

Pediatric Emergency Care for Children and Adolescents with Cancer: Causes of Consultation and Factors Associated with Hospitalization

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Atendimento de Emergência Pediátrica a Crianças e Adolescentes com Câncer: Causas de Consultas e Fatores associados à Internação

Atención de Emergencia Pediátrica al Niño y Adolescente con Cáncer: Causas de Consultas y Factores Asociados a la Hospitalización

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ABSTRACT

Introduction: Pediatric emergency care is essential for adequate medical treatment of pediatric cancer-associated complications and for increasing the chances of cure. **Objective:** This study aimed to describe pediatric cancer-associated emergencies and outcomes, and to analyze the factors associated with hospitalization. **Method:** A retrospective observational cohort study was conducted including patients aged ≤19 years who attended the pediatric emergency of a general cancer hospital from April 17 to October 17, 2019. The variables analyzed were demographics, socioeconomic status, disease and treatment factors, reasons for seeking emergency care, and associated outcomes. **Results:** This study included 309 patients who required 994 emergency consultations, with a total of 766 reasons for seeking care. The median age was 4.86 years; 50.8% were female and 51.5% were white. The patients had solid tumors (49.8%), central nervous system tumors (27.5%), and hematological neoplasms (15.5%). Most of the patients were home discharged (72.2%) or to support houses (6.7%). Fever was the most frequent symptom (30.8%) and the most common reason for admission. 19.2% of the patients were admitted to the ward and 2.0% to the pediatric intensive care unit (2.0%). Only two of the 309 patients (0.6%) seeking care in the pediatric emergency died in the emergency room, and these patients were in end-of-life care. **Conclusion:** The availability of a pediatric emergency room with skilled professionals in supportive care of pediatric patients with cancer was essential for the management of disease and treatment-related complications.

Keywords: febrile neutropenia; medical oncology; emergency medical services; children; adolescent.

RESUMO

Introdução: O atendimento de emergência pediátrica é essencial para o tratamento adequado das complicações associadas ao câncer pediátrico e para aumentar as chances de cura. **Objetivo:** Descrever as emergências associadas ao câncer pediátrico e seus desfechos, e analisar os fatores associados à hospitalização. **Método:** Estudo de coorte observacional retrospectivo incluindo pacientes com idade ≤ 19 anos que foram atendidos na emergência pediátrica de um hospital oncológico geral no período de 17 de abril a 17 de outubro de 2019. As variáveis analisadas foram demográficas, socioeconômicas, fatores relacionados à doença e ao tratamento, razões para procurar atendimento de emergência e resultados associados. **Resultados:** Foram incluídos 309 pacientes que necessitaram de 994 consultas de emergência, totalizando 766 causas de atendimento. A idade mediana foi de 4,86 anos; 50,8% eram do sexo feminino e 51,5% afirmaram ser da raça branca. Os pacientes apresentavam tumores sólidos (49,8%), tumores do sistema nervoso central (27,5%) e neoplasias hematológicas (15,5%). A maioria dos pacientes foi liberada para a residência (72,2%) ou casa de apoio (6,7%). A febre foi o sintoma mais frequente (30,8%) e o motivo mais comum de admissão. Os pacientes foram internados em enfermaria (19,2%), ou em unidade de terapia intensiva pediátrica (2,0%). Somente dois dos 309 (0,6%) pacientes atendidos na emergência pediátrica morreram nesse setor, estando estes em cuidados de fim de vida. **Conclusão:** A disponibilidade de um departamento de emergência pediátrica com profissionais especializados e treinados em cuidados de suporte a pacientes pediátricos com câncer foi essencial para o manejo das complicações relacionadas à doença e ao tratamento.

Palavras-chave: neutropenia febril; oncologia; serviços médicos de emergência; criança; adolescente.

RESUMEN

Introducción: La atención de emergencias pediátricas es fundamental para el adecuado tratamiento médico de las complicaciones asociadas al cáncer pediátrico y para aumentar las posibilidades de cura. **Objetivo:** Describir las emergencias asociadas al cáncer pediátrico y sus desenlaces, y analizar los factores asociados a la hospitalización. **Método:** Estudio de cohorte observacional retrospectivo que incluyó pacientes con edad ≤ 19 años que fueron atendidos en el servicio de emergencias pediátricas de un hospital general de oncología del 17 de abril al 17 de octubre de 2019. Las variables analizadas fueron demográficas, socioeconómicas, factores relacionados con la enfermedad y tratamiento, razones para buscar atención de emergencia y resultados asociados. **Resultados:** Se incluyeron 309 pacientes que requirieron 994 consultas de urgencia, totalizando 766 causas de atención. La mediana de edad fue de 4,86 años; el 50,8% eran mujeres y el 51,5% eran personas blancas. Los pacientes tenían tumores sólidos (49,8%), tumores del sistema nervioso central (27,5%) y neoplasias hematológicas (15,5%). La mayoría de los pacientes fueron dados de alta a su hogar (72,2%) o casa de apoyo (6,7%). La fiebre fue el síntoma más frecuente (30,8%) y el motivo de ingreso más frecuente. Los pacientes fueron admitidos en una sala (19,2%) o en una unidad de cuidados intensivos pediátricos (2,0%). Solo 2 de 309 (0,6%) pacientes atendidos en el servicio de emergencias pediátricas fallecieron en este sector, estando estos en cuidados al final de la vida. **Conclusión:** La disponibilidad de un servicio de emergencias pediátricas con profesionales especializados y capacitados en el cuidado de apoyo al paciente oncológico pediátrico fue fundamental para el manejo de las complicaciones relacionadas con la enfermedad y el tratamiento.

Palabras clave: neutropenia febril; oncología médica; servicios médicos de emergencia; niño; adolescente.

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INTRODUCTION

Estimates indicate that 7,930 cases of childhood and adolescent cancer will be diagnosed in Brazil¹ in 2023. Cancer is the second most common cause of death for this population². The disease and therapies used for patients with cancer can pose life-threatening risks to them. The reasons for emergency care include disease and treatment-related complications, as infections and non-infectious toxicities^{3,4}. Immediate recognition and management of emergencies is essential to reduce morbidity and mortality in these patients⁵. Pediatric emergency (PE) care is essential for adequate medical treatment of pediatric cancer-associated complications and to increase the chances of cure^{5,6}.

Neutropenia is a common complication of chemotherapy and radiation therapy; fever can be an alarming sign of a serious bacterial infection^{7,8}. The risk of febrile neutropenia in patients undergoing cancer treatment depends on several factors, including the patient's age, tumor type, and the chemotherapy protocols utilized. The immediate use of broad-spectrum empirical antibiotic therapy, regardless of prior microbial isolation, has successfully reduced the mortality rate associated with febrile neutropenia⁹. Moreover, access to PE care facilitates the early use of antibiotic therapies⁵.

Determining the reasons for needing care in the PE and the outcomes is essential for assessing the quality of the service and patient care with effective strategies to anticipate, prevent and manage complications to improve the outcomes of cancer treatment^{3,6}. However, studies addressing emergency care in pediatric oncology are scarce^{4,10}.

This study aimed to evaluate the main pediatric cancer-associated complaints in PE of a major cancer hospital in an upper middle-income country and the associated outcomes, as well as risk factors for hospital admission.

METHOD

Retrospective observational cohort study of pediatric patients with solid tumors and malignant hematological diseases admitted to the PE from April 17 to October 17, 2019. The inclusion criteria were patients with malignant and benign solid tumors who received cancer treatment. Patients treated at other institutions but admitted for imaging exams, invasive procedures, or exclusive radiotherapy treatments were excluded. Data from physical and electronic medical records were collected. The Institutional Review Board of INCA (CAAE (submission for ethical review) 94086318.0.0000.5274) approved the study, report number 3,815,145, in compliance with

Resolution 466/2012¹¹ of the National Health Council. The informed consent form was waived because of the study design.

This study was conducted at the Pediatric Oncology of the National Cancer Institute – INCA. This institution is a reference center for the diagnosis and treatment of pediatric patients with solid tumors and hematological malignancies, as part of the services offered by the Brazilian National Health System (SUS)^{12,13}. Approximately 250 pediatric patients with cancer are registered annually. The INCA's PE performs around 2,500 consultations per year and is responsible for the emergency care of the patients at diagnosis and during treatment, long-term follow-up, and palliative care. Patient care at the PE is provided by a specialized multidisciplinary team to assist pediatric patients with cancer 24 hours a day, 7 days a week.

The treatment approach is multidisciplinary and includes socioeconomic support and prevention of treatment abandonment¹⁴. Patients who live far from the hospital are eligible for accommodation free of charge¹⁵.

The demographic and socioeconomic variables analyzed included age at diagnosis, age at PE consultation, sex, race, distance from the hospital (≤ 80 km or > 80 km), monthly family income *per capita*, and maternal and paternal ages.

Disease and treatment-associated factors analyzed were diagnosis of hematological, central nervous system (CNS) tumors and other solid and benign tumors, in addition to metastasis at diagnosis (staging), time since diagnosis up to consultation (≥ 1 year or < 1 year), diagnostic investigations, first-line treatment, second- or later-line treatment, follow-up after treatment and end-of-life care (oncological status) and type of treatment (chemotherapy, radiotherapy, surgery, and bone marrow transplantation). The types of cancers were classified according to the International Classification of Childhood Cancer (CICI)¹⁶.

The reasons for emergency care were: febrile neutropenia with axillary temperature $\geq 38.3^{\circ}\text{C}$ in a single measurement or a peak of 38°C sustained for more than one continuous hour in a patient with absolute neutrophil count of < 500 cells/mL or an expected drop to < 500 neutrophils/ mm^3 within 48h^{9,17}. Any other symptoms related to disease or treatment were recorded. The reviews of the emergency causes per patient were also measured. Patients were categorized as frequent PE users if they had > 2 visits in 6 months¹⁸.

The outcomes were home or support house discharge, hospitalization at the ward, emergency room, or Pediatric Intensive Care Unit (PICU) and death at the emergency room or within 30 days of emergency care.

A descriptive analysis of the study population was performed by estimating measures of central tendency and

dispersion for continuous variables, and percentage values for categorical variables. The Kolmogorov-Smirnov test was performed to assess the normality of the continuous variables. The chi-square hypothesis or Fisher's exact test was calculated when the absolute counts were lower than five observations to detect possible differences between categorical independent variables and outcomes. The Mann-Whitney U test was used to detect differences between the variables and outcomes, since the distribution was non-parametric.

The odds ratio was calculated using logistic regression to assess the association between the exposures and outcomes. Variables with $p < 0.25$ or theoretical relevance with the theme were selected for the multiple regression model using the Enter method (stepwise forward) to control the confounding factors.

After entering the variables into the multiple regression model, variables with $p < 0.05$ were considered statistically significant and were kept in the final model. The quality of the model fit was determined using Hosmer-Lemeshow test values. IBM SPSS Statistics for Windows, version 24.0 (IBM Corp., Armonk, N.Y., USA) was used for the analyses.

RESULTS

This study included all 309 consecutive patients who met the eligibility criteria and were treated at the PE from April 17 to October 17, 2019, for 766 different causes, requiring 994 consultations, including 228 appointments to review patients when necessary.

The median age at cancer diagnosis was 4.86 years (interquartile range 2.02–11.40). The 0–4-year-old age group (46.6%) was most frequently enrolled, followed by the 5–9-year-old age group (22.7%), 50.8% were females who claimed there were White (51.1%). The median *per capita* family monthly income was US\$ 59.71 (range: 00.00-599.45), which means 0.25 times the national minimum wage (range 0–2.5 times the minimum wage), 86.4% lived ≤ 80 km far from the treatment center (Table 1). The mean age at the emergency consultation was 9.50 years (range: 1-31) (Table 2).

A total of 766 reasons for emergency care were identified, resulting in 994 visits, with an average of 2.49 visits per reason (range 1–13). The mean age of patients was 9.50 (SD \pm 6.35) and 49.9% of the consultations occurred in less than one year since registration. At the institution, 49.6% of the consultations were for solid tumors.

Fever was reported as reason for seeking emergency care in 30.8% of the PE visits. The most frequent reasons for emergency consultations were fever without neutropenia (21.4%), pain (16.7%), upper airway infection (14.4%),

viral or bacterial infection (7.4%), nausea and vomiting (6.9%), and fever with neutropenia (5.6%). There were 43 episodes of febrile neutropenia in 34 patients. Microbiologically confirmed infections occurred in six of the 34 (17.6%) patients; three (8.8%) required PICU admission, but no deaths occurred.

In 603 (78.8%) consultations, patients were home-discharged (72.1%) or to support houses (6.7%). Hospitalization was required in 162 (21.2%) cases, of which 147 (19.2%) were to the ward and 15 (2.0%) to the PICU (Table 2).

A significant difference was found among patients who were hospitalized and those who were treated and discharged, in terms of the following variables: fever as a reason for consultation, time from enrollment, metastasis at diagnosis, necessity of surgical intervention, and oncological status at the time of consultation (Table 3).

In the univariate analysis, the following variables showed significant differences: fever as a reason for PE care ($p = 0.009$); patients within 1 year of enrollment ($p < 0.001$); metastatic disease at diagnosis ($p = 0.031$), and patients undergoing diagnostic investigations ($p < 0.001$), first-line treatment ($p < 0.001$), second- or later-line treatment ($p = 0.001$), and exclusive palliative care ($p < 0.001$). Patients with hematological malignancies also tended to be hospitalized after emergency care ($p = 0.075$) (Table 4).

In the multiple regression model, patients with fever were 1.78 times more likely to be hospitalized than patients without fever. Patients receiving exclusive palliative care were 4.28 times more likely to be hospitalized than patients whose cancers were being followed up after cancer treatment. An increased likelihood of hospitalization was also observed in patients undergoing diagnostic investigations (3.89 times), first-line treatment (2.30 times), and second- or later-line treatment (2.68 times) (Table 5).

Only two of the 309 patients (0.6%) seeking care at the PE died. Six patients (1.9%) died within 30 days from care. In all, eight patients died due to disease progression (2.5%).

DISCUSSION

There is scarce literature on emergency care for pediatric patients with solid tumors and hematologic malignancies, especially by institutions which provide services to treat these patients exclusively. This study assessed 309 children at a pediatric cancer referral center along the cancer care continuum. Retrospective studies investigated a database with 45 Emergency Departments of Pediatric Hospitals in the United States^{4,8,18}. Another retrospective report studied the main complaints of

Table 1. Sociodemographic and clinical characteristics of pediatric patients who attended INCA's PE from April to October 2019 (n = 309)

Variables	Median (IQR)	Range
Patient age at cancer diagnosis (years)	4.86 (2.02 - 11.40)	0 - 18
Age at the PE consultation (years)	9.50 (6.35)	1 - 31
Maternal age (years)	33.00 (26.00 - 38.00)	17 - 56
Paternal age (years)	36.00 (30.00 - 42.75)	18 - 61
Variables	n	%
Sex		
Male	152	49.2
Female	157	50.8
Age at cancer diagnosis		
0 - 4 years	144	46.6
5 - 9 years	70	22.7
10 - 14 years	59	19.1
15 - 19 years	36	11.7
Race		
White	158	51.1
Not white*	143	46.3
No information	8	2.6
Distance from treatment center		
≤ 80 km	267	86.4
> 80 km	42	13.6
Diagnosis		
Hematological tumors	48	15.5
CNS tumors	85	27.5
Other solid tumors	154	49.8
Benign tumors	22	7.1
Cancer Staging		
Not metastatic	214	69.3
Metastatic	48	15.5
Not applicable	47	15.2
Oncological situation		
Diagnostic investigation	33	10.7
First-line treatment	82	26.5
In ≥ second line treatment	27	8.7
Follow-up after cancer treatment	150	48.5
End-of-life care	11	3.6
Not applicable	6	1.9
Treatment performed		
Single surgery	45	14.6
Surgery + Chemotherapy and/or Radiotherapy	131	42.4
Chemotherapy and/or radiotherapy	101	32.6
BMT	8	2.6
Others**	6	2.0
Not applicable	18	5.8
Frequent emergency user (> 2 causes of visits/6 months)		
No	198	64.1
Yes	111	35.9

Captions: IQR = interquartile range; CICI = International Classification of Childhood Cancer; CNS = central nervous system; BMT = bone marrow transplant; PE = pediatric emergency.

(*) Brown/Black/Yellow.

(**) Others: Intra-arterial chemotherapy for retinoblastoma among others National Minimum Wage in 2019: US\$ 239,33.

Table 2. Characteristics of consultations provided at the PE and outcomes, from April to October 2019 (n = 766)

Causes of consultations	Mean (\pmSD)	Range
Per patient	2.48 (1.91)	1 - 13
Reviews of causes of consultation	1.30 (0.84)	1 - 8
Variables	n	%
Fever		
No	523	68.3
Yes	236	30.8
No information	7	0.9
Time from cancer diagnosis and PE visit		
\geq 1 year	384	50.1
< 1 year	382	49.9
Chemotherapy		
No	196	25.6
Yes	570	74.4
Radiotherapy		
No	550	71.8
Yes	216	28.2
Surgery		
No	337	44.0
Yes	429	56.0
BMT		
No	746	97.4
Yes	20	2.6
CICI diagnosis		
Hematological tumors	115	15.0
CNS tumors	226	29.5
Other solid tumors	380	49.6
Not applicable	45	5.9
Cancer staging		
Not metastatic	540	70.5
Metastatic	126	16.4
Not applicable	99	12.9
No information	1	0.1
Oncological situation		
Diagnostic investigation	59	7.7
First-line treatment	264	34.5
In \geq second line treatment	108	14.1
Follow-up after cancer treatment	288	37.6
End-of-life care	33	4.3
Not applicable	14	1.8
Outcomes		
Home discharge	553	72.2
Support house	51	6.7
Ward admission	147	19.2
PICU admission	15	2.0

Captions: CICI = International Classification of Childhood Cancer; CNS = central nervous system; BMT = bone marrow transplant; PICU = pediatric intensive care unit; PE = pediatric emergency.

Table 3. Clinical and treatment characteristics of patients according to admission versus discharge after care at the PE, from April to October 2019 (n = 766)

Variables	Outcome of the causes of care		p value ^A
	Treatment and discharge n = 604 (78.9%)	Hospitalization n = 162 (21.1%)	
Fever as reason for care			0.009
No	425 (71.2)	98 (60.5)	
Yes	172 (28.8)	64 (39.5)	
Time from registration at PE			< 0.001
≥ 1 year of enrollment	325 (53.8)	59 (36.4)	
< 1 year of enrollment	279 (46.2)	103 (63.6)	
Chemotherapy			0.605
No	152 (25.2)	44 (27.2)	
Yes	452 (74.8)	118 (72.8)	
Radiotherapy			0.741
No	432 (71.5)	118 (72.8)	
Yes	172 (28.5)	44 (27.2)	
Surgery			0.014
No	252 (41.7)	85 (52.5)	
Yes	352 (58.3)	77 (47.5)	
BMT			0.277 ^B
No	586 (97.0)	160 (98.8)	
Yes	18 (3.0)	2 (1.2)	
CICI diagnosis			0.186
Hematological tumors	84 (14.8)	31 (20.0)	
CNS tumors	175 (30.9)	51 (32.9)	
Other solid tumors	307 (54.2)	73 (47.1)	
Metastasis			0.030
Not metastatic	437 (82.8)	103 (74.6)	
Metastatic	91 (17.2)	35 (25.4)	
Oncological situation			< 0.001 ^B
Diagnostic investigation	39 (6.5)	20 (12.3)	
First line treatment	199 (32.9)	65 (40.1)	
In ≥ second line treatment	79 (13.1)	29 (17.9)	
Follow-up after cancer treatment	253 (41.9)	35 (21.6)	
End-of-life care	21 (3.5)	12 (7.4)	
Not applicable	13 (2.2)	1 (0.6)	

Captions: CICI = International Classification of Childhood Cancer; CNS = central nervous system; PE = pediatric emergency; BMT = bone marrow transplant.

(A) Chi-square test.

(B) Fisher's Exact Test significant values ($p < 0.05$).

children with cancer in a general PE, but restricted to patients undergoing active cancer treatment¹⁹. In a study from Turkey, 88 patients admitted to the Department of Pediatric Oncology who presented with oncological emergencies were prospectively analyzed²⁰. To the best of the current knowledge, no studies have addressed specific PE care in a cancer hospital.

The most frequent neoplasms in pediatric patients who attended the institution's PE were CNS tumors (27.5% of cases). These findings differ from those of another study, where 25.9% of the cases were due to acute lymphoblastic leukemia (ALL), which was the most frequent neoplasm²⁰. Similarly, in other publication the authors found that 41.3% of children consulted at the PE had ALL¹⁹. One

Table 4. Crude odds ratios between the clinical characteristics of patients and the outcome hospitalization versus discharge after the cause of care at the PE, from April to October 2019

Variables	OR	95% CI	p value
Fever as reason for care			
No	REF		
Yes	1.61	1.12 - 2.32	0.009
Time from registration at PE			
≥ 1 year of enrollment	REF		
< 1 year of enrollment	2.03	1.42 - 2.91	<0.001
Chemotherapy			
No	REF		
Yes	0.90	0.61 - 1.33	0.605
Radiotherapy			
No	REF		
Yes	0.94	0.63 - 1.38	0.741
Surgery			
No	REF		
Yes	0.64	0.46 - 0.92	0.015
BMT			
No	REF		
Yes	0.407	0.09 - 1.77	0.231
CICI diagnosis			
Other solid tumors	REF		
Hematological tumors	1.55	0.96 - 2.52	0.075
CNS tumors	1.23	0.82 - 1.83	0.322
Cancer staging			
Not metastatic	REF		
Metastatic	1.63	1.05 - 2.55	0.031
Oncological status			
Follow-up after cancer treatment	REF		
Diagnostic investigation	3.70	1.95 - 7.06	<0.001
First line treatment	2.36	1.50 - 3.71	<0.001
In ≥ second line treatment	2.65	1.53 - 4.61	0.001
End-of-life care	4.13	1.87 - 9.12	<0.001

Captions: CICI = International Classification of Childhood Cancer; CNS = central nervous system; PE = pediatric emergency; BMT = bone marrow transplant; OR = odds ratio; CI = confidence interval; REF = reference category; significant values ($p < 0.05$)

Table 5. Factors associated with the hospitalization outcome after the causes of care at the PE, from April to October 2019

Variables	Adjusted OR	95% CI	p value
Fever as reason for care			
No	REF		
Yes	1.78	1.23 - 2.59	0.002
Oncological status			
Follow-up after cancer treatment	REF		
Diagnostic investigation	3.89	2.03 - 7.47	<0.001
First-line treatment	2.30	1.46 - 3.62	<0.001
In ≥ second line treatment	2.68	1.53 - 4.67	0.001
End-of-life care	4.28	1.92 - 9.54	<0.001

Captions: Adjusted OR = adjusted odds ratio; CI = confidence interval; REF = reference category; significant values ($p < 0.05$); Hosmer and Lemeshow test = 0.179.

explanation for this finding is that the PE care is provided to patients enrolled at INCA, which is the largest referral center in the city for the treatment of solid tumors, whereas hematological neoplasms, such as leukemias, are treated at several local institutions.

Another objective was to investigate patients' main reasons for requiring PE care of which fever was the most frequent reason. This finding concurs with previous studies^{8,19}. In a study of patients undergoing active treatment who were consulted at the emergency, 61.2% had fever, which was the most frequently reported symptom. However, the number of cases of fever with neutropenia was unspecified¹⁹.

Febrile neutropenia occurred in 5.6% of the patients and was the sixth most frequent reason for emergency consultation in this cohort, while it was the second most frequent reason in other reports^{4,18}. Febrile neutropenia is one of the most life-threatening complications experienced by patients undergoing cancer treatment. Its prompt recognition and treatment has reportedly led to a decrease in mortality and morbidity²¹. Standard operating procedures for cases of febrile neutropenia have been established at the institution. The entire team is trained to promptly attend to the patient, collect specimen for tests, and initiate antibiotic therapy within less than one hour of the patient's arrival. In this cohort, microbiologically confirmed infections occurred in 17.6% of the patients, while 8.8% required PICU admission and no deaths occurred. Another study evaluated 199 episodes of febrile neutropenia in 119 patients. Similar to these results, microbiologically confirmed infections occurred in 22.6% of the cases, while eight (4%) patients required PICU admission and one patient died (0.8%)²².

Nausea and vomiting were frequent complaints, accounting for 6.9% of the visits to the PE. An explanation for the high incidence of nausea and vomiting could be that many patients were receiving highly emetogenic chemotherapy treatment on an outpatient basis. These patients were followed up in the outpatient clinics and day hospitals for clinical and symptom control and hydration when necessary, avoiding evolution to dehydration. In another study nausea or vomiting was present in only 2.3% of the PE visits in pediatric patients with cancer⁴.

Patients were home or support houses discharged in 78.8% of the cases as the investigation of the outcomes of the emergency consultations revealed. Hospitalization was required in only 21.1% of cases. Independent risk factors associated with hospital admission were fever, diagnostic investigations, active treatment, and exclusive palliative care. Patients receiving palliative care rarely presented to the emergency room for care, but the risk of hospitalization for these patients was higher than that

for patients in other oncologic situations when treated at the PE. In another study, approximately 50% of children with cancer consulted at the PE were hospitalized⁸. The same authors found a similar admission rate (50.8%) in another study conducted the following year^{8,18}. However, they did not analyze the relation between oncological situation and hospitalization.

A study with pediatric patients with cancer treated at the PE of a pediatric hospital enrolled only patients receiving active treatment¹⁸. Patients undergoing diagnostic investigations and those who were newly diagnosed or relapsed were excluded. Hospitalization and discharge were the outcomes considered. The authors found similar reasons for seeking care of those identified in the current investigation, such as fever, pain, nausea and vomiting, and laboratory result abnormalities. Unlike these results, bleeding was among the top five reasons for seeking care, perhaps because the cohort investigated was on active treatment, and a higher frequency of acute leukemias was observed. Of the total visits, 56.5% resulted in hospitalization. The risk factors for hospitalization were fever and hospitalization in the previous four weeks¹⁹.

Death at the institution's PE was very rare, occurring in only 0.6% of cases, and 1.9% of all deaths occurred within 30 days of care. In this study, patients who died at the PE, or up to 30 days after care, were receiving exclusive palliative care. Other studies confirmed these findings: one study was on pediatric patients receiving palliative care who were consulted at the PE²². Of those, 39.4% had cancer and were generally ill with dyspnea, fever, pain, and seizures. Many were terminally ill, but none died at the PE, although 38.3% died after admission and 19% within 72 hours of admission²³. Other researchers found that death at the emergency room was rare, at a rate of one death for every 15,000 visits in the United States²⁴. These studies highlight the importance of a structured health service for immediate treatment of complications, with a specialized team trained in supportive care to reduce mortality and morbidity.

The study limitations are the retrospective design with data obtained from charts not designed for research data collection. Nevertheless, collection bias was minimized by the fact that a single researcher performed the data search. Additionally, considering the heterogeneity of the population in terms of age, underlying pathologies, and chemotherapy protocols, studies over a longer period may establish better performance indicators.

CONCLUSION

The availability of a PE with skilled professionals trained in supportive care of pediatric patients, as well as standard

operating procedures for most life-threatening complications with cancer enabled safe and effective oncologic treatment. Fever was the most frequent cause of PE consultations and in this cohort no death occurred due to fever neutropenia. Most patients consulted at the PE were discharged. Factors associated with increased odds of admission included main complaint of fever and oncological status of diagnostic investigations, treatment, and end-of-life care. This knowledge is important to plan treatment and improve safe and effective care of children with cancer.

CONTRIBUTIONS

All the authors contributed to the study design, data acquisition, interpretation, analysis and wording. They approved the final version for publication.

DECLARATION OF CONFLICT OF INTEREST

There is no conflict of interests to declare.

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