

THE FUNCTIONAL PROFILE OF PEDIATRIC PATIENTS ADMITTED TO THE ICU OF A REFERRAL HOSPITAL

O PERFIL FUNCIONAL DE PACIENTES PEDIÁTRICOS INTERNADOS NA UTI DE UM HOSPITAL DE REFERÊNCIA

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Abstract: Introduction: Intensive care units are a relatively recent area in medicine, having emerged about 50 years ago, around 1980, for the care of children in critical health conditions. At an epidemiological level, it is of utmost importance to discover patterns of events in relation to the health and subsequent treatment of these patients. **Objective:** To assess the level of functionality of critically ill pediatric patients upon admission and discharge from the pediatric intensive care unit. **Methods:** This is a retrospective, descriptive, observational, cross-sectional, analytical and cohort study, with critically ill patients in the period from 2021 to 2022. Functional status upon admission and discharge was assessed using the Functional Status Scale in Intensive Care Unit, gestational age in the case of premature infants, weight, diseases acquired during pregnancy, and reason for hospitalization. **Results:** 61 female and 80 male children were selected, under 1 year and over 10 years old. Individuals aged between 01 and 02 years, 47.54% female and 41.25% male, the mean age was 3.61, with height 86.83 cm. Pneumonia ($p=0.0035$) was the most prevalent pathology causing greater functional impairment. **Conclusion:** The data obtained in our study can be compared to those reported for other pediatric intensive care units in Brazil and worldwide, considering population differences. The results found are similar to those of other health centers.

Keywords: Pediatrics, Integrative Pediatrics, Functional Status, Intensive Care Units,

INTRODUCTION

Intensive Care Units (ICU) is characterized by the continuous offering of advanced life support for patients in critical conditions, making it different from other hospital sectors. They were created around the 1940s, due to numerous scientific advances and the need for care and treatment of vulnerable patients with high risk of death¹. In relation to pediatric intensive care units (PICU'S), a relatively recent area in medicine, they emerged about 50 years ago, around 1980, for the care of children in a critical state of health². Where they are directed to the care of patients between the ages of 29 days and 12 years, this limit being defined according to the routines of each institution^{3,4}. In Brazil, the first ICU aimed at pediatric patients appeared in 1974, in São Paulo¹. Being environments for continuous care, monitoring and treatment in order to provide the improvement of dysfunction induced by the underlying pathology and reduce the morbidity and mortality of these individuals⁵.

Além de que aproximadamente 30 milhões de crianças são avaliadas por clínicos gerais e pediatras. According to the most recent Census of the Intensive Medicine Association of Brazil (AMIB), the main causes that lead to hospitalization of these patients are: infections, respiratory and central nervous system changes. In addition, another census also shows that there are 2.84 pediatric ICU beds per 10,000 inhabitants up to 14 years in Brazil⁶. At the epidemiological level, it is of paramount importance to discover patterns of events in relation to health and subsequently to the treatment of this patient, due to about 25% of hospital admissions being by pediatric patients. In addition, approximately 30 million children are evaluated by general practitioners and pediatricians⁷.

In this context, due to the criticality of the individual's condition and the need for stabilization, the use of advanced life support such as invasive mechanical ventilation, vasoactive drugs, sedation, among others, are necessary for the patient's body to be able to respond to the necessary therapy and combat the causative agent of the disease. However, it is important to point out that, although they are strategies to help, they can still cause certain physiological or mechanical dysfunctions, such as functional loss, which will directly affect the performance of tasks such as sitting and orthostatism or also in simpler ones such as picking up objects, for example.

To this end, the FSS-ICU (Functional Status Scale in Intensive Care Unit) was developed

to evaluate the functionality of children in the PICU. Composed of 6 domains: mental state, sensory functioning, communication, motor functioning, food and respiratory state. Each domain is categorized from normal (1) to very serious (5). From the sum of the values obtained in this categorization, the total score varies from 6 to 30 points, where lower scores indicate better functionality⁸.

As a way to maintain the functionality, well-being and adequate development of the child within the PICU, physiotherapy has proven indispensable, since sedated or mechanically ventilated patients are on prolonged rest due to the clinical picture in which they are. These prolonged immobilizations lead to several short, medium and long-term problems, such as hypotonia and hypotrophy of muscles at the axial level that will directly affect postural control and even diaphragmatic and appendicular functionality affecting fine and thick motricity, triggering the delay in neuropsychomotor development. Therefore, the mobilization made by these professionals is of paramount importance, since they improved the general functional capacity of the patient and restored their respiratory and physical independence, thus reducing the risks of complications associated with staying in bed, causing the patient's hospitalization time to decrease, consequently, there will be a lower financial cost for hospitals (9). Therefore, the present study aimed to evaluate the level of functionality of pediatric critical patients at admission and discharge from the ICU.

METHODS

This is a retrospective, descriptive, cross-sectional, analytical and cohort study, with a selection of electronic medical records of pediatric patients aged between 01 and 10 years who were hospitalized in the PICU in the period from January 2021 to December 2022. The research was conducted at the Medical Archive and Statistics Service Sector (SAME) of the Dr. Abelardo Santos Regional Hospital (HRAS), in the city of Belém, in the state of Pará, Brazil. This research was approved by the Ethics and Research Committee with Human Beings (CEP) of the Maurício de Nassau University Center - Belém, through the substantiated opinion number 6.075.335/2023.

The functional status at admission and discharge from the PICU was evaluated through the FSS-ICU to determine the degree of commitment during the hospitalization period, in addition, the age group, weight, body mass index (BMI), height, most prevalent pathologies and reason for hospitalization in the pediatric ICU were analyzed. And 500 medical records were selected from patients who were hospitalized in the PICU for more than 48 hours (forty-eight hours) who presented functional decline from the evaluation of the physiotherapist. Medical records of patients hospitalized in the institution directly and transferred and excluded from the study medical

records with incomplete records and that evolved to death during the period of hospitalization in the PICU were included in the study.

The information obtained was included in spreadsheets of the Microsoft Excel Office 2010 (Windows) application, the results were presented in texts and tables. Regarding the quantitative evaluation, the data obtained were treated by statistical methods and percentage including measures of central tendency and dispersion according to the specificities of the data. The analysis was performed after evaluation, interpretation, correlation and comparison of the collected results, where the numerical data were quantified through the statistical tests Student's T test, Chi-square test and Wilcoxon to compare the variables, with a level of statistical significance of 5%.

RESULTS

Among the sample universe found, 301 medical records were selected for analysis where 142 showed compliance with the inclusion criteria of the research. The other 159 were excluded because they did not present sufficient data for the investigation and patients who died in the PICU.

Table 1 shows the age group of the patients who were included in the study, where 61 female and 80 male children were found, with ages ranging from 1 to 10 years of age of both sexes. Individuals between 01 and 02 years old, presented a higher quantitative, being 47.54% female and 41.25% male, although the age group specifically did not present a statistically significant correlation ($p= 0.6451$) to determine the prevalence of age according to the sex of patients in the sector.

Table 1 - Data regarding the age group of pediatric patients admitted to the ICU in a reference hospital.

Age range	Female (n=61)		Male (n=80)		General (n=141)		p-value*
	n	%	n	%	n	%	
From 1 to 2 years	34	55,74	42	52,50	76	53,90	0,6451
From 03 to 04 years	8	13,11	15	18,75	23	16,31	
From 05 to 06 years	8	13,11	7	8,75	15	10,64	
From 07 to 08 years	2	3,28	5	6,25	7	4,96	
From 09 to 10 years	5	8,20	3	3,75	8	5,67	
Up to 10 years	4	6,56	8	10,00	12	8,51	

Source: Prepared by the authors, 2024.
Result of the Chi-square test.

The anthropometric data of the patients found were distributed in table 2, where the mean age was 3.61 and the height 86.83cm in general. Unlike the height of the patients, the age showed a dispersion of ± 3.47 not having such a high standard deviation, being a positive data for the research since it represents a greater homogeneity of the sample favoring a more reliable comparative analysis.

Table 2 - Anthropometric data of patients admitted to the pediatric ICU.

General and anthropometric characteristics	General	
	Average	\pm Standard deviation
Age (years)	3,61	3,47
Height (cm)	86,83	27,81
Body mass at entry (kg)	14,13	11,37
Body mass at exit(kg)	12,17	10,38
BMI at entry (kg)	17,44	9,24
BMI at departure (kg)	15,39	10,35
Days of hospitalization	435,09	181,21

Source: Prepared by the authors, 2024. Student's t test result .

The same can be found in the weight, evaluated in kilograms, where there was the presence of a significant weight loss, already expected by the fact of the condition of these patients due to the pathologies found, since the criticality of this can trigger an intentional immobility in order to ensure the hemodynamic stability of the patient, since this finding did not have a very high dispersion (± 10.38) demonstrating that this reduction was prevalent in the vast majority of the sample. As expected, the aforementioned data is strengthened when we analyzed the Body Mass Index (BMI), since this finding showed a small standard deviation both in admission and discharge from the sector, however, with a lower value at admission, because the circumstance in which the child is at this time of entry into the sector says a lot about the compromise caused by the underlying pathology. This may reflect in a more similar mass pattern between the samples making a confirmatory final finding to reflect the effects of pathological dysfunctions acquired during the hospitalization process and also the possibility of impact of body mass loss on functional impairment.

More specifically, table 3 shows the same anthropometric data, but with a correlation between genders, given that the data are quite similar to those of the previous table, and both the weight of the female and male groups showed a reduction, however, the girls presented a lower loss, this being a different finding from the expected because, given the profile of the sample, the authors

assumed that there would not be a big difference in this regard. The BMI, on the other hand, showed the opposite course, because the boys had a lower reduction than the other group.

Table 3 - Anthropometric data in relation to the sex of patients in the pediatric ICU

General and anthropometric characteristics	Female		Male		p-value*
	Aver age	±Standard deviation	Aver age	±Standard deviation	
Age (years)	3,58	3,39	3,64	3,55	0,4361
Height (cm)	87,36	26,65	86,43	28,83	0,4220
Body mass at entry (kg)	13,28	10,87	14,79	11,75	0,2187
Body mass at exit(kg)	11,42	9,97	12,75	10,71	0,2276
BMI at entry (kg)	16,30	7,23	18,31	10,48	0,0896
BMI at departure (kg)	14,07	7,21	16,40	12,17	0,0800
Days of hospitalization	419,30	172,05	447,13	188,07	0,1842

Source: Prepared by the authors, 2024. Student's t test result.

Table 4 shows the distribution of the pathological profile found in the sector, where pneumonia presented a statistically significant value for the research ($p=0.0035^*$) demonstrating that it was the most prevalent pathology ($n=59$) and the one that presented the greatest functional impairment of these patients, because although the other results did not have reflected in such a way, it is important to make clear that they also have their way of compromising the patient's functionality, especially the ventilatory muscles increasing dependence on mechanical ventilation and predisposing the patient to a greater risk of infection. This fact can be explained due to a seasonal context of the region where the hot and humid tropical climate allows the temperature variation to be continuous where it does not obey a more delimited pattern as is found in other Brazilian regions. In this context, we observed that the main annual periods where this disease was most prevalent were in the months of January to March, due to the high rainfall rate in which the state is, increasing the search for health services due to respiratory diseases. Not only that, the institution where the research was carried out, because it is a regional hospital, it meets the demands of the 144 municipalities of the state and more the state of Macapá, which has the same climate pattern favoring a more multifocal analysis and thus obtaining more satisfactory data.

Table 4 – Distribution of the prevalence of pathologies based on gender

Clinical features	Female (n=61)	Male (n=80)	General (n=141)	

	n	%	n	%	n	%	p-value
Pneumonia							
Yes	34	55,74	25	31,25	59	41,84	0,0035 *
No	27	44,26	55	68,75	82	58,16	
Bronchospasm							
Yes	2	3,28	7	8,75	9	6,38	0,1879
No	59	96,72	73	91,25	132	93,62	
Bronchopneumonia							
Yes	3	4,92	9	11,25	12	8,51	0,1819
No	58	95,08	71	88,75	129	91,49	
Asthma							
Yes	2	3,28	4	5,00	6	4,26	0,6159
No	59	96,72	76	95,00	135	95,74	
Pleural effusion							
Yes	10	16,39	8	10,00	18	12,77	0,2597
No	51	83,61	72	90,00	123	87,23	
Bronchiolitis							
Yes	4	6,56	2	2,50	6	4,26	0,2370
No	57	93,44	78	97,50	135	95,74	
Abdominal surgery							
Yes	3	4,92	11	13,75	14	9,93	0,0823
No	58	95,08	69	86,25	127	90,07	
IRA							
Yes	6	9,84	3	3,75	9	6,38	0,1430
No	55	90,16	77	96,25	132	93,62	
Severe acute respiratory syndrome							
Yes	6	9,84	3	3,75	9	6,38	0,1430
No	55	90,16	77	96,25	132	93,62	
SEPSE							

Yes	1	1,64	1	1,25	2	1,42	0,8464
No	60	98,36	79	98,75	139	98,58	
Neonatal anoxia							
Yes	1	1,64	3	3,75	4	2,84	0,4545
No	60	98,36	77	96,25	137	97,16	
Heart disease							
Yes	2	3,28	2	2,50	4	2,84	0,7826
No	59	96,72	78	97,50	137	97,16	

Source: Prepared by the authors, 2024. Result of the Chi-square test.

*Statistically significant result.

Based on the context mentioned above, pneumonia showed a higher prevalence in underage individuals with an average age of 3.18 years (DV: ± 2.62 ; $p = 0.0599^*$) (Table 5), in a way this fact is already something quite common, because there is a context of immunity, social and even structural profile leaving them more susceptible to this type of involvement, thus, it should be noted that many patients who have this level of commitment are low income, residing in housing in the regions on the banks of the rivers and who have a less balanced diet. At the functional level, in these patients, there was no statistically significant relevance between those who had the disease and those who did not, which means that both presented a similar compromise profile, despite the fact that those who had pulmonary dysfunction had a lower value in the FSS-ICU, among this type of profile are motor dysfunctions caused mainly by loss of strength, sensory alteration by demyelination caused mainly by critical patient polyneuromyopathy. However, translating into a clearer form, they achieved a functional improvement still within the PICU and for this data to be achieved, the work of the entire multidisciplinary team in the sector was necessary.

Table 5 - Clinical data of patients with Pneumonia and without Pneumonia in the pediatric ICU.

General characteristics	With Pneumonia		Without Pneumonia		p-value*
	Aver age	\pm Standard deviation	Aver age	\pm Standard deviation	
Age (years)	3,18	2,62	3,93	3,96	0,0599*
FSS entry	9,95	6,63	10,98	7,30	0,1970
FSS exit	7,29	3,60	7,56	3,77	0,3332
Height (cm)	86,81	21,74	86,84	31,60	0,4975
Body mass at entry	13,52	8,93	14,57	12,88	0,2844

(kg)					
Body mass at exit(kg)	11,53	8,38	12,64	11,63	0,2548
BMI at entry (kg)	17,65	7,05	17,29	10,58	0,4029
BMI at departure (kg)	15,11	7,21	15,59	12,16	0,3851
Days of hospitalization	430,90	173,09	438,10	187,84	0,4085

Source: Prepared by the authors, 2024. Result of Student's t test.

*Statistically significant result.

DISCUSSION

The knowledge of epidemiological data of the population served in an intensive care unit is as important as the investment in new treatment resources and cutting-edge technologies⁷ where it is possible to know the profile of patients who are hospitalized so that in this way, the direction of more specific approaches end up being more effective and thus the reduction of excessive costs is something more controlled, because a capital directed to purchases of drugs, antibiotics, sedatives among others ends up being something much larger when the public is varied to the point that management cannot define its standard. More detailed, for this reason, epidemiological studies of this type are fundamental, as they allow to know Brazilian PICU statistics in order to program actions for improvements.

The age group identified in this study was similar to that observed in another study¹⁰ where hospitalizations between 01 and 04 years of age predominated, and most patients admitted to PICU were male (58.1%), but there was no statistically significant difference between the age groups studied as well as in our study, which reflects the fact that it is a characteristic closely related to the regionality of the study. It should be noted that about 60% of hospitalizations occurred with children under five years of age, with a subsequent decrease with advancing age, which can be explained by the development of the individual's immunological context. Justifying the profile found in this research, with the predominance of individuals between 01 and 02 years of age, with higher rates for the male gender.

In addition, in another study¹¹, the average age was 4.3 years, but there was no significant difference between boys and girls. In another analyzed perspective^{12,13} with an average of 03 years of age, it reflected in a greater susceptibility to respiratory diseases. There are many risk factors for the development of this type of involvement: malnutrition, immaturity of the immune system, comorbidities, prematurity and permanence in daycare, the latter being the most common and the climatic context as directly impacting the development of this pathological condition. It is

important to note that in this period of life, respiratory tract hypersensitivity is greater than in the other phases, because it is a time of recognition of aggressor factors and modulation of the immune system.

In the findings of the literature^{2,14}, PICU's in general have a high prevalence of hospitalizations for respiratory diseases. With data that reflect this fact, demonstrating that 50.2% of hospitalizations of children in the state of Pará were due to pneumonia, with the main factors that led to hospitalization were due to aspiration of breast milk during breastfeeding, malnutrition, lack of immunization, intra-home and extra-domestic pollution, lack of access to health services of basic units and history of prematurity. In addition, the most affected age group is in children from 18 months to 4 years, where the respiratory tract is still in the development phase and recognition of external compounds that can be facilitators for the development of infections. Given the above, it is evident that these pathologies have a great impact on the child population, being essential for the reduction of their complications in hospitals, the emergence of means to prepare family members about the risk factors, diagnosis and treatment of these diseases. Given that this condition is one of the most responsible for readmissions leading to an increase in child morbidity and mortality.

The nutritional profile of critically ill patients has been showing a reduction in BMI with a higher prevalence in individuals with a mean age of 21.5 months and male gender. When performing the nutritional evaluation of patients, it was possible to observe that malnutrition is still very common in this sector, being an important marker of severity and mortality. In addition, the association between malnutrition and worse results is explained by the depletion of metabolic reserves, the loss of muscle strength that affects respiratory function, as well as impaired immunity associated with delayed wound healing and increased risks of infection. Patients with this condition need to have a more adequate caloric support, because the opposite, it may contribute to a worse prognosis for these individuals, a fact that can be explained by altering osteomyoarticular development and immune factors that are important in this phase of development. In addition, during the evolution it was observed that patients with this condition had more organic dysfunctions, the main one being the respiratory, followed by the cardiovascular and neurological¹⁵, because the energy reserve cannot sustain the body demand leading to fatigue and anaerobic reactions of metabolism.

The average length of stay is one of the most worrying factors in the PICU, because depending on the predominant pathological profile in the sector, this number may be higher or lower, as for example in our study, where the average time was 435.09 days, but it is important to note that there was a very high dispersion of results. This is in line with other studies^{16,17} that found a much shorter time of 14.4 and 9.7 days, respectively. Despite being a very divergent result

taking into account the population profile of the inpatients, its registration is very important, because the neurological as found in our research already have a more prolonged pattern of this hospitalization period mainly due to the change in respiratory function that leads to a need for invasive mechanical ventilation and not only this, in more severe cases where the patient presents changes in the electrical function of the central nervous system such as seizures, it ends up needing drug support such as sedatives which can further prolong this time in the sector, increasing the Contractile dysfunction of the diaphragm due to the disuse and weakness of the same. Given that despite mechanisms such as neuroplasticity, rapid activation of compensatory mechanisms of the human body by virtue of being a very young organism, still in most cases we can observe a long stay of these patients in the ICUs.

Finally, respiratory diseases were shown to be a major problem for public health¹⁸, especially for the pediatric class in general, since, in the present study, pneumonia was the main factor associated with hospitalization. From another analysis¹⁰, corroborating the objective of this research, it is necessary to characterize the pediatric population that resides in each state, since having this information the control of health services in all 3 care would be able to further reduce infant mortality and change the reality of the waiting lines of the Unified Health System.

CONCLUSION

It is concluded that the data obtained in our study can be compared to those reported for other PICUs in Brazil and the world, considering the population differences and the characteristics of the services provided. Not only this, we proved that, in the population studied, the functionality presents compromise directly linked to the pathological condition as it was presented in individuals who developed pneumonia, requiring intensive support.

According to the level of functional impairment, we also observe that this type of alteration was responsible for increasing the length of hospitalization of patients and compromising their development at the optimal time. However, more studies are needed to identify the clinical and functional profile of pediatric patients hospitalized in these units to better understand the real impact of clinical criticality on functionality, quality of life and durability of sequelae resulting from hospitalization.

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