



## FACTORS RELATED TO PROLONGED HOSPITALIZATION IN A NEUROSURGIC WARD

### FATORES RELACIONADOS AO INTERNAMENTO PROLONGADO NUMA ENFERMARIA NEUROCIRÚRGICA

Daniela Virginia Porto Borges <sup>1</sup>  
Quessia Paz Rodrigues <sup>2</sup>  
Manoela Lima Maciel <sup>3</sup>

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#### Abstract

**Introduction:** Hospitalization significantly changes patient's life. Hospitalization, often crucial to the success of the therapeutic plan, becomes harmful with its extension. **Objectives:** analyze factors associated with prolonged hospitalization (PH) of neurosurgical patients; trace sociodemographic and clinical profile; verify the association of PH with sociodemographic and clinical characteristics. **Method:** This is a quantitative, cross-sectional analytical research, performed in a neurosurgical ward of a public hospital that is a reference in neurology. The sample consisted of 93 medical records. To verify the association between the variables, the significance level was considered with  $p < 0.05$ . The research was approved by the Research Ethics Committee. **Result:** The average of PH time was 27.4 days. In the studied population, there is a predominance of males, who declared themselves black, from the interior of the State of Bahia, aged between 50 and 60 years. The most prevalent diagnosis was neoplasm of uncertain behavior, having tumor resection microsurgery as the most performed procedure, in addition to the identification of important operational complications. There was no statistically significant association between the variables analyzed. **Conclusions:** The study made it possible to identify the sociodemographic and clinical profile of the patient assisted in the neurosurgical ward who presented PH. Despite not identifying the association between the variables examined, this research provided visibility to the high occurrence of this harmful extension.

**Keywords:** Length of hospitalization; Ward; Neurosurgery.

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<sup>1</sup> Resident in Intensive Care at the Federal University of Bahia. Graduated in Nursing and Administration.

ORCID: <https://orcid.org/0000-0002-7742-4456> E-mail: [portodany@yahoo.com.br](mailto:portodany@yahoo.com.br)

<sup>2</sup> Doctor in Nursing from the Federal University of Bahia. Professor at the UNIRuy University Center. Coordinator of the Nursing Research Group and the Nucleus of Quality Management of the Hospital Geral Roberto Santos.

ORCID: <https://orcid.org/0000-0003-0762-4679> E-mail: [qprodrigues@gmail.com](mailto:qprodrigues@gmail.com)

<sup>3</sup> Master's student in Nursing and Health by the Federal University of Bahia. Graduated in Nursing from the UNIRuy University Center. Member of the Interdisciplinary Research Group on Cardiovascular Health Care and the Nucleus of Patient Safety of Hospital Geral Roberto Santos.

ORCID: <https://orcid.org/0000-0001-6034-9915> E-mail: [portodany@yahoo.com.br](mailto:portodany@yahoo.com.br)



## Resumo

**Introdução:** O internamento modifica de forma significativa a vida do paciente. A hospitalização, muitas vezes crucial para o sucesso do plano terapêutico, torna-se danosa com o seu prolongamento. **Objetivos:** Analisar fatores associados ao internamento prolongado (IP) dos pacientes neurocirúrgicos; traçar o perfil sociodemográfico e clínico; verificar a associação do IP com características sociodemográficas e clínicas. **Método:** Trata-se de pesquisa quantitativa, transversal analítica, realizada numa enfermaria neurocirúrgica de um hospital público referência em neurologia. A amostra foi constituída por 93 prontuários. Para verificação da associação entre as variáveis, considerou-se o nível de significância com  $p < 0,05$ . A pesquisa foi aprovada pelo Comitê de Ética em Pesquisa. **Resultado:** O tempo médio de IP foi de 27,4 dias. Na população estudada, apresenta-se o predomínio do sexo masculino, que se autodeclararam negros, originários do interior do Estado da Bahia, com faixa etária entre 50 e 60 anos. O diagnóstico mais prevalente foi neoplasia de comportamento incerto, tendo microcirurgia de ressecção de tumor como procedimento mais realizado, além da identificação de importantes complicações operacionais. Não houve associação estatisticamente significativa entre as variáveis analisadas. **Conclusões:** O estudo possibilitou identificar o perfil sociodemográfico e clínico do paciente assistido na enfermaria neurocirúrgica que apresentaram IP. Apesar de não identificar a associação entre as variáveis examinadas, esta pesquisa proporcionou visibilidade à elevada ocorrência deste danoso prolongamento.

**Palavras-chave:** Tempo de internação; Enfermaria; Neurocirurgia.

## INTRODUCTION

The process of hospitalization in hospitals has been widely discussed in contemporary times. The Ministry of Health defines hospitalization as the admission of Every patient who occupies a hospital bed for a period equal to or greater than 24 hours<sup>1</sup>. Hospitalization significantly changes the patient's life, as it transforms the family dynamics, which now have their routine conducted by the institution. Hospitalization, often crucial for the success of the therapeutic plan, becomes harmful with its prolongation.

The hospital is characterized as the main multiprofessional institution, responsible for the care of people with health complications<sup>2</sup>. It is in this ambience that patients with neurological disorders are predominantly assisted. When these patients are subjected to a prolonged hospitalization (PH), they may develop new clinical disorders, such as pneumonia, integumentary tissue damage and nosocomial infections<sup>3</sup>.

Therefore, what defines the length of hospitalization is the average length of stay, classic hospital perform indicator, which, in summary, determines the average time in days that a patient remains hospitalized in the hospital<sup>4</sup>.



The parameter for determining the PH, adopted by health institutions, is still not a consensus in the scientific literature<sup>5</sup>. A research carried out in Portugal considered any hospitalization longer than 7 days to be prolonged. In another institution in this country, they estimated the interval between 28/30 days to characterize PH with greater precision.

In Brazil, there is also no standardization that characterizes the length of hospitalization as prolonged<sup>6</sup>. In this perspective, the MS states and adds that the average length of hospitalization varies according to the complexity of the institution and that for large hospitals the desirable length of hospitalization would be 4 to 5 days<sup>4</sup>. For the purposes of this study, the value from the average length of hospitalization established by the investigated hospital, which is 15 days, was considered as PH.

The length of hospitalization can induce the emergence of new diseases in neurological patients, which collaborates with the extension of their stay in the hospital, and by empirically observing the repetition of this cycle in the neurosurgical ward, the motivation came to analyze in more details the factors related to PH.

It is worth noting the importance of the research locus institution for the national public health system, it is the largest public hospital in the state of Bahia, high complexity reference center in neurology, in which 85% of the neurosurgeries performed in the state of Bahia were performed in 2019 alone<sup>7</sup>.

The present investigation may contribute to the improvement of care and quality of care, in addition to providing subsidies to managers in the development of strategies to reduce hospitalization time and consequently reduce the impact of this problem on hospital costs.

Thus, the following guide question was raised: What are the factors related to PH of neurosurgical patients? The objective was to analyze the factors associated with the PH of neurosurgical patients, to trace sociodemographic and clinical profile of these patients, and verify the association of PH with the sociodemographic and clinical characteristics of the patients in question.



## METHOD

This is a quantitative, cross-sectional, analytical research, having as locus a public hospital of high complexity, reference in neurology in the state of Bahia. Specifically, an inpatient unit consisting of 30 beds dedicated exclusively to patient care in the pre and post-operative period of nervous system surgeries.

According to the 2019 hospital census available for consultation in the institution's digital files, the average occupancies rate of beds in the selected unit was 90 (ninety) patients/month, which is equivalent to approximately 1000 (one Thousand) patients/year. Thus, to compose the sample, for convenience, 200 medical records were selected, about 20% of total number of patients hospitalized in the neurosurgical ward in that period.

Subsequently, all medical records in the sample that presented PH were included in the research, and excluded inappropriate medical records with inconsistent information. From this final screening, a universe of 93 medical records was obtained (N=93).

For the analysis of these records, ethical aspects were respected upon approval by the Research Ethics Committee (CEP) through opinion no. 4.289,152 CAAE 36505720.8.0000.5028, observing the provisions of the Resolutions no. 466/12 of the National Research Ethics Commission (CONEP) and no. 580/2018 of the National Health Council. Furthermore, according to the CEP, patients and/or family members were contacted to authorize the use of data through the Free and Informed Consent Form (TCLE). However, after three unsuccessful contact attempts, the medical record in question was exempted from this authorization.

The dependent variable defined for investigation is PH, described as hospitalization equal to or greater than 15 consecutive days in the selected unit. The independent variables are sociodemographic characteristics (age, sex, race/color, schooling, origin); clinical features (main diagnosis; surgery performed; clinical and operational complications).

The independent variables underwent refinement, the nominals were transformed into numerical categories and some recategorized for better elaboration and handling of the findings, as recommended in the literature<sup>8-9</sup>.



Frame 1 below shows the independent variables of the research and how they were categorized in this study.

**Frame 1 – Description of the independent variables used in the study.**

Independent Variables	Categorization
<b>Sociodemographic Characteristics</b>	
Age (Years)	≤19, 20-29; 30-39; 40-49; 50-59; 60-69 e 70-80
Sex	Female or male
Race Color	Black/brown; yellow (Asians); indigenous; white and not informed.
Schooling	Illiterate; incomplete elementary school; complete elementary school; incomplete high school; complete high school; incomplete higher education and uninformed.
Origin	Capital and countryside
<b>Clinical Features</b>	
Main Diagnosis	Unruptured brain aneurysm; Malignant Neoplasm of brain; Neoplasm of uncertain behavior of the brain; Subarachnoid hemorrhage; Hydrocephalus; Intervertebral discs disorders; Arteriovenous malformations; Other diagnosis.
Surgery Performed	Contraindicated for surgical approach; Microsurgery intracranial tumor resection; Aneurysm clipping; Arteriovenous Embolization; Arthrodesis; Brain tissue biopsy; Resection of an extra-axial expansive lesion; Other Procedures.
Clinical and operational complications	No Complications; Pulmonary thromboembolism (PTE); Respiratory Tract Infection (RTI); Operative Wound Infection; Multiple Clinical Complications; Urinary Tract Infection (UTI); Operational Complications.

**Source:** own authorship.

Sociodemographic and clinical data were analyzed by consulting printed medical records filed at the institution. In the descriptive analysis of the data, the mean, standard deviation, maximum, minimum and variance were calculated and presented the relative and absolute frequencies. The nonparametric Mann-Whitney statistical test was used for comparison between dichotomous categorical variables and the dependent variable, and the Kruskal-Wallis test in the comparison of multichotomous categorical variables with the outcome. To verify the association between the variables, a significance level of 95% was considered that is  $p < 0,05$ .

It was also identified at which time of hospitalization the extension occurred whether preoperatively and/or postoperatively, calculating minimum, maximum, mean, standard deviation and variance.

Data were processed using Excel Microsoft Office® system 2010 and IBM SPSSStatistics20 and the results presented in the form of tables.



## RESULTS

Of the 200 medical records analyzed, 39 (19,5%) were classified as inadequate, for presenting inconsistencies such as: absence of relevant information for research, ambiguity of records, having then 161 records remaining. Of these, about 1/3 of patients (68) had less hospitalization than PH, which culminated in a sample of 93 medical records. All validated medical records presented a satisfactory magnitude for the purpose of the study.

**Table 1** – Relative frequency of documents analyzed. Salvador, 2021.

Documents	N	%
Inadequate Medical Records	39	19,5%
Hospitalization < 15 days	68	34,0%
Valid Medical Records	93	46,5%
Medical Records Analyzed	200	100%

Source: own authorship.

The average PH time was 27.4 days, with the longest PH lasting 82 days. Most of the prolonged hospitalization was carried out in the preoperative period and lasted an average of 16.1 days (Table 2).

**Table 2** – Descriptive measures of hospitalization time. Salvador, 2021.

Time	N	Min	Max	Mean	Standard deviation	Variance
PH days	93	15	82	27,40	12,370	153,025
Preoperative PH days	93	0	50	16,16	12,429	154,485
Postoperative PH days	93	0	52	10,05	11,727	137,530

Source: own authorship.

Patients assisted in the neurosurgical ward who underwent PH had the following sociodemographic profile: slight predominance of males, representing 51.6% of the sample. The most prevalent age group in prolonged hospitalization was between 50 and 59 years old, with 24.7%. These same patients declared themselves to be black/brown, that is, black (67.7%), reported having completed high school (24.7%) as a formal education background, and 58.1% of them come from the interior of the State of Bahia (Table 3).



**Table 3** - Distribution of the Sociodemographic profile of neurosurgical patients with PH in a public hospital. Salvador, 2021.

Variable	Frequencies (Fr)	%	p
<b>Sex</b>			0,930
Male	48	51,6	-
Female	45	48,4	-
Total	93	100,0	-
<b>Age Group</b>			0,588
≤19 years	5	5,4	-
20 to 29 years	9	9,7	-
30 to 39 years	19	20,4	-
40 to 49 years	16	17,2	-
50 to 59 years	23	24,7	-
60 to 69 years	19	20,4	-
70 to 80 years	2	2,2	-
Total	93	100,0	-
<b>Race/color</b>			0,289
Black/Brown (Black)	63	67,7	-
Yellow (Asians)	4	4,3	-
Indigenous	1	1,1	-
Uninformed	25	26,9	-
Total	93	100,0	-
<b>Schooling</b>			0,277
Illiterate	8	8,6	-
Incomplete Elementary School	22	23,7	-
Complete Elementary School	15	16,1	-
Incomplete High School	6	6,5	-
Complete High School	23	24,7	-
Incomplete Higher Education	10	10,8	-
Uninformed	9	9,7	-
Total	93	100,0	-
<b>Origin</b>	<b>Fr</b>	<b>%</b>	<b>p (0,332)</b>
Capital	39	41,9	-
Interior	54	58,1	-
Total	93	100,0	-

Source: own authorship

In the statistical analysis, no statistically significant associations were found, Mann-Whitney test was used to compare the PH and the sex of the patients ( $p=0,930$ ), PH and city of origin ( $p=0,332$ ), and applying Kruskal-Wallis statistical test to verify the association between the PH and the variables: age group ( $p=0,588$ ), race/color ( $p=0,289$ ) and schooling ( $p=0,277$ ), respectively.

Regarding the clinical characteristics of patients with prolonged hospitalization, were identified as the main diagnoses the neoplasm of uncertain behavior of the brain (29%), followed by malignant brain neoplasm (16,1%). On the contrary, the diagnosis that appeared the least in the sample was arteriovenous malformations (4,3%). Other diagnoses accounted for about 20% of cases, which shows a high neurosurgical specificity and complexity of the diseases.



**Table 4** - Distribution of the main diagnoses present in the studied population. Salvador, 2021.

Main Diagnosis	Fr	%	% Accumulated
Arteriovenous malformations	4	4,3	4,3
Hydrocephalus	5	5,4	9,7
Subarachnoid hemorrhage	7	7,5	17,2
Unruptured brain aneurysm	8	8,6	25,8
Invertebral disc disorders	9	9,7	35,5
Malignant neoplasm of brain	15	16,1	51,6
Other diagnoses	18	19,4	71
Neoplasm of uncertain behavior of the brain	27	29,0	100
Total	93	100,0	<b>p (0,287)</b>

Source: own authorship.

As for surgical procedures, intracranial tumor resection microsurgery (25.8%) was the most performed surgery among the data analyzed. Also noteworthy is the contraindication of surgical procedures, which occurred in 9 of the 93 cases identified in the study (9.7%), demonstrating judicious care in weighing risks and the benefits that surgery as the treatment of choice can offer the patient.

**Table 5** - Relative frequency of surgical procedures performed and/or not performed. Salvador, 2021

Conduct	Fr	%	% Accumulated
Arteriovenous Embolization	4	4,3	4,3
Brain Tissue Biopsy	5	5,3	9,6
Arthrodesis	6	6,4	16,0
Contraindicated for Surgical Approach	9	9,7	25,7
Aneurysm Clipping	10	10,8	36,5
Resection of an extra-axial expansive lesion	13	14,0	50,5
Other Procedures	22	23,7	74,2
Microsurgery Intracranial Tumor Resection	24	25,8	100
Total	93	100,0	<b>p (0,141)</b>

Source: own authorship.

Regarding the variable “clinical and operational complications”, the main occurrences that contributed to the extension of the hospital stay were identified. The “multiple clinical complications” that occurred in 14% of the cases are highlighted. Concomitantly, complications arise: pulmonary thromboembolism (3.2%); respiratory tract infection (6.5%), operative wound infection (5.4%); urinary tract infection (3.2%), among other comorbidities.





Also noteworthy is the high frequency of “operational complications” such as: failure to prepare the patient for surgery; absence of an operating room available in the surgery center, in addition to numerous cancellations and rescheduling of procedures without adequate record in the medical record of the reason for the postponement.

These operational complications, which were grouped into a single item for better data tabulation, correspond to 47.3% of the findings (close to half), represented below.

**Table 6** - Relative frequency of clinical and operational complications

Complications	Fr	%	% Accumulated
TEP	3	3,2	3,2
ITU	3	3,2	6,4
FO Infection	5	5,4	11,8
ITR	6	6,5	18,3
Others	7	7,5	25,8
No Complications	12	12,9	38,7
Multiple Clinical Complications	13	14,0	52,7
Operational Complications	44	47,3	100
Total	93	100,0	<b>p (0,337)</b>

Source: own authorship

The existence of a statistically significant association was not verified through the Kruskal-Wallis test of the PH with the main diagnostic variables ( $p= 0.287$ ), surgery performed ( $p= 0.141$ ) and clinical and operational complications ( $p=0.337$ ).

## DISCUSSION

The present study aimed to analyze the PH of neurosurgical patients and in this investigation it was identified that patients with prolonged hospitalization remained in the neurosurgical ward for an average of 27.4 days, the focus of this research. This average time exceeds the length of stay described in the research which analyzed the temporal trend of hospitalizations for surgeries performed in the Unified Health System (SUS). In this study, the average length of stay for each surgical procedure performed by the public health system was described, highlighting as average length of stay 8.9 days of hospitalization for neurosurgical patients<sup>10</sup>.



This discrepancy in length of stay may be related to structural singularities and the work process developed in the neurosurgical ward analyzed. The literature indicates that in this ambience, by the dimensioning of the assistance team and physical structure, monitoring and supervision of patients tend to occur less intensively, which may favor the occurrence of clinical and neurological complications, negatively influencing the evolution of the patient<sup>11</sup>.

As evidenced in the literature, the analysis of the hospitalization process has subjective components in which the factors responsible for the PH are not linear, thus most patients have multiple factors that condition the prolongation of hospital stay<sup>5</sup>.

Regarding the sociodemographic characteristics found in the study, a similar outcome is observed in an epidemiological survey carried out in the state of Bahia which outlined the sociodemographic profile of patients affected by tumors in the nervous system between the years 2005 to 2014. In this exam, males were also more frequent than females, in terms of race/color, blacks were again prevalent and about two thirds of the patients were from the interior of the state who, due to structural issues of the health system, are treated in the capital<sup>12</sup>.

The predominant age group in the PH was from 50 to 59 years old, precisely a quarter of the patients, followed by the age group of 60 years old or more. This information differs from the findings of the epidemiological study carried out in the state of Bahia <sup>(12)</sup> which showed a greater predominance of neurosurgeries in patients aged 60 years or older, when excluding underage patients. When related to epidemiological assessment carried out in the state of Rio de Janeiro<sup>13</sup>, search results are similar, in this evaluation, the mean age of neurological patients was approximately 50 years. In a hospital investigation that analyzed the clinical evolution of patients hospitalized with a diagnosis of cerebral aneurysm in a public hospital ward in the city of Fortaleza (CE), it was evidenced that the age group between 51 and 60 years was more affected by this pathology, representing about a third of the population studied<sup>14</sup>.



The comparison of the present study with hospital epidemiological research showed important similarities in the sociodemographic profiles of patients with neurological disorders, assisted by the SUS. However, the scientific literature highlights that research that evaluates health services is subject to inconsistent and/or incomplete information bias<sup>15</sup>. Situation evidenced in the variables race/color and education shows that in both the topic “not informed” presented high rates.

Another finding of this research highlights intracranial tumor resection microsurgery as the main surgical procedure performed in patients with PH. In accordance with the research that outlined the clinical profile of patients with brain neoplasms in the state of Bahia, in which neurosurgery was identified as one of the most frequent treatment choices for neurological tumors<sup>12</sup>.

The aforementioned analysis of the clinical profile<sup>12</sup> also presents neoplasms as the most prevalent pathologies that attack the nervous system, confirming the research finding that indicates neoplasm of uncertain behavior and malignant neoplasm of the brain, respectively, as the most common injuries in patients with PH.

Regarding the factors that conditioned the prolongation of hospital stay, operational complications stand out. These situations were described in the literature as not responsible for the worsening of patients' clinical conditions, rather a limiting factor for the resolution of diagnoses<sup>14</sup>.

By analyzing the course of the hospital stay of the patient with PH, it was identified at which time of hospitalization there was prolonged hospitalization, whether before or after the surgical procedure. On average, the patient spends more time waiting for surgery than recovering postoperatively. And in some situations, after a long hospital stay, surgery is contraindicated by the team. These impressive findings suggest the need for a review of care routines and operational processes. The structuring of the therapeutic plan should be initiated as soon as the patient is admitted to inpatient unit. This is in view of the negative impact of PH on the quality of hospital services and its impact on the lives of patients and their families.



This PH assessment has the limitation of analyzing only the hospitalization in the neurosurgical ward, disregarding the flow of this patient in other sectors of the hospital. In this sense, it is salutary to develop new studies that expand and deepen knowledge about the impacts of prolonged hospitalization.

## CONCLUSION

The study made it possible to identify the predominant sociodemographic profile as the male patient in the age group of 50 to 59 years, black, with complete high school, resident in the interior of the state of Bahia. Regarding the most prevalent clinical features, the findings were the neoplasm of uncertain behavior as the main diagnosis, the most common surgical treatment was tumor resection microsurgery and operational complications overlapped clinical complications during the hospital stay of patients who presented PH.

Despite not identifying the association between the variables examined (PH, sociodemographic and clinical characteristics), this analysis provided visibility to the high occurrence of this harmful extension. In addition, it offers subsidies that identify at what time of hospitalization the postponement of hospital discharge occurs, and outlined the epidemiological and clinical profile of the neurosurgical patient assisted in the unit, these data can be used to develop strategies that make the hospitalization process more efficient.

It is worth mentioning that this knowledge can instigate managers and the care team in the development of plans to optimize care, that minimize the effects or mitigate the occurrence of PH.

Special attention is given to better structuring and management of operational process emphasizing the importance of the institution's good performance for the strengthening of the Brazilian Unified System.



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