition at admission. Although gender did not bring differences with statistical significance, age and length of stay were associated with variations in the levels of ADL dependence. Multidisciplinary perioperative rehabilitation is important to enhance surgical outcomes, and a nursing investment in ADL capacity building is essential. Furthermore, it is important to note that this worsening level of dependence refers to the period immediately after surgery, without probably being the final result. This study has implications for the organization of care in hospital settings, contributing to the development of nursing care itineraries for patients with CSM.

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