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RESEARCH ARTICLE (ORIGINAL)

# Patients with cancer who frequently use the emergency department: Main demographic and clinical characteristics

*Doentes oncológicos utilizadores frequentes do serviço de urgência: Principais características demográficas e clínicas*

*Pacientes oncológicos usuarios frecuentes de los servicios de urgencias: Principales características demográficas y clínicas*

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**Abstract**

**Background:** Patients with cancer often use emergency services more frequently and may experience more unplanned hospitalizations. If follow-up programs are implemented appropriately, certain instances can be avoided.

**Objective:** To determine the age, gender, and disease-related characteristics of the patients who visit the emergency room of an institution specialized in cancer treatment the most frequently.

**Methodology:** A retrospective cohort study was conducted on adult patients from an institution specialized in cancer treatment. The study involved the analysis of clinical records pertaining to age, gender, disease characteristics, and use of resources across three groups with varying levels of emergency room visits.

**Results:** Patients with more emergency room visits are often treated with chemotherapy, and the most commonly diagnosed cancers are of the hematopoietic and reticuloendothelial systems and lymph nodes, with lymph node invasion or metastasis. The greater use of the ER is not explained by age or gender.

**Conclusion:** Identifying the profile of these patients allows for more detailed follow-up programs to reduce emergency room visits and unplanned hospitalizations.

**Keywords:** case management; neoplasms; cancer patient; emergency service, hospital; emergency room visits; medical overuse

**Resumo**

**Enquadramento:** Os doentes oncológicos tendem a tornar-se utilizadores frequentes dos serviços de urgência (SU), podendo ter mais episódios de internamento não programados. Alguns episódios poderão ser evitados com programas de acompanhamento adequados.

**Objetivo:** Identificar características relativamente ao sexo, idade e doença, dos doentes que mais vezes acedem ao SU, numa instituição especializada no tratamento de cancro.

**Metodologia:** Estudo de coorte retrospetivo de doentes adultos de uma instituição especializada no tratamento oncológico, através da análise dos registos clínicos das variáveis idade, sexo, características da doença e utilização de recursos, em três grupos com diferentes intensidades de acesso ao SU.

**Resultados:** Doentes com mais acessos ao SU são frequentemente tratados com quimioterapia, os cancros mais diagnosticados são dos sistemas hematopoiético e reticuloendotelial, e gânglios linfáticos, com invasão de gânglios ou metastização. A maior utilização do SU não é explicada pela idade ou sexo.

**Conclusão:** A identificação do perfil destes doentes possibilita maior detalhe na construção de programas de acompanhamento, na tentativa de diminuição dos acessos ao SU e internamentos não programados.

**Palavras-chave:** gestão de casos; neoplasias; doentes com cancro; serviço hospitalar de emergência; utilização do serviço de urgência; sobremedicalização

**Resumen**

**Marco contextual:** Los pacientes con cáncer suelen acudir con frecuencia a los servicios de urgencias (SU) y pueden tener más episodios de hospitalización no programada. Algunos episodios podrían evitarse con programas de seguimiento adecuados.

**Objetivo:** Identificar las características de sexo, edad y enfermedad de los pacientes que acuden con más frecuencia a urgencias en una institución especializada en el tratamiento del cáncer.

**Metodología:** Estudio de cohorte retrospectivo de pacientes adultos de una institución especializada en el tratamiento del cáncer, mediante el análisis de las variables edad, sexo, características de la enfermedad y utilización de recursos en las historias clínicas de tres grupos con diferentes intensidades de acceso al SU.

**Resultados:** Los pacientes que más acudieron a urgencias suelen ser tratados con quimioterapia, y los cánceres diagnosticados con más frecuencia son los del sistema hematopoyético y reticuloendotelial, y de los ganglios linfáticos, con invasión ganglionar o metástasis. La edad y el sexo no implica que se recurra más a urgencias.

**Conclusión:** Identificar el perfil de estos pacientes permite elaborar programas de seguimiento más detallados para intentar reducir las visitas a urgencias y las hospitalizaciones no programadas.

**Palabras clave:** gestión de casos; neoplasias; pacientes con cáncer; servicio de urgencias hospitalario; uso del servicio de urgencias; sobremedicalización

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## Introduction

Individuals diagnosed with cancer are frequently subjected to debilitating treatments and are consequently at an elevated risk of becoming frequent users of health services (Isikber et al., 2020; Lee et al., 2021). This phenomenon is evidenced by an increase in the number of emergency room visits, unplanned hospital admissions, and even readmissions (Gallaway et al., 2021; Nene et al., 2021). The rise in care activity inevitably leads to a corresponding increase in associated costs (Gould Rothberg et al., 2022; Powell & Tahan, 2021).

In the context of ER visits, the implementation of differentiated follow-up strategies for patients who utilize this resource with greater frequency could potentially reduce the incidence of such episodes (Gallaway et al., 2021; Malebranche et al., 2021). To achieve this objective, it is essential to identify these patients, and study their personal characteristics and details related to their illness (Gonçalves et al., 2022; Nene et al., 2021).

The objective of this study is to ascertain the demographic characteristics of gender and age, as well as the characteristics of the disease, of the adult patients who most frequently utilize the ER services of an institution specializing in cancer treatment.

## Background

The growing number of cancer patients puts pressure on healthcare systems (Lee et al., 2021; Majka & Trueger, 2023). These patients are at greater risk for ER visits (Grewal et al., 2020; Kim et al., 2021), These patients are at higher risk of emergency room visits, particularly for symptoms such as fever, often related to infection, pain, gastrointestinal or respiratory complications, or even bleeding, which may be related to the disease or treatment (Gallaway et al., 2021; Grewal et al., 2020). The elevated risk of ER visits may also be attributed to the fact that there is a higher prevalence of diagnoses among individuals who are older and consequently less physically fit, have more comorbidities, more severe symptoms, or greater difficulty in managing their health condition (Isikber et al., 2020). This is due to the high number of diagnoses made at more advanced stages of the disease or even because of late referral to palliative care (Majka & Trueger, 2023). ER visits can be seen as critical in acute situations. Still, they can also be the result of inadequate care for patients with chronic conditions (Koch et al., 2022) and difficulties in (self-)managing their health at home. ER use has been described as a bad experience for the patient, an indicator of inadequate planned care, or a source of potentially avoidable costs (Loerzel et al., 2021; Majka & Trueger, 2023). Therefore, considering that some ER visits are unnecessary or potentially avoidable (Alishahi Tabriz et al., 2023; Gallaway et al., 2021), it is imperative to develop healthcare interventions that can improve care and reduce the number of unplanned visits (Gallaway et al., 2021; Nene et al., 2021).

## Research question

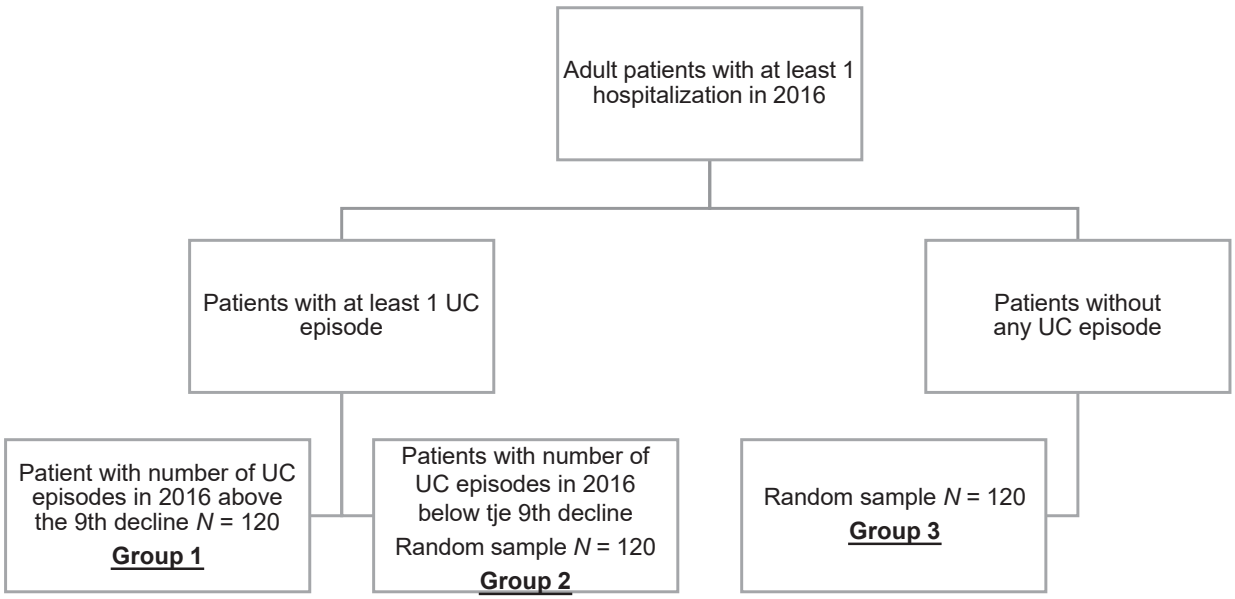
What are the main demographic and clinical characteristics of the patients who most frequently visit the ER of an institution specializing in cancer treatment?

## Methodology

This is an observational, analytical study that retrospectively analyzed the clinical records of the repository of an institution specializing in cancer treatment, of a cohort of patients whose inclusion criteria were being older than 18 years at the time of diagnosis and having at least one hospitalization in 2016 (the year of the complete transition of the information to electronic format). The data collected included care documentation for the period between 2013 and May 2019 (when the information was extracted from the databases). We started from an analysis model with a priori categories derived from the literature review on demographic and disease characteristics, such as gender, age, anatomical location of the tumor, lymph node invasion, metastasis, or treatments performed, such as chemotherapy, radiotherapy, surgery, and other care resources, such as urgent consultations and hospitalizations. Subsequently, it was deemed necessary to analyze the records to validate chemotherapy treatment, as this treatment has been described as an important motivating factor for ER visits (Isikber et al., 2020) and was not cataloged in the database at that time. A sample of three groups of patients was defined (Figure 1) based on the number of unscheduled care (UC) visits, to identify unique characteristics of patients with the highest number of such visits compared to others, namely those with the lowest number of UC visits or no UC visits at all. Group 1 was thus defined as patients with the highest number of UC visits in 2016, exceeding the 9th decile of the sum of UC visits, which represents the 10% of patients with the highest total number of UC visits. Group 2 was constituted of patients who had also had UC visits in 2016 and were randomly selected to match the number of patients in Group 1 with the lowest UC visit intensity (patients below the 9th decile of the UC visit sum). Group 3 consisted of patients without any type of UC visit and was also randomly selected to match the number of patients in the other groups.

**Figure 1**

*Grouping according to UC visits*




Continuous variables are defined by measures of central tendency (mean) and dispersion (standard deviation). To ensure a valid comparison between the groups of interest, the homogeneity of the variances was assessed using Levene's test. The analysis of the three groups was conducted using the ANOVA test and Tukey's test in instances where homogeneity of variances was present. In instances where the assumption of homogeneity of variance was not met, the Brown-Forsythe test and the Games-Howell test were employed. Categorical variables are presented as absolute and relative frequencies, with comparisons ensured by the Chi-square test at a significance level of 5%. The software utilized was IBM SPSS Statistics, version 26.0.

The study was approved by the Ethics Committee of the institution where it was conducted (CES 160/019), and the confidentiality of the data was ensured by requesting that the department responsible for the data ensure that no nominal identifying elements or health system user numbers were included.

## Results

In 2016, of the 4,163 urgent hospitalizations, 2,823 were for different patients, and of the 1,233 urgent consultations, 4,286 were also for different patients. This demonstrates that a considerable proportion of patients had multiple urgent hospitalizations or consultations. The group with the highest number of UC episodes had a mean of 12.95 urgent consultations and a higher mean of unplanned hospitalizations (Table 1).

**Table 1**

*Hospitalizations and consultations*

| | | Total episodes (*N*) | Patients (*N*) |
|---|---|---|---|
| Urgent hospitalizations in 2016 | | 4163 | 2823 |
| Urgent consultations in 2016 | | 11234 | 4286 |
| Urgent consultations throughout the period | | Patients with 1 episode (*N*) 1776 | Patients with multiple episodes (*N*) 2510 |
| | | Group 1 (*N*) | Group 2 (*N*) |
| Urgent consultations throughout the analysis period* | Maximum | 79 | 32 |
| | Minimum | 6 | 1 |
| | Mean (*SD*) | 12.95 (9.04) | 4.58 (4.33) |
| Urgent consultations in 2016* | Maximum | 21 | 5 |
| | Minimum | 6 | 1 |
| | Mean (*SD*) | 7.5 (2.56) | 2 (1.27) |
| | With 1 or 2 | - | 80 |
| | With 3, 4, or 5 | - | 40 |
| | With 6 or 7 | 60 | - |
| | With 8 or more | 60 | - |
| Urgent hospitalizations throughout the analysis period* | Maximum | 18 | 6 |
| | Minimum | 0 | 0 |
| | Mean (*DP*) | 0.63 (2.63) | 0.08 (0.66) |

*Note*. *SD* = Standard-deviation; *N* = Sample.
* Results relating to the patient with the highest or lowest number of urgent consultations or hospitalizations in each analysis period.

Regarding the medical treatments received, patients with more UC episodes had more urgent surgeries and underwent chemotherapy (80.8%; $p < 0.001$), radiotherapy (43.3%), or both treatments (39.2%) more often (Table 2).

**Table 2**

*Main medical treatments performed*

| | | Group 1 (*N*) | Group 2 (*N*) | Group 3 (*N*) |
|---|---|---|---|---|
| Surgeries | Maximum | 14 | 13 | 18 |
| | Mean | 2.4 | 1.9 | 2.7 |
| | *SD* | 2.8 | 2.4 | 2.9 |
| | | $p$ = 0.070 (difference between Group 2 and Group 3) | | |
| Urgent surgeries | Maximum | 8 | 5 | 1 |
| | Mean | 0.3 | 0.2 | 0.2 |
| | *SD* | 1.0 | 0.7 | 0.7 |
| | | $p$ = 0.002 (difference between Group 1 Group 3; difference between Group 2 and Group 3) | | |
| | | *N* (%) | *N* (%) | *N* (%) |
| Chemotherapy | Yes | 97 (80.8%) | 68 (56.7%) | 25 (20.8%) |
| | No | 23 (19.2%) | 52 (43.3%) | 95 (79.2%) |
| | | | $p$ < 0.001 | |
| Radiotherapy | Yes | 52 (43.3%) | 44 (36.7%) | 30 (25%) |
| | No | 68 (56.7%) | 76 (63.3%) | 90 (75%) |
| | | | $p$ = 0.011 | |
| Chemotherapy and radiotherapy | Yes | 47 (39.2%) | 32 (26.7%) | 13 (10.8%) |
| | No | 73 (60.8%) | 88 (73.3%) | 107 (89.2%) |
| | | | $p$ < 0.001 | |

*Note*. *SD* = Standard-deviation; *N* = Sample; $p$ = $p$-value

In terms of demographic characteristics, the data indicates that the distribution of gender is similar across the three groups, as is the distribution of age, with an approximate mean and no significant differences in the distribution by age groups initially used in the institution's database (Table 3).

**Table 3**

*Patients' demographic characteristics*

| | | Group 1 (*N*) (%) | Group 2 (*N*) (%) | Group 3 (*N*) (%) |
|---|---|---|---|---|
| Gender | Female | 46 (38.3%) | 50 (42.7%) | 64 (53.3%) |
| | Male | 74 (61.7%) | 70 (58.3%) | 56 (46.7%) |
| Age (years) at the time of cancer diagnosis | | Mean (*SD*) | Mean (*SD*) | Mean (*SD*) |
| | | 57.7 (15.3) | 62.7 (14.4) | 60.7 (14.8) |
| | | *N* (%) | *N* (%) | *N* (%) |
| | 19-24 | 2 (1.7) | 1 (0.8) | 3 (2.5) |
| | 25-34 | 6 (5) | 4 (3.3) | 4 (3.3) |
| | 35-44 | 15 (12.5) | 9 (7.5) | 6 (5) |
| | 45-54 | 25 (20.8) | 13 (10.8) | 29 (24.2) |
| | 55-64 | 30 (25) | 41 (34.2) | 20 (16.7) |
| | 65-74 | 21 (17.5) | 22 (18.3) | 36 (30) |
| | >75 | 21 (17.5) | 30 (25) | 22 (18.3) |

*Note*. *SD* = Standard-deviation; *N* = Sample.

With regard to the characteristics related to the disease, the distribution according to the anatomical location of the tumor differs (Table 4). The occurrence of colon, breast, and thyroid tumors is more prevalent in the group of patients without a history of UC episodes. Conversely, tumors of the hematopoietic system, endothelial reticulum, and lymph node tumors are more frequently observed in patients with a higher number of UC episodes. It is noteworthy that lung, bronchus, and trachea tumors are more prevalent in groups with a history of ER visits. Furthermore, these groups exhibited a higher prevalence of patients with lymph node invasion or metastasis ($p < 0.001$), which suggests the involvement of factors associated with disease severity and progression.

**Table 4**

*Disease characteristics*

| | | Group 1 *(N)* (%) | Group 2 *(N)* (%) | Group 3 *(N)* (%) | Total *(N)* (%) |
|---|---|---|---|---|---|
| Anatomical location | Colon | 2 (1.7%) | 6 (5%) | 12 (10%) | 20 (16.7%) |
| | Hematopoietic and reticuloendothelial systems | 12 (10%) | 7 (5.8%) | 2 (1.7%) | 21 (17.5%) |
| | Breast | 9 (7.5%) | 11 (9.2%) | 26 (21.67%) | 46 (38.3%) |
| | Thyroid | 0 | 0 | 9 (7.5%) | 9 (7.5%) |
| | Lymph nodes | 7 (5.8%) | 3 (2.5%) | 0 | 10 (8.3%) |
| | Trachea, bronchus, lung | 17 (14.2%) | 17 (14.2%) | 2 (1.7%) | 36 (30%) |
| Node invasion | | | | | Omitted |
| | Yes | 57 (47.5%) | 52 (43.3%) | 25 (20.8%) | 48 |
| | No | 42 (35%) | 47 (39.2%) | 89 (74.2%) | |
| | | | $p < 0.001$ | | |
| Metastasis | | | | | Omitted |
| | Yes | 39 (32.5%) | 41 (34.2%) | 4 (3.3%) | 24 |
| | No | 66 (55%) | 73 (60.8%) | 113 (94.2%) | |
| | | | $p < 0.001$ | | |

*Note*. *N* = Sample; $p$ = $p$-value.

## Discussion

This study analyzed adult patients who use an institution specializing in cancer treatment on an unscheduled basis. Other studies on this subject exist, but they differ in their methodological aspects (Grewal et al., 2020; Isikber et al., 2020; Kirkland et al., 2020; Koch et al., 2022; Lee et al., 2021; Li et al., 2020; Nene et al., 2021; Verhoef et al., 2020). This study was conducted in an institution exclusively dedicated to cancer treatment, which distinguishes it from other studies in this field. It focuses specifically on the group of patients who most often use the emergency room. This allows us to identify the characteristics of patients with the highest number of urgent care episodes. In the future, those who share the same characteristics can be flagged when they are admitted to institutions. This allows integrating them into specific follow-up programs to reduce the number of ER visits. Case management is an example of such a program. It is a collaborative approach to coordinating different services for the patient, in which a case manager assesses, plans, and implements the health services needed by a very specific population of patients (Hudon et al., 2023). These programs are typically led by nurses, as the needs of patients often relate to the management of signs and symptoms and/or the promotion of self-care skills in the context of their overall health and well-being (Orem, 2001). The objective of case management is to provide specialized care for a specific group of patients who are at risk due to advanced age, multiple comorbidities, difficulty in self-managing their therapeutic regime, poor economic, social, or family conditions, or chronic illnesses (Leonard & Miller, 2012). In this context, it is a follow-up strategy that has already demonstrated effectiveness in reducing the number of avoidable visits to the emergency room (Gonçalves et al., 2022; Malebranche et al., 2021; Schaad et al., 2023). In light of the high volume of ER visits, this strategy is particularly relevant. Research suggests that between 30 and 60% of such visits by cancer patients could be avoided (Alishahi Tabriz et al., 2023; Gallaway et al., 2021). Some patients use the ER because they find it difficult to cope with their illness (Barbera et al., 2010), because they are unable to be competent in assessing and interpreting their symptoms (Majka & Trueger, 2023), or because they find the ER an easy gateway into a system that will provide them with the care they deem necessary (Nene et al., 2021). In accordance with the standardized structure for case management programs

and the logic of this study, we consider that the patients with the highest number of UC episodes (Group 1) fall within the category of cases.

The results demonstrate that several patients had multiple ER visits, which is consistent with the findings of other studies (Isikber et al., 2020; Li et al., 2020; Williams et al., 2022). This suggests that there are patients whose personal characteristics, when combined with certain disease-related factors, may be more susceptible to potential misuse of health resources. In essence, the results demonstrate that demographic characteristics do not explain why some patients are heavier users of emergency services. Our findings indicate no differences with regard to gender or age. However, other studies have yielded varying results in this regard (Isikber et al., 2020; Lee et al., 2021; Peyrony et al., 2020). Other studies have identified a trend toward increased risk of ER overuse among older patients (typically over 60 years old; Isikber et al., 2020; Lee et al., 2021; Nene et al., 2021). This can be attributed to the fact that cancer affects older individuals, as well as the reality that advancing age often results in a higher prevalence of comorbidities, reduced functionality, or more severe symptoms, necessitating more time to manage (Gallaway et al., 2021).

However, our study data indicates that there are certain distinguishing characteristics among patients who utilize ER services most frequently. These characteristics are the existence of lymph node invasion and metastization at the time of medical diagnosis, and the fact that they had undergone chemotherapy treatment. Patients in the UC groups had more advanced disease (classified as stage 4 or metastatic cancer), which may explain the higher number of ER visits. This is in line with previous findings (Isikber et al., 2020; Nene et al., 2021; Peyrony et al., 2020). Furthermore, patients in these groups exhibited a higher prevalence of disease affecting the hematopoietic and reticuloendothelial systems, lymph nodes, trachea, bronchi, and lungs. These results suggest that these tumors may require more ER visits due to their intrinsic severity or the complexity of the proposed treatments, namely chemotherapy, which is the treatment of choice for cancers of the hematological system. This finding aligns with the results of another study (Oatley et al., 2016). Some studies have found no correlation between tumor location and ER visits, while others have demonstrated that patients with breast, prostate, lung, and digestive tract tumors are frequently seen in the ER (Gallaway et al., 2021; Isikber et al., 2020; Lee et al., 2021; Peyrony et al., 2020). We believe that methodological aspects may influence some of the results. It is to be expected that, in studies that analyze all episodes of ER visits, the distribution of tumors will be similar to the distribution in the population. For instance, there may be multiple women with breast cancer who visit the ER, which would differ from a woman with breast cancer who visits the ER on multiple occasions. Other studies (Lee et al., 2021; Nene et al., 2021) did not identify patients with tumors of the hematopoietic and reticuloendothelial system as the most common in the ER overall. However, these patients were the ones who had to return to the ER more often or were hospitalized more often, which attests to their seriousness and justifies their being identified as frequent users of the ER in our study.

A further characteristic identified in patients who had used the ER most frequently was that they had undergone chemotherapy. Specifically, 80.8% of these patients had undergone chemotherapy (neoadjuvant, adjuvant, or palliative), resulting in a higher number of ER visits, possibly due to the associated side effects (Gould Rothberg et al., 2022). Other studies have already identified chemotherapy treatment as a factor in ER visits (Isikber et al., 2020; Peyrony et al., 2020), and it has even been considered a predictive factor (Goyal et al., 2014). In light of these considerations, alternative solutions have been devised for patients undergoing this treatment to reduce the necessity for urgent care (Majka & Trueger, 2023). With regard to radiotherapy, it was also among the cases in which we found a higher number of patients who underwent the treatment. In contrast to chemotherapy, the effects of radiotherapy are not necessarily systemic but depend on the irradiated anatomical region. Areas such as the thorax, head and neck, or digestive tract are particularly susceptible (Barazzuol et al., 2020; Gould Rothberg et al., 2022; Marar et al., 2018). Notably, tumors in the head and neck region were more prevalent in patients with a history of UC episodes. Radiotherapy was identified as a less significant factor (Isikber et al., 2020) or was less frequently identified as an active treatment at the time of arrival at the ER (Peyrony et al., 2020). It should be noted that one of the key factors driving the need for ER visits is the combination of chemotherapy and radiotherapy treatments (Isikber et al., 2020; Marar et al., 2018). However, our findings do not fully elucidate this aspect, despite the fact that the cases subjected to both treatments, either concurrently or at different points in time, constituted the largest proportion (39.2%).

The objective of this study is to contribute to the development of follow-up programs for high-risk patients, based on the concept of case management. This approach will facilitate the identification of the specific characteristics of cancer patients who frequently visit the ER. We therefore set out to identify the cases that form the core of these programs, which will always be a limited group of patients with well-defined characteristics and needs. This fulfills the original purpose of case management programs, as these approaches are not suitable for all patients. There is an opportunity to make progress in the construction of these programs, particularly with regard to other central elements such as the formulation of objectives, evaluation, clinical roadmaps, interventions, or indicators (Goodwin et al., 2011). The results of the study indicate that there are no significant differences between the groups with a history of urgent care with regard to some of the characteristics studied, such as the anatomical location of the tumor and the stage of the disease. This indicates that the motivation for some patients to use the ER may extend beyond the intrinsic characteristics of the disease. While these intrinsic characteristics are undoubtedly a contributing factor, it is plausible that other factors, such as the patients' cognitive abilities,

self-care skills, health attitudes, beliefs, family support, and social support, may also play a role. Further studies should be conducted using other research methodologies, potentially with a more qualitative approach, with the objective of identifying underlying motives or reasons not evident from the analysis of documented data within the health services' databases. For instance, the search for unidentified data should also include an examination of the reasons or complaints that patients have provided to the ER. The incorporation of this new data will allow a more comprehensive understanding of the characteristics of cancer patients who frequently use the ER, which is the initial objective of this study.

It should be noted that this study has certain limitations. The study did not determine whether all visits to the ER were justified, unnecessary, or avoidable. To achieve this, it would be necessary to analyze the patient's illness and treatment plan, which was not the objective of this study. However, the distinction between potentially unnecessary and non-necessary visits is still being investigated for better clarification (Leshinski et al., 2023). Furthermore, it would be beneficial to assess the significance of each identified characteristic of the case group patients in order to determine the primary factor influencing their behavior. The grouping based on the total number of UC episodes in 2016, with an examination of the patients' journeys from 2013 to 2019, has an impact on the statistical power of certain results. This deliberate approach to examining the patients who used the ER the most, rather than all of them, is subject to this same limitation. As a result, we are unable to apply the findings to other contexts of cancer patient care. It should be noted that the results presented here are limited to the context of the institution where they were conducted. However, they do suggest a methodology and analysis that could be replicated in other contexts, thus ensuring that these initial results are more robust.

## Conclusion

The results of this study indicate that there are patients who use the ER with greater frequency and that certain aspects of medical treatment, particularly the use of chemotherapy, as well as factors related to advanced disease, such as lymph node invasion or metastasis, are associated with a higher likelihood of visiting the ER. Furthermore, patients who use the ER more frequently tend to have a higher prevalence of hematological or respiratory system tumors.

By considering these characteristics, we can begin to define a clearer profile of the patients who are the biggest consumers of ER resources and, ultimately, avoidable hospitalization episodes. These patients can be considered particularly vulnerable. Implementing case management programs based on clinical roadmaps and specific follow-up programs could help reduce the excessive and avoidable use of health resources, with clear benefits for the health system and, most importantly, for the patients themselves. Case management, conducted by nurses, could serve as a valuable clinical micro-management tool in the context of cancer care services and institutions. The results presented are relevant to clinical practice in that they allow for the identification of patients with the profile suggested by our results, who may have a greater potential for the use of urgent care resources. These patients can then be included in special monitoring programs led by nurses, in anticipation of this greater potential use, guiding them along their treatment path, identifying and acting in advance on the conditions that would trigger greater use of these resources.

### Author contributions

Conceptualization: Ferreira, D., Gonçalves, F. N., Pereira, F. M.
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