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# Evaluation of palliative care costs for neurological patients in a hospital of the Unified Health System

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## Abstract

**Objective:** To quantify daily direct costs through absorption costing and the demographic profile of neurological patients receiving palliative care (PCs) at a hospital in the Unified Health System. **Methods:** Convenience sample composed of 132 individuals admitted to Hospital Mestre Vitalino (HMV), in Caruaru-Pernambuco, with a diagnosis of neurological diseases, over 18 years of age and a favorable opinion for PCs, admitted to the Intensive Care Unit (ICU) and/or wards of HMV, and who had a favorable opinion from the PCs committee to start this type of care at HMV between 01/01/2019 and 12/31/2019, evolving to death in the unit in the same period. Average daily costs were adjusted by purchasing power parity<sup>1</sup> and the American Consumer Price Index<sup>2</sup>, later converted to US dollars according to the exchange rate in effect on September 13, 2024. **Results:** The time interval between the start of PC and death had an average of 18.3 days. After the institution of this assistance, there was a 27% reduction ( $p < 0.0001$ ) in daily costs in the wards for the group evaluated. The reduction in costs for PC patients admitted to the Intensive Care Unit was not statistically significant for the sample evaluated, just as the demographic variables did not statistically influence the costs. The total cost was US\$ 211,981.49 to US\$ 164,562.37 in daily rates after the institution of PCs for the entire sample during 2019. **Conclusion:** The present study found a significant reduction in direct hospitalization costs for patients after insertion into PCs, mainly for those who were inserted into PCs from the beginning of the hospitalization period and who were allocated to wards.

**Keywords:** Palliative Care, Costs, Neurology, Unified Health System.

## Avaliação de custos dos cuidados paliativos para pacientes neurológicos em um hospital do Sistema Único de Saúde

## Resumo

**Objetivo:** Quantificar os custos diretos diários através do custeio por absorção e o perfil demográfico dos pacientes neurológicos em Cuidados Paliativos (CPs) em um hospital do Sistema Único de Saúde. **Métodos:** Amostra composta por 132 indivíduos internados no Hospital Mestre Vitalino (HMV), em Caruaru-Pernambuco, com diagnóstico de doenças neurológicas, com mais de 18 anos e parecer favorável aos CPs, internados na Unidade de Tratamento Intensivo (UTI) e/ou enfermarias do HMV, e que tiveram parecer favorável da comissão de CPs para iniciar esse tipo de cuidado no HMV entre 01/01/2019 e 31/12/2019, evoluindo para óbito na unidade nesse mesmo período. Os custos diários médios foram corrigidos pela paridade de poder de compra<sup>1</sup> e o Índice de Preços ao Consumidor Americano<sup>2</sup>, posteriormente convertidos para dólares americanos de acordo com a cotação vigente em 13 de setembro de 2024. **Resultados:** O intervalo de tempo entre o início dos CPs e o óbito apresentou média de 18,3 dias. Após a instituição dessa assistência, houve uma redução de 27% ( $p < 0,0001$ ) nos custos das diárias nas enfermarias para o grupo avaliado. A redução dos custos para os pacientes em CPs internados em Unidade de Tratamento Intensivo não teve significância estatística para a amostra avaliada, assim como, as variáveis demográficas não influenciaram estatisticamente nos custos. O custo total foi de US\$ 211.981,49 para US\$ 164.562,37 em diárias após a instituição dos CPs para toda a amostra durante o ano de 2019. **Conclusão:** O presente estudo encontrou uma redução significativa nos custos diretos de internação dos pacientes após a inserção em CPs, principalmente para aqueles que foram inseridos em CPs desde o início do período de internação e que estiveram alocados em enfermarias.

**Palavras-chave:** Cuidados Paliativos, Custos, Neurologia, Sistema Único de Saúde.



## Introduction

Palliative Care (PC) is defined as care provided by a multidisciplinary team aimed at improving the quality of life of patients and their families. It seeks to prevent and relieve suffering, ensure early identification of diseases, and provide optimal treatments<sup>19,6</sup>.

There is a growing incidence of neurological conditions that can compromise life continuity. Stroke is the second leading cause of death in Europe, accounting for more than one million deaths annually. It is also the leading cause of long-term disability, loss of independence, and reduced quality of life<sup>9</sup>.

In Brazil, according to data from the Ministry of Health (MH), approximately 100,000 deaths per year are attributed to stroke. This condition has a significant economic and social impact, especially as life expectancy continues to increase<sup>3</sup>.

Given the importance of this topic, following strong societal engagement led by social movements, the MH published the National Palliative Care Policy (PNPC) through Ordinance No. 3,681/2024. This is considered a major achievement for patients within the Unified Health System (SUS). The goal is to enable 1,300 teams to deliver care focused on pain relief, symptom management, and emotional support<sup>14</sup>.

PC optimizes therapeutic approaches by focusing on symptom management, which tends to reduce hospital costs by avoiding potentially excessive measures. Although hospitals and healthcare systems often agree with the clinical objectives of PC, evidence of its value and return on investment is necessary to justify this type of care<sup>5</sup>.

No national publications were found in the literature evaluating hospital costs for neurological patients in the context of PC. Therefore, the objective of this research was to estimate the direct costs associated with hospitalizations of neurological patients before and after the implementation of PC in a hospital within the SUS.

## Methods

A descriptive, quantitative study was conducted to analyze the costs associated with the Palliative Care (PC) service from the perspective of Hospital Mestre Vitalino (HMV). The hospital is managed by the Government of the State of Pernambuco (PE) through the Social Health Organization Hospital do Tricentenário and is located in the city of Caruaru, PE. This research was approved by the Research Ethics Committee (CEP) of the Federal University of Pernambuco (UFPE) on July 4, 2019, under protocol number 3,436,951.

The sample was defined by convenience. Eligible participants were patients aged 18 years or older, diagnosed with neurological diseases, admitted to the Intensive Care Unit (ICU) and/or wards at HMV, and who received approval from the PC committee to initiate this type of care at HMV between January 1, 2019, and December 31, 2019, with progression to death during the same period. Retrospective data analysis began at the time of death and extended back to the patient's hospital admission. The year 2019 was chosen due to data availability. Data sources included electronic medical records managed by the MVPEP System and administrative databases from the Commissions department. The hospital hosting the study does not have a dedicated ward for patients receiving PC.

For the cost analysis in this research, the absorption costing method was used, which involves allocating all direct costs. The

average daily expenses of 132 evaluated patients were summed for the periods before and after the initiation of PC, based on the hospitalization sectors.

To calculate service costs using absorption costing, direct costs (materials and direct labor) were allocated, as these are directly related to production and reflect actual consumption. Indirect costs, which are not directly associated with services, were allocated based on estimates or allocation bases<sup>11</sup>.

Direct costs were assessed after the patients' deaths and divided into two periods: (1) direct costs incurred from the date of admission until the PC committee's recommendation, and (2) direct costs incurred from the PC committee's recommendation until the time of death, representing the PC period. The costs were divided by the number of hospitalization days in each phase to determine average daily costs. These values were adjusted for purchasing power parity (PPP) and the U.S. Consumer Price Index<sup>2</sup> (CPI) and then converted into U.S. dollars using the exchange rate on September 13, 2024<sup>4</sup>.

In addition to costs, sociodemographic variables were assessed, including age, sex, education level, marital status, hospitalization location (ICU or ward), date of inclusion in PC, and date of death. Clinical variables were extracted from medical records, including the primary neurological diagnosis impacting life continuity and quality, and the number of comorbidities recorded according to the International Classification of Diseases (ICD)-10.

Data were processed in Excel spreadsheets and presented in tables and comparative graphs. Continuous variables were expressed as means and standard deviations. The D'Agostino test was used to assess sample normality. For mean comparisons, the Student's t-test was applied for independent samples with a Gaussian distribution. In cases where normality was not achieved, non-parametric tests such as Mann-Whitney or Wilcoxon were used. Statistical significance was set at  $p < 0.05$ . Correlations were determined using Spearman's correlation.

All data were analyzed using GraphPad Prism 6 and STATA software version 9.1. Binary logistic regressions were performed with the latter, using  $p < 0.20$  as the cutoff for multivariate regressions.

## Results

The review of electronic medical records identified 249 patients over 18 years old who utilized PC services at HMV in 2019. Of these, 23 were excluded because they did not receive approval from the PC committee to enter this type of care. Additionally, 94 patients were deemed ineligible as they did not have a primary diagnosis of a neurological disease qualifying them for PC. Thus, the final sample consisted of 132 patients, with 74 females (56%) and 58 males (44%).

The age of patients receiving PC in this study ranged from 29 to 102 years, with a median age of 78 years. Most individuals in the sample were married, accounting for 63% of the participants. Regarding educational level, as recorded in the medical records, 45% of the patients were illiterate, and only 1% had higher education (Table 1).

The most frequently recorded neurological condition was ischemic stroke (101 patients), followed by cerebral hypoxia after cardiorespiratory arrest (ICD-10: G93.1), hepatic encephalopathy (ICD-10: K72), and epilepsy (ICD-10: G40), totaling 31 patients. The number of associated comorbidities ranged from two to eight physical or mental conditions. Most patients remained in PC for up to 15 days during their hospital stay (Table 1).



**Table 1.** Sociodemographic and clinical characteristics of neurological patients in palliative care at HMV (Pernambuco, Brazil).

Clinical characteristics	n	n (%)
<b>Number of comorbidities</b>	2	17%
	3	17%
	4	26%
	5	21%
	≥ 6	19%
<b>Days in CPs</b>	1 -15	62%
	16 - 30	18%
	31 - 60	9%
	61 - 90	7%
	> 90	4%
<b>Hospitalization sector</b>	Infirmary	83%
	ICU	17%

CPs: Palliative Care; HMV: Hospital Mestre Vitalino; ICU: Intensive Care Unit.

### Cost Assessment

The results indicated a reduction in costs with the implementation of PC (Table 2) in the studied sample, particularly for patients in the ward, where a statistically significant difference was observed ( $p < 0.0001$ ) (Table 2).

**Table 2.** Comparison of total costs by hospital admission sector with respective differences (Pernambuco, Brazil).

Sector	Cost before CPs	Cost after CPs	Cost difference
General Wards	US\$ 146.564,42	US\$ 107.450,83	- US\$ 39.113,59 (- 27%)*
ICUs	US\$ 65.416,93	US\$ 57.111,53	- US\$ 8.305,40 (-13%)

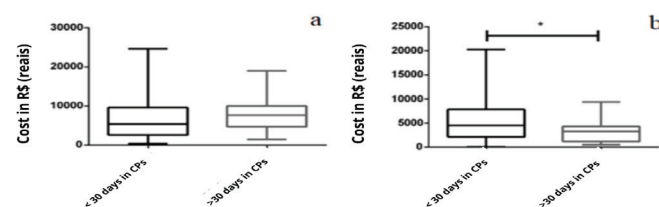
CPs: Palliative care; ICUs: Intensive Care Units. Statistical analysis performed using the Wilcoxon test. \*:  $p < 0.001$  was considered significant when comparing costs before and after palliative care in the general ward.

### Costs Considering Days in PC

There was no statistically significant association ( $p = 0.1312$ ) between the groups that started PC earlier (PC duration > 30 days) compared to those included in PC less than 30 days before death.

However, considering costs after the implementation of PC (Figure 1b), it was observed that there was a lower financial expenditure for the group that remained in PC for more than 30 days before death, with a significant statistical association ( $p = 0.0256$ ).

**Figure 1.** Costs associated with PC according to time to start (Pernambuco, Brazil).



Comparison of costs before starting CPs; b) Comparison of costs after starting CPs, according to the duration of CPs.

The Wilcoxon test was used for statistical analysis. \*:  $p = 0.0256$  was considered significant. CPs: Palliative Care.

### Statistical Analysis of Sociodemographic Variables Versus Time in PC

The variable “Cost After” showed statistically significant confirmation ( $p = 0.001$ ), as shown in Table 3. This provides further evidence of an inverse relationship, indicating that the longer a patient remains in PC, the lower the direct costs (i.e., a higher likelihood of reducing direct costs).

**Table 3.** Multivariate logistic regression with “Days in CPs” as the dependent variable (Pernambuco, Brazil).

Days in CPs versus	OR	Standard error	z	p	IC (95%)
Cost after	0.999	0.0008	-3.33	0.001	0.999 – 0.999
Cost difference	0.999	0.0001	-1.69	0.09	0.999 - 1

CPs: Palliative Care; CI: Confidence Interval; OR: Odds Ratio (Software STATA 9.1).

### Statistical Analysis of “Cost Reduction After PC” Versus “Time in PC”

As presented in Table 4, a statistically significant association ( $p = 0.031$ ) was found between the time spent in PC and cost reduction. In other words, the longer the patient remains in PC, the greater the likelihood of reducing hospitalization costs.

**Table 4.** Univariate logistic regression with “Cost Reduction” as the dependent variable.

Cost Reduction versus	OR	Error standard	z	p	IC (95%)
Days outside of CPs	0.497	0.195	-1.78	0.076	0.230 – 1.074
Days in CPs	4.064	2.647	2.15	0.031	1.134 – 14.567

CPs: Palliative Care; CI: Confidence Interval; OR: Odds Ratio (Software STATA 9.1).

## Discussion

In Brazil, with the increase in life expectancy and, consequently, population aging, there is a growing need for discussions about Palliative Care (PC) and improved patient care. PC remains a relatively new scientific topic in the country but is gaining more attention, particularly in the public sector. Following Resolution No. 41, dated October 31, 2018, from the Ministry of Health (MS), PC must be included nationwide within the Health Care Networks. The resolution provides guidelines for organizing PC within the framework of integrated continued care under the Unified Health System (SUS)<sup>13</sup>.

Of the 132 patients included in the study sample, 110 were elderly, and 45 were over 80 years old. The median age was 78 years. These results align with national and international trends of neurological conditions affecting individuals over 60 years of age. Moreover, there is a need and recommendation for the early inclusion of PC for elderly patients with severe<sup>12</sup> acute stroke.

Another highlighted variable was gender, with 74 patients being women (56%) and 58 men (44%). However, the literature identifies men as being more predisposed to developing cerebrovascular diseases compared to women. Estrogen appears to have a protective effect for women. Additionally, lower exposure to tobacco and alcohol among women—modifiable factors that increase the risk of neurological<sup>13</sup> diseases—may contribute to this difference.

Regarding the duration of PC before death, most of the studied population—106 patients—remained in PC for less than 30 days. Among these, 82 patients (62%) received PC for less than 15 days before death. These findings suggest a late initiation of care, which may negatively impact the quality of life for patients and their families<sup>15</sup>.

Studies show that PC is considered early when initiated at least three months before death. Patients who began PC less than three months before death were classified as receiving “late palliative care.” This classification is based on randomized clinical trials; patients who received early PC integrated with standard oncology treatment experienced improved quality of life and mood, fewer symptoms, and greater satisfaction with care after 12 weeks of treatment compared to those who received only standard<sup>18</sup> oncology treatment.

In their multicenter study, Kendall and colleagues (2018) investigated stroke patients admitted to three Scottish hospitals. Combining the data yielded a sample size of  $n=219$ , and the study showed that 57% of patients with total anterior circulation syndrome died within six months. Questionnaires revealed that patients experienced immediate and persistent emotional distress and poor quality of life. These findings suggest that PC should be initiated as early as possible<sup>10</sup>.

In the present study, there was a significant reduction in costs for patients admitted to wards ( $n=109$ ), with a 27% decrease in average daily costs. Patients who were enrolled in PC early—at the beginning of hospitalization—had even lower costs. Conversely, the group admitted to the ICU showed only a 13% reduction, which was not statistically significant. This result can be explained by the smaller number of patients receiving PC in the ICU compared to those in the ward.

There was considerable variability in the direct hospitalization costs within the study sample. This phenomenon may be attributed to the range of treatments provided based on each patient’s complexity. Additionally, there is a tendency to use measures that are inconsistent with PC in intensive care settings, such as vasopressor use, routine testing, invasive mechanical ventilation, and other interventions.

These findings align with those of Khandelwal and colleagues (2017), who outlined recommendations for economic evaluations of PC for ICU patients. The authors highlighted the need for accurate economic estimates in this area. They noted slight differences between the cost of a day in the ICU at the end of a stay and the cost of the first day of intensive care, emphasizing the need for analytical<sup>20</sup> consideration of this variation.

Modern intensive care should balance palliative and curative measures in critical conditions to ensure the well-being of patients and their families<sup>7</sup>. In their research, Bickel and Ozanne (2017) discussed the challenge of quantifying the value of life. They raised the issue that the revenue generated by a typical multidisciplinary PC team is often lower than the actual costs. While hospitals and health systems frequently agree with the positive clinical goals of PC, they seek evidence of value and return on investment. In their cited study, cost analysis revealed a 25% reduction in hospital expenses (from \$452.33 to \$353.64) following the adoption of palliative therapeutics<sup>5</sup>.

However, another study involving non-oncological patients indicated that individuals with various chronic illnesses could benefit from palliative care (PC). The authors also evaluated

whether there was a significant reduction in hospital costs, hypothesizing that PC is associated with lower hospital expenses for individuals dying of cancer. However, it was unclear whether hospital costs were universally reduced across various life-limiting conditions eligible for PC. Their findings showed that individuals with Alzheimer’s disease and Parkinson’s disease had the lowest rates of hospital expenditures. The authors reported that implementing PC during hospitalization consistently resulted in lower hospital costs in the last year of life<sup>17</sup>.

Despite robust literature on the benefits of PC, studies focusing on its cost implications remain limited. Several limitations of this research can be highlighted: (i) convenience sampling in a single hospital. This may limit the generalizability of findings; (ii) absence of a dedicated PC unit. The healthcare facility where the research was conducted lacks a specialized PC unit, which could hinder clinical practice, the work of the multidisciplinary team, and potentially influence direct costs; (iii) data collection timeframe. The data collection period dates back over five years (2019); (iv) given the size and role of Hospital Mestre Vitalino (HMV) as a referral center for neurological conditions, there may be underreporting of patients eligible for PC referral to the commission active in the unit.

Excessive use of life-sustaining therapies is often observed, even when such measures fail to improve quality of life. Furthermore, the integration of Brazilian healthcare services with PC remains inadequate. To address this, various healthcare strategies have emerged in recent years to meet the needs of individuals facing life-threatening diagnoses. The most recent of these is the National Palliative Care Policy (PNCP), which formalizes increased investments and specialized training for healthcare professionals, enabling teams to address these demands<sup>14</sup> effectively.

In this context, training programs are sporadic, and there is still resistance to discussing the topic. This highlights the need for a substantial shift in knowledge management and the curricula of healthcare professionals’ undergraduate programs to provide PC with the opportunity to establish itself in Brazil<sup>21</sup>.

Thus, this study can contribute to the discussion of PC in the national context, aiming to improve care for critically ill patients and their families, while simultaneously promoting greater social and economic well-being.

## Conclusion

This study found a significant reduction in the direct hospitalization costs of patients following their inclusion in palliative care (PC), particularly for those who were enrolled in PC at the beginning of their hospitalization and were admitted to general wards.

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The authors declare no conflicts of interest.

### Contributors

CSM and MCP conceived the project, analyzed and interpreted the data, and drafted the project. MMR contributed to the drafting and critical review of the project. All authors are responsible for all aspects of the work and ensure the accuracy and integrity of any part of the study.



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