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PREVALENCE OF PROLONGED HOSPITAL STAY IN OLDER ADULT PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA AND ASSOCIATED FACTORS AT VICENTE CORRAL MOSCOSO HOSPITAL, CUENCA, IN 2021

Janina Tatiana Torres Arévalo[1]*, Julia Alexandra Mejía Almeida[2]

[1]*Médica. Posgradista en Medicina Interna – Universidad de Cuenca,
Email: janina.torresa90@ucuenca.edu.ec, ORCID ID: http://orcid.org/0000-0003-2430-3586
[2]Médica especialista en Geriatría y Gerontología – Hospital Vicente Corral Moscoso,
Email: alexita.mejis@gmail.com, ORCID ID: https://orcid.org/0009-0001-5080-8265

***Corresponding Author: -** Janina Tatiana Torres Arévalo
*Médica. Posgradista en Medicina Interna – Universidad de Cuenca,
Email: janina.torresa90@ucuenca.edu.ec, ORCID ID: http://orcid.org/0000-0003-2430-3586

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Abstract

Introducction: Community-Acquired Pneumonia (CAP) occurs outside the hospital environment and is a frequent cause of morbidity and mortality, mainly in older adults. **Objective:** determine the prevalence of prolonged hospital stay and associated factors in older adults with CAP at the Vicente Corral Moscoso Hospital (VCMH) in Cuenca. **Materials and methods:** a cross-sectional analytical study was carried out with 129 older adults admitted to the Internal Medicine Department of the VCMH for CAP during the year 2021. To collect the information, the observational method was used, which consisted of the analysis of the patient's clinical histories. Through the Chi-Square test, categorical associations were made, while the risk was determined with OR, in 2x2 tables. The significance of 5% ($p<0.05$) was obtained through the Mann-Whitney U-test. Data processing was performed using SPSS v.27. **Results:** The prevalence of prolonged hospital stay was 65.89%, with a median of 11 days and an average of 17.5 days. Associated factors were age, the severity of PSI pneumonia (69.4% of patients presented class IV/V), previous cognitive impairment, and dependence on instrumental activities of daily living (severe and moderate). **Conclusions:** the main factors associated with prolonged hospital stay were the severity of CAP and dependence on instrumental activities of daily living. In addition, this study found that the lower the cognitive impairment and the more advanced the age, the shorter the hospital stay.

Keywords: older adult, community-acquired pneumonia, prolonged hospital stay. associated factors.

Resumen

Introducción: la Neumonía Adquirida en la Comunidad (NAC), se produce fuera del ambiente hospitalario y es una causa frecuente de morbimortalidad, principalmente en adultos mayores. **Objetivo:** determinar la prevalencia de la estancia hospitalaria prolongada y factores asociados, en adultos mayores con NAC, en el Hospital Vicente Corral Moscoso (HVCM), en Cuenca. **Materiales y métodos:** se realizó un estudio analítico transversal, con 129 adultos mayores que ingresaron al servicio de Medicina Interna del HVCM por NAC, durante el año 2021. Para recolectar la información, se empleó el método de observación, que consistió en el análisis de historias clínicas de los pacientes. A través de la prueba de Chi-Cuadrado, fueron realizadas asociaciones categóricas, mientras que, el riesgo se determinó con OR, en tablas de 2x2. La significancia del 5% ($p<0.05$), fue obtenida a través de la Prueba U de Mann-Whitney. El procesamiento de datos fue realizado a través

de SPSS v.27. **Resultados:** la prevalencia por estancia hospitalaria prolongada fue del 65.89%, con mediana de 11 días y promedio de 17.5 días; y fueron factores asociados la edad, la severidad de neumonía por PSI (el 69.4% de pacientes presentó clase IV/V), alteración cognitiva previa y dependencia en actividades instrumentales de la vida diaria (grave y moderada). **Conclusiones:** los principales factores asociados a la estancia hospitalaria prolongada fueron la gravedad de la NAC, la dependencia a las actividades instrumentales de la vida diaria. Además, en este estudio se determinó que, mientras menor sea el deterioro cognitivo y más avanzada sea la edad, la hospitalización es más corta.

Palabras clave: adulto mayor, neumonía adquirida en la comunidad, estancia hospitalaria prolongada. factores asociados.

Introduction

Aging is a gradual process that develops over the course of a lifetime and involves biological, physiological, and psycho-social changes, with different consequences[1]. At this stage, the respiratory tract undergoes structural and functional changes; the elastic elements of the lung tissue are lost, the alveoli and bronchioles dilate, the elasticity of the chest wall decreases, intercostal muscle mass and strength are lost, and the gas exchange surface area is reduced[2,3]. Older adult patients are the main users of hospitalization services and present a combination of multiple comorbid conditions, which usually decompensate and lead to states of prefrailty, frailty, and mild and severe disability, including death, thus increasing the length of hospital stay and readmissions; in addition, as they are subjected to more tests and diagnostic procedures, health care costs also increase[4,5]. Gallego-González et al.[6] describe in their study that lack of functional recovery at discharge is associated with increased mortality at 6 and 12 months.

Community-acquired pneumonia (CAP) occurs outside a hospital setting, involves the lung parenchyma, and is a frequent cause of morbidity and mortality, especially in older adults[7]. Its estimated prevalence, worldwide, ranges from 150 to 1400/100.000[8].

In 2017, in people older than 70 years, their mortality rate was 261/100.000, representing an increase of 9% compared to 3 previous decades[8,9]. Its incidence increases exponentially with age, and it also represents a need for hospital admission 11 to 12 times higher than that of younger people[10]. The main predisposing factors for its development are decreased mucociliary clearance, colonization of the pharynx by pathogenic germs, and proliferation of bacteria in the gastric contents[11].

For this study, hospital stay was considered as an indicator of hospital efficiency, which is prolonged when it exceeds 9 days and generates negative effects on the health system, such as increased costs, poor accessibility to hospitalization services, emergency room saturation, and risks of adverse events[12,13].

The objective of this research was to determine the prevalence of prolonged hospital stay and associated factors in older adults with community-acquired pneumonia at the HVCM in the city of Cuenca.

Methodology

In order to investigate the prevalence and associated factors of prolonged hospital stay, a cross-sectional analytical study was used. Through the EPIDAT version 4.2 program, the universe of 129 older adult patients admitted to the Internal Medicine service of the HVCM for hospitalization and emergency, with a diagnosis of CAP, during the year 2021 was determined. The expected prevalence of pressure ulcers (with a value of 7.43%) was taken into account as sample restrictions[14], The inclusion criteria were patients aged 65 years or older, with a clinical and radiological diagnosis of CAP and duly signed consent. Patients were excluded from the study if they did not have a chest X-ray and had a diagnosis of in-hospital pneumonia, i.e., developed symptoms more than 48 hours after hospitalization[15].

To collect the information, the observation method was used, as well as direct and individual interviews with the patients and their clinical histories, establishing the study variables as follows: sociodemographic data, such as sex ratio and mean age, marital status, were gathered from the interviews, while nutritional status was determined by the Mini Nutritional Assessment scale, MNA, with the following interpretation: normal (24-30), risk of malnutrition (17-23.5), and malnutrition (< 17)[16,17]. For the biochemical parameters of nutrition (lymphocyte count, serum albumin, and total cholesterol levels), data were taken from medical records.

For the variable severity of pneumonia, the Pneumonia Severity Index (PSI) was considered, which guides the initial need for admission and degree of care of each patient (outpatient care, hospital admission, or admission to intensive care), interpreted as follows: mild risk ≤ 70-90 points (Class II-III), moderate risk 91-130 points (Class IV), high or severe risk >130 points (Class V), and high or severe risk >130 points (Class V)[18,19]. For the variable dependence for basic activities of daily living, the Barthel Index was used, which classifies dependence as total (0-20), severe (21-60), moderate (61-90), low (91-99), and independence (100)[20,21].

The variable dependence for instrumental activities of daily living was evaluated through the Lawton and Brody Scale and interpreted as follows: total dependence (0-1), severe (2-3), moderate (4-5), light (6-7) and autonomy (8)[22]. Meanwhile, the confusion variable was assessed with the *Confusion Assessment Method* (CAM), which is positive provided that the first two criteria (acute change in mental state with a fluctuating course and inattention) and at least one of the last two (disorganized thinking and altered level of consciousness) are included[23].

For the cognitive status variable, in adults who did not demonstrate delirium, two scales were applied: MEC (Mini Cognitive Examination) used in patients with schooling and ISAACS (Verbal Semantic Fluency Test), for those without schooling. In both instruments, it was interpreted that the lower the score, the lower the cognitive functioning[24,25]. The socio-family risk assessment was measured using the Gijón scale, as follows: good social situation (<7 points), intermediate situation (8-9 points), and severe social deterioration (>10 points)[26].

To determine the variables of antibiotic use, multiple hospital admissions, pressure ulcers, dysphagia, polypharmacy, and immunizations, interview responses were collected. While, serum inflammatory parameters (C-reactive protein, procalcitonin, lactate) were obtained from medical records.

Statistical analysis was expressed through percentage frequency measures and numerical variables through measures of central tendency and dispersion. Categorical associations were performed through the Chi-square statistical test and the range of OR, in 2x2 tables. Comparison between groups was established through the Mann-Whitney U test, obtaining a significance of 5% ($p<0.05$).

Data processing was performed using the SPSS version 27 statistical package and the logistic regression model was run in JASP 0.17.0.

Results

Of the 129 participants. 63 were men (48.8%) and 66 were women (51.2%), with ages ranging from 65 to 99 years with a mean age of 79.74 years, within the age classification 50 patients were within the group of very old age (>85 years), marital status married (41.1%) or widowed (31.8%), 42.6% had independence in basic activities and 24.8% with total dependence in instrumental activities of daily living.

Table 1. Characterization of participants

Characteristics		n	%
Sex	Male	63	48.8
	Female	66	51.2
Age	Young old age (65 to 74 years old)	46	35.7
	Advanced old age (75 to 84 years)	33	25.6
	Very old age (≥ 85 years)	50	38.8
Marital Status	Single	23	17.8
	Married	53	41.1

	Divorced	12	9.3
	Widowed	41	31.8
Basic activities	Total dependence	18	14.0
	Severe dependence	12	9.3
	Moderate dependency	35	27.1
	Low dependence	9	7.0
	Independence	55	42.6
Instrumentals	Total dependence	32	24.8
	Severe dependence	20	15,5
	Moderate dependency	30	23.3
	Light dependence	32	24.8
	Autonomy	15	11.6

The hospital stay of the patients ranged from 2 to 53 days. Considering that the indicator for prolonged stay is ≥9 days, the prevalence was 65.89% with a mean of 17.5 days (SD = 8.9 days); for short stays, the mean was 5.9 days (DE = 1.9).

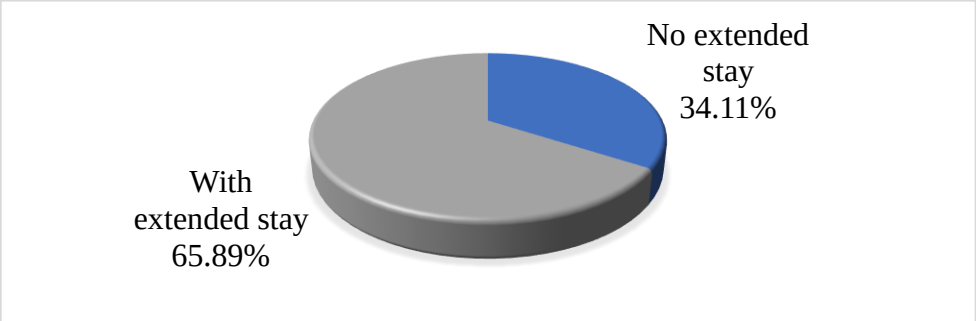

Figure 1. Prevalence of prolonged stay

Patients had an average weight of 61.0 kg (SD = 14.5 kg) and 160 cm in height, the albumin malnutrition marker was on average mild, and lymphocytes and cholesterol at a moderate level. In general, the Body Mass Index (BMI) was within the normal range (M=25.4; SD=5.9), however, the nutritional assessment (M=19.9; SD=5.3) showed that 51.2% of patients were at risk of malnutrition.

Table 2. Nutritional characteristics

Indicators		Media	DE
Nutritional indicators	Weight	61.0	14.5
	Height (m)	1.6	0.1
	Body Mass Index (BMI)	25.4	5.9
	MNA (Mini Nutritional Assessment)	19.9	5.3
	Albumin	3.1	0.6
	Lymphocytes	1123.3	695.3
	Cholesterol	134.1	33.1
Indicators		n	%
MNA (Classification of *Mini Nutritional Assessment*)*	Malnutrition	29	22.5
	Risk of malnutrition	66	51.2
	Normal nutritional status	34	26.4
BMIC (Body Mass Index Classification)	Skinny	56	43.4
	Normal	31	24.0
	Overweight	23	17.8
	Obese	19	14.7

Note: * From the score of the MNA (*Mini Nutritional Assessment*) nutritional status is classified as malnutrition, risk of malnutrition, and normal nutritional status.

When relating socio-demographic and clinical factors to the presence of prolonged hospital stay, it was found that the severity of pneumonia divided by class was significantly related to the presence of prolonged hospital stay (X^2=8.24; p=0.041). 69.4% of patients had class IV pneumonia (Table 3).

Table 3. Relations

		No extended stay (<9 days)		With extended stay (≥9 days)		X^2	OR (ICI - ICS)
		n	%	n	%	(p)	
Sex	Male	18	40.9	45	52.9	1.68 (0.195)	0.615 (0.295 – 1.285)
	Female	26	59.1	40	47.1		
Age	Young old age	11	25.0	35	41.2	5.486 (0.064)	-
	Advanced old age	10	22.7	23	27.1		
	Very old age	23	52.3	27	31.8		
Marital Status	Single	6	13.6	17	20.0	0.845 (0.839)	-
	Married	19	43.2	34	40.0		
	Divorced	4	9.1	8	9.4		
	Widowed	15	34.1	26	30.6		
Delirium	No	29	65.9	54	63.5	0.072 (0.789)	1.110 (0.517 – 2.383)
	Yes	15	34.1	31	36.5		
Polypharmacy	No	28	63.6	62	72.9	1.190 (0.275)	0.649 (0.298 – 1.414)
	Yes	16	36.4	23	27.1		
Hospital Admission	No	28	63.6	61	71.8	0.895 (0.344)	0.689 (0.317 – 1.494)
	Yes	16	36.4	24	28.2		
Immunizations	No	16	36.4	36	42.4	0.432 (0.511)	0.778 (0.367 – 1.646)
	Yes	28	63.6	49	57.6		
ATB	No	36	81.8	66	77.6	0.305 (0.581)	1.295 (0.516 – 3.252)
	Yes	8	18.2	19	22.4		
Ulcers	No	36	81.8	77	90.6	2.052 (0.152)	0.468 (0.162 – 1.345)
	Yes	8	18.2	8	9.4		
Severity of pneumonia	Class II	1	2.3	0	0.0	8.238 (0.041*)	-
	Class III	8	18.2	9	10.6		
	Class IV	20	45.5	59	69.4		
	Class V	15	34,1	17	20,0		
Socio-family risk	Good social situation	23	52.3	45	52.9	1.156 (0.561)	-
	Intermediate situation	8	18.2	21	24.7		
	Severe social deterioration	13	29.5	19	22.4		

Note: * Significant difference (p<0.05)

Patients with prolonged hospital stay presented a mean age of 78.7 (SD=9.8), a mean BMI was 25.1 (SD=5.5), in general, it was determined that these patients had greater dependence on basic activities

of daily living (M=80. 2; SD=29.6), dependence for instrumental activities of daily living (M=4.3; SD=2.5), also elevated lymphocytes (M=1141.3; SD=668.4) as well as procalcitonin (M=4.1; SD=14.3). Although there was no general level of deterioration, patients with prolonged hospital stay presented greater difficulties (Z=2.895; p=0.004), Details are in Table 4.

Table 4. Comparisons according to numerical variables

Characteristics	No extended stay		With extended stay		Z (p)
	Media	DE	Media	DE	
Age	81.8	9.1	78.7	9.8	1.917 (0.055)
Body Mass Index	25.9	6.7	25.1	5.5	0.566 (0.571)
Calf	32.3	8.0	31.4	4.2	0.012 (0.990)
MNA	19.3	6.0	20.3	4.9	0.689 (0.491)
Dependence for basic activities of daily living	67.8	38.4	80.2	29.6	1.706 (0.088)
Dependence for instrumental activities of daily living	3.5	3.2	4.3	2.5	1.269 (0.205)
Socio-familial risk	7.8	3.3	7.3	3.1	0.610 (0.542)
Cognitive functioning (MEC)	31.6	3.5	29.3	4.0	-2.166 (0.030*)
Cognitive functioning (ISAAC)	26.7	8.1	24.1	9.5	-0.672 (0.502)
Severity of pneumonia	115.3	24.5	113.5	18.1	0.845 (0.398)
Albumin	3.2	0.7	3.1	0.6	0.977 (0.328)
Cholesterol	134.3	32.1	134.1	33.8	0.234 (0.815)
Lymphocytes	1088.6	751.4	1141.3	668.4	0.648 (0.517)
Procalcitonin Ng/ml	3.1	7.9	4.7	14.3	1.417 (0.156)
CRP Mg/L	26.3	42.4	19.7	32.0	0.683 (0.495)
Lactate mmol/l	2.3	2.2	2.2	1.8	0.308 (0.758)

Note: For the analysis of cognitive functioning, patients with delirium were excluded * Significant difference (p<0.05)

When correlating demographic, nutritional, cognitive, and socio-familial characteristics with the time in days of hospitalization, it was identified that age had a slight inverse relationship with that of the time of hospitalization, while cognitive functioning in patients with schooling (MEC) had an inverse relationship at a moderate level. Clinical characteristics did not reflect any relationship (Table 5).

Table 5. Correlation between days of hospital stay and patients' characteristics

	rs	p
Age	-.182*	0.039
BMI (Body Mass Index)	0.022	0.806
Calf	0.024	0.787
MNA	-0.001	0.995
BADL (Dependence for basic activities of daily living)	0.137	0.121
IADL (Instrumental Activities of Daily Living Dependence)	0.071	0.425
Socio-familial risk	-0.012	0.891
MEC (Cognitive impairment)	-.323*	0.016
ISAAC (Cognitive impairment illiterate)	-0.298	0.124
Severity of pneumonia	0.026	0.773
Albumin	-0.046	0.608
Cholesterol	-0.002	0.981
Lymphocytes	0.073	0.408
Procalcitonin Ng/ml	0.196	0.081
CRP Mg/L	-0.015	0.872
Lactate mmol/l	0.034	0.704

Note: For the analysis of cognitive functioning, patients with delirium were excluded.
A stepwise logistic model with hospital stay as the dependent variable, age and cognitive function as co-variables, and instrumental dependence as a factor, revealed a poorly adjusted but significant model (R2=0. 372) in cognitive function, severe and moderate instrumental dependence and age were elements associated with a prolonged hospital stay when visualizing the standardized estimators it was identified that cognitive function and severe instrumental dependence intervened negatively in prolonged hospital stay; in addition, cognitive functioning and age represented a protective factor for a high hospital stay, details in Table 6.

Table 6. Stepwise regression model (Stepway)

Model	***Parameter***	***Standardized estimator***	***Odds Ratio***	**p**	**ICI (95%)**	**ICS (95%)**
1	*(Intercept)*	0.80	2.23	0.00	1.33	3.74
2	*(Intercept)*	0.94	26.14	0.01	1.79	380.20
	Cognitive	-0.163	0.85	0.054	0.719	1.00
3	*(Intercept)*	-2.95	3.79	0.21	0.45	31.51
	Cognitive	-1.57	0.85	0.51	0.73	09.8
	Instrumental Dependence (Severe)	4.42	83.65	0.06	0.80	87.74
	Instrumental Dependence (Moderate)	5.33	208.21	0.02	1.92	225.70
	Instrumental Dependence (Light)	4.04	56.94	0.09	0.47	67.86
	Instrumental (Autonomy)	4.02	56.15	0.09	0.51	61.62
4	(Intercept)	-3.26	2.77	0.02	2.85	26.93
	Cognitive	-1.83	0.82	0.05	0.71	0.96
	Instrumental dependence (Severe)	-0.70	215.33	**0.03**	1.64	281.24
	Instrumental dependence (Moderate)	5.37	420.75	**0.01**	2.95	599.45
	Instrumental Dependence (Mild)	6.04	89.76	0.07	0.63	127.17
	Instrumental (Autonomy)	4.49	51.89	0.10	0.42	63.11
	AGE	3.94	**0.92**	**0.04**	0.85	0.997

Model 1: R^2 = 0.00; Model 2: R^2 = 0.11; Model 3: R^2 = 0.23; Model 4: R^2 = 0.3. For the analysis of the cognitive model, patients with delirium were excluded.

Discussion

Although no specific time has been standardized to define prolonged hospital stay, the decision was made to consider it as from 9 days, based on studies that consider it within a range of 9.4 ±3.3 days and 14.1 ±7.2 days, with a mean duration of 11.5 ± 6.4 days[27,28]. In this research, it was proposed as greater than 9 days and was present in 65.89% of the patients, having a median of 11 days; with a mean stay value of 17.5 days (SD = 8.9 days). In the year 2018, in Cuba, 63.4% of patients were admitted for up to seven days and 36.6% had a stay longer[29]. Whereas, in 2016, in Spain, the mean length of stay was 9.8 days (SD: 6.9) and the median length of stay was 8 days [13]. Ramos-Ramírez[30] and Bo et al.[31], described that the average length of hospital stay was 11 days.

Prolonged hospital stay in this research was associated with cognitive functioning, specifically that evaluated in patients with schooling, this coincides with studies in which functional deterioration is

related to prolonged hospital stay accompanied by an increase in the rate of complications, functional deterioration, hospital readmission, mortality, which has caused an interruption in the flow of patients and their access to care[5,32].
Fick[33] related delirium to the longer length of hospital stay (mean = 9.1) and poorer function at discharge. Thus, he argued that the presence of cognitive impairment may make older adult patients who are hospitalized more likely to deteriorate their functional status or to be unable to recover function once the acute illness is resolved. James[34] concluded that non-elective hospitalizations are related to a more dramatic acceleration in cognitive deterioration and may prolong hospital stays. This study argues that, although there is no relationship with the presence of delirium, the higher the cognitive functioning, the fewer the days of hospitalization.

In a study conducted in Lima that analyzed the behavior of hospital stay from 1997 to 2008, it was determined that there was no relationship between age and prolonged stay[35], In another study carried out in Cuba, it was pointed out that advanced age is not a condition for a longer hospital stay, but the presence of comorbidities and the degree of dependence, the development of severe pneumonia and complications were more frequent in the group with a prolonged stay[32]; in addition, García-Vidal[36] reported that patients with higher severity of CAP have a longer mean hospital stay. Para Toh[28], the severity of illness, and functional status are risk factors for prolonged hospital stay. these assumptions are consistent with the results of this research, initially with an absence of a relationship between age and prolonged hospital stay and similarly, prolonged hospital stay with severity of pneumonia.

In the present study, no relationship was found between a prolonged hospital stay and dependence on basic activities of daily living, as mentioned by Lopez [13], who also found a relationship with older age, Charlson Index, marital status, main admitting diagnosis, albumin, and functional loss. However, moderate or severe instrumental dependence in this research represented a risk factor.

The link between the number of days of hospitalization and the age of the patients allows to interpret that the older the patient, the shorter the hospital stay. This result is based on clinical practice, which opts for a short stay in older patients. Priority is given to stabilizing them, administering short courses of antibiotics, and considering home admission to avoid in-hospital complications, taking into account that a long stay is a risk factor for mortality in older adults, independent of 6 months after discharge[10].
In addition, in younger patients, the aim is to compensate for previous pathologies and to perform more diagnostic studies during hospitalization.

Conclusions

The majority of older adult patients participating in the research were women, and a considerable percentage were over 85 years old, which classifies them as very advanced old age. In addition, they presented a prolonged hospital stay (≥9 days), the main related factors were: the severity of CAP, cognitive functional status, and dependence on instrumental activities of daily living (moderate to severe degree).
Concerning biochemical markers, no significant association was found with a prolonged hospital stay, but in general, patients presented mild hypoalbuminemia, moderate lymphopenia, and moderate hypocholesterolemia.
BMI was measured in all patients and in those whose physical condition did not allow it, weight and height were estimated with standardized formulas; most of them had a normal body mass index and when classified according to the NMI, most of them were risk of malnutrition, which led not to consider BMI as the only nutritional indicator.
In younger patients, longer stays were recorded, which is because they underwent mainly diagnostic procedures, while in older patients, short antibiotic regimens were applied and home admission was prioritized.

It is important to point out that the institution had a shortage of the reagent to perform the procalcitonin test (PCT) for several periods, so it was not possible to define whether or not there is a relationship between this indicator of sepsis risk and prolonged stay. Due to the pandemic caused by the SARS-CoV-2 virus, in the immunization variable, priority was given to knowing whether the older adult patients had full doses of COVID-19; immunizations for Influenza and Pneumococcus were not taken into account.

Specific comorbidities were not analyzed because this research sought the relationship of hospital stay with nutritional and cognitive characteristics, so it is recommended to deepen the line of research with these variables independently of demographic characteristics. In the present study, when assessing functional status, the normal Lawton and Brody scale was used; however, it is recommended that, for future research, it be replaced by the modified scale, since culturally women perform more domestic activities and therefore men will generate lower scores that do not necessarily reflect their functionality.

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