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ORIGINAL RESEARCH

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Emergency department visits among people with cancer: Frequency, symptoms, and characteristics

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Abstract

Objective: People with cancer are increasingly more likely to visit an emergency department for acute care than the general population. They often have long wait times and more exposure to infection and receive treatment from staff less experienced with cancer-related problems. Our objective was to examine emergency department (ED) visits among people with cancer to understand how often and why they seek care.

Methods: We conducted a retrospective study of ED visits using the National Syndromic Surveillance Program BioSense Platform. Cancer reported during an ED visit was identified using *International Classification of Diseases, Tenth Revision* codes for any cancer type, including bladder, breast, cervical, colorectal, kidney, liver, lung, ovary, pancreas, prostate, or uterine cancers. Symptoms prompting the visit were identified for people with cancer who visited EDs in the United States from June 2017 to May 2018 in ≈4500 facilities, including 3000 EDs in 46 states and the District of Columbia (66% of all ED visits during a 1-year period).

Results: Of 97 million ED visits examined, 710,297 (0.8%) were among people with cancer. Percentages were higher among women (50.1%) than men (49.5%) and among adults aged ≥65 years (53.6%) than among those ≤64 years (45.7%). The most common presenting symptoms were pain (19.1%); gastrointestinal (13.8%), respiratory (11.5%), and neurologic (5.3%) complaints; fever (4.9%); injury (4.1%); and bleeding (2.4%). Symptom prevalence differed significantly by cancer type.

Conclusions: The Centers for Medicare & Medicaid Services encourages efforts to reduce acute care visits among people with cancer. We characterized almost 70% of ED visits among this population.

KEYWORDS
cancer survivors, emergency department, syndromic surveillance, symptoms

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1 | INTRODUCTION

1.1 | Background

Each year in the United States, about 1.6 million new cancers are diagnosed and nearly 600,000 people die of cancer.[1,2] From 2010 to 2020, cancer diagnoses are projected to increase over 20% among both men and women because of the growth and aging of the US population.[3] At the same time, because of advances in prevention, early detection, and treatment, survival rates have improved, and many cancer patients are living longer.[4] Cancer increasingly is managed as a chronic illness, which requires a coordinated approach among patients and physicians beyond initial oncology care.[5] Perhaps in part because of the increasing number of cancer survivors, studies have shown that people with cancer are increasingly likely to visit an emergency department in general hospitals and cancer centers[6–8] for problems both related and not related to their cancer or cancer treatments.[9] The use of EDs by people with cancer can negatively affect both the individual and the ED system.[10–12] For example, people with cancer often experience long wait times and increased exposure to infection and receive treatment from staff less experienced with cancer-related problems.[10–12] These visits also increase the cost of care for patients.[11,13,14] Studies suggest that 30% to 60% of ED visits among people with cancer are preventable.[11,13,14] Reducing unnecessary ED visits among this population may be critical to improving cancer care delivery.[15,16]

1.2 | Importance

The first step to reducing ED visits in the United States is to accurately identify the population of people with cancer who are visiting the ED and their chief complaints. Previous studies of ED visits among people with cancer vary widely in their aim, the populations of interest, and their sample selection.[12,17,18] Most studies have been limited to small sample sizes (eg, single institutions, hospitals, cancer centers), patients receiving specific treatment therapies, or patients with advanced disease.[17,18] Some large studies representative of all people with cancer who visit EDs have been done.[8,11,17–20] In the United States, county- and state-level studies were published in 2012 and 2018.[8,11] Similar studies were done in Ontario, Canada, and Melbourne, Australia.[19,20] The most common symptoms reported by patients across previous studies were fever and infection, gastrointestinal complaints, pain, respiratory complaints (and pneumonia), and bleeding.[8,11,12,17–22] However, the current literature lacks consistent definitions of symptoms or an accurate comparison of symptoms across cancer types. A more thorough understanding of ED visits among people with cancer is needed to educate health care physicians, nurse practitioners, nurse navigators and other healthcare professionals and help them improve care delivery and manage patients' clinical risks.

1.3 | Goals of this investigation

The purpose of this study is to provide a comprehensive assessment of characteristics and chief complaints of ED visits for people with cancer.

The Bottom Line

Acute emergency department (ED) visits related to cancer are increasing nationally. Data from 3000 EDs (2017–18) showed that 0.8% of all visits were related to cancer, with the most common complaints being pain, gastrointestinal, respiratory, and neurological complaints.

We analyzed this information for the most common cancer types using a sample from ≈4500 facilities, including 3000 EDs to understand why people with specific cancers seek care in the ED.

2 | METHODS

2.1 | Study design and setting

This was a retrospective study of people with cancer who visited an ED from June 1, 2017 to May 31, 2018. We analyzed ED visits from the Centers for Disease Control and Prevention's National Syndromic Surveillance Program (NSSP)[23] to characterize cancer-related visits using Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) software. NSSP's BioSense platform launched in 2003 to establish a national public health surveillance system for early detection and assessment of bioterrorism-related events. Since 2011, the focus has expanded to situational awareness for all-hazards preparedness and response.[24] NSSP receives demographic and chief complaint data and *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) diagnostic codes from 4478 medical facilities, including 3021 EDs in 46 states and the District of Columbia, covering about 66% of all ED visits in the United States.[24,25] Non-ED visits were excluded from analyses. Availability and completeness of data vary across EDs, with the chief complaint text missing in 6% of visits and diagnosis discharge codes missing in 23% of visits. Completeness of chief complaint (6%–15%) and diagnosis discharge (23%–40%) fluctuates over time as information improves. ED visits are defined as occurring in facilities categorized as "emergency" and involving patients whose medical record noted them as "emergency" status. They exclude patients designated as only inpatient or outpatient.

2.2 | Selection of participants

Consistent with previous studies,[11,26] we identified a person (of an age) as having cancer if the following ICD-10-CM diagnostic codes appeared in the chief complaint of the ED visit record (in any position): all cancers (C00-C96, D00-D07) in aggregate; and the following specific cancer types: bladder (C67), breast (both male and female, C50), cervix (C53), colon or rectum (C18-C20), kidney (C64-C65), liver

TABLE 1 Chief complaints/syndromes and symptoms for emergency departments visits among people with cancer

Chief complaint/ syndrome	Symptoms
Pain	Chest pain, back pain, extremity pain, abdominal pain, other pain
Gastrointestinal	Bloating, gastroenteritis, loss of appetite, nausea, vomiting, diarrhea, food poisoning, abdominal pain
Respiratory	Respiratory distress, shortness of breath, cough, hemoptysis, pneumonia, acute bronchitis
Neurologic	Altered mental status, dizziness, drowsiness, encephalitis, seizure
Fever	Chills, fever, febrile, neutropenia (temperature not always noted)
Injury	Bite, sting, cut, pierce, drowning, excessive heat, fall, injury, motor vehicle, poisoning, firearm
Bleeding	Bleed, blood, bleeding
Malaise/fatigue	Malaise, weakness, fatigue
Medication refill	Refill, medication, prescription, requesting script, lost script
Dehydration	Dehydration, hypernatremia, dehydrated
Hypertension	Hypertension, high blood pressure

(C22), lung (C33-C34), ovary (C56), pancreas (C25), prostate (C61), and uterus (C54-C55). These cancer types were included because they are the most commonly diagnosed among several populations in the United States.[25] Persons visiting the ED could have multiple ICD-10-CM diagnostic codes; all were included in the determination of cancer status.

2.3 | Outcomes

The chief complaint was defined as the main symptom prompting the visit to the ED. No standard nomenclature or data entry mechanism for ED chief complaints exists. An algorithm that parses chief complaints was developed for ESSENCE. It categorizes text strings and ICD-10-CM diagnostic codes into syndrome groupings.[27] We categorized symptoms according to similar previously published studies, as well as the output of the algorithm, into 11 non-mutually exclusive broad groups: pain, gastrointestinal complaints, respiratory complaints, neurologic complaints, fever, injury, bleeding, malaise/fatigue, medication refill, dehydration, and hypertension (Table 1).[27–29] A single visit could be associated with multiple chief complaint categories. For example, pain (the most common reported symptom among all visits) includes abdominal pain, which also is captured in the group of gastrointestinal complaints.

2.4 | Measurements

Patient and visit demographic variables for ED visits among people with cancer included sex (male/female), age at first visit (≤17, 18–44, 45–64, ≥65 years), disposition (admitted, transferred, deceased, discharged), and visit date.

2.5 | Analysis

Descriptive statistics, both counts and percentages, were calculated for symptom categories and patient and visit characteristics for all cancers combined, as well as for each of the 11 cancer types examined. Z-test of 2 proportions and chi-square analyses were used to assess differences in symptom categories and patient and visit characteristics for each individual cancer type (eg, lung cancer) compared to the aggregate of all other cancers, excluding the cancer type of interest (eg, lung cancer vs all cancers in the sample, excluding lung cancer; cervix cancer vs all cancers in the sample, excluding cervix). All analyses were completed using SAS 9.3 (Statistical Analysis System), and statistical significance was regarded as a 2-sided P value <0.01. This study was conducted in accordance with all ethical standards of our institution, and as a secondary analysis of de-identified aggregate data, institutional review board approval was not required.

3 | RESULTS

3.1 | Characteristics of study subjects

Among ≈97 million ED visits captured in NSSP from June 2017 to May 2018, a total of 710,297 were among people with cancer (Figure 1). Visits among people with cancer were documented most often for cancers of the lung (13.0%), breast (9.9%), colon or rectum (6.8%), prostate (6.2%), pancreas (3.5%), liver (2.6%), bladder (2.1%), ovary (2.1%), and kidney (2.1%). Of these visits, slightly more were among women (50.1%) and adults aged ≥65 years (53.6%). Almost half (48.2%) of ED visits among people with cancer had a disposition (ie, discharge status after the ED encounter) of discharged and another one-quarter of people with cancer were admitted to the same hospital (21.9%) or transferred to another hospital (6.3%).

3.2 | Main results

Overall, the most common symptoms were related to pain (19.1%), gastrointestinal complaints (13.8%), respiratory complaints (11.5%), neurological complaints (5.3%), fever (4.9%), injury (4.1%), and bleeding (2.4%) (Table 2). More than 90% of gastrointestinal complaints were related to abdominal pain (52.1%) or nausea/vomiting (41.3%). Approximately 60% of respiratory complaints were related to respiratory distress or shortness of breath (63.0%). The most common neurologic complaints among all ED visits were altered mental status (2.1%) and dizziness (2.0%).

Chief complaints and symptoms varied significantly by cancer site (Table 2). ED visits for pain (P) and gastrointestinal (GI) complaints were significantly higher among people with cancers of the bladder (P, 22.5%; GI, 15.6%), cervix (P, 29.7%; GI, 22.3%), colon and rectum

TABLE 2 Percentage of chief complaints and symptoms for emergency department visits among people with cancer

Chief complaint	All cancers (N = 710,297)	Bladder (N = 14,612)	Breast (N = 70,476)	Cervical (N = 6,658)	Colorectal (N = 48,002)	Kidney (N = 14,627)	Liver (N = 18,489)	Lung (N = 92,458)	Ovarian (N = 14,614)	Pancreas (N = 25,017)	Prostate (N = 43,795)	Uterine (N = 11,312)
Pain	19.1	22.5†	15.5	29.7†	23.8†	24.0†	28.2†	17.7	23.1†	26.7†	19.7†	20.3†
Gastrointestinal (GI)	13.8	15.6†	9.4	22.3†	25.3†	15.6†	27.2†	9.5	23.8†	28.0†	10.7	17.1†
Nausea/vomiting	5.7	6.1†	5.0	8.3†	8.2†	6.1†	8.2†	4.6	10.7†	10.1†	3.8	7.0†
Diarrhea	1.6	1.9†	1.5	2.0†	2.8†	1.9†	1.9†	1.3	1.8†	2.4†	1.3	1.9†
Abdominal pain	7.2	8.7†	3.9	14.4†	14.4†	8.7†	17.6†	3.8	14.5†	17.6†	5.0	10.0†
Respiratory	11.5	11.2	9.6	6.4	6.8	11.3	9.2	25.9†	8.4	6.9	8.6	7.9
Respiratory distress/shortness of breath	7.3	7.1	6.3	3.9	4.6	7.1	6.2	17.3†	5.8	4.8	5.6	5.5
Cough	1.8	1.8	1.6	1.1	0.9	1.8	1.2	3.4†	0.9	0.7	1.4	1.0
Hemoptysis	0.4	0.5	0.2	0.1	0.1	0.5	0.3	1.4†	0.1	0.1	0.2	0.2
Pneumonia	0.7	0.7	0.5	0.3	0.4	0.7	0.4	1.7†	0.3	0.3	0.6	0.4
Neurologic	5.3	5.2	4.2	3.7	4.2	5.2	6.3†	5.8†	3.5	4.5	5.4	4.0
Altered mental status	2.1	2.3	1.4	1.1	1.5	2.3	4.0†	2.5†	1.2	2.2†	2.2	1.5
Dizziness	2.0	1.9	1.8	1.7	2.0	1.9	1.6	2.0	1.6	1.7	2.4†	1.8
Fever	4.9	4.5	4.3	4.3	4.2	4.5	5.2†	3.7	4.0	7.1†	3.9	3.7
Neutropenia	1.5	0.5	1.6	0.9	0.9	0.6	0.7	0.9	1.5	1.2	0.5	1.1
Injury	4.1	4.0	3.9	2.9	3.4	4.0	3.9	4.2	2.3	3.1	5.2†	2.8
Fall	2.7	2.7	2.3	1.5	2.1	2.7	2.7	3.1†	1.6	2.2	3.7†	2.0
Cut or pierce	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.1
Poisoning	0.3	0.3	0.3	0.5†	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2
Bleeding	2.4	2.2	1.3	2.2	5.1†	2.2	4.3†	1.5	2.0	2.9†	2.2	1.9
Malaise/fatigue	1.6	1.5	1.2	1.4	1.4	1.5	1.9†	1.8†	1.4	1.9†	1.6	1.5
Medication refill	0.9	1.1	0.8	1.6†	0.9	1.0	1.0	0.9	0.9	1.1†	1.0†	0.8
Dehydration	0.9	1.1[a]	0.7	0.8	1.3†	0.7	1.0	1.0†	1.1†	1.7†	0.7	0.8
Hypertension	0.7	0.8	0.7	0.6	0.7	0.9†	1.1†	0.6	0.7	0.6	1.0†	0.8

† *Z*-test calculation of 2 population proportions ($P < 0.01$) used to assess differences in symptom categories for each individual cancer type (eg, lung cancer) compared to the aggregate of all other cancers, excluding the cancer type of interest (eg, lung cancer vs all cancers in the sample, excluding lung cancer.

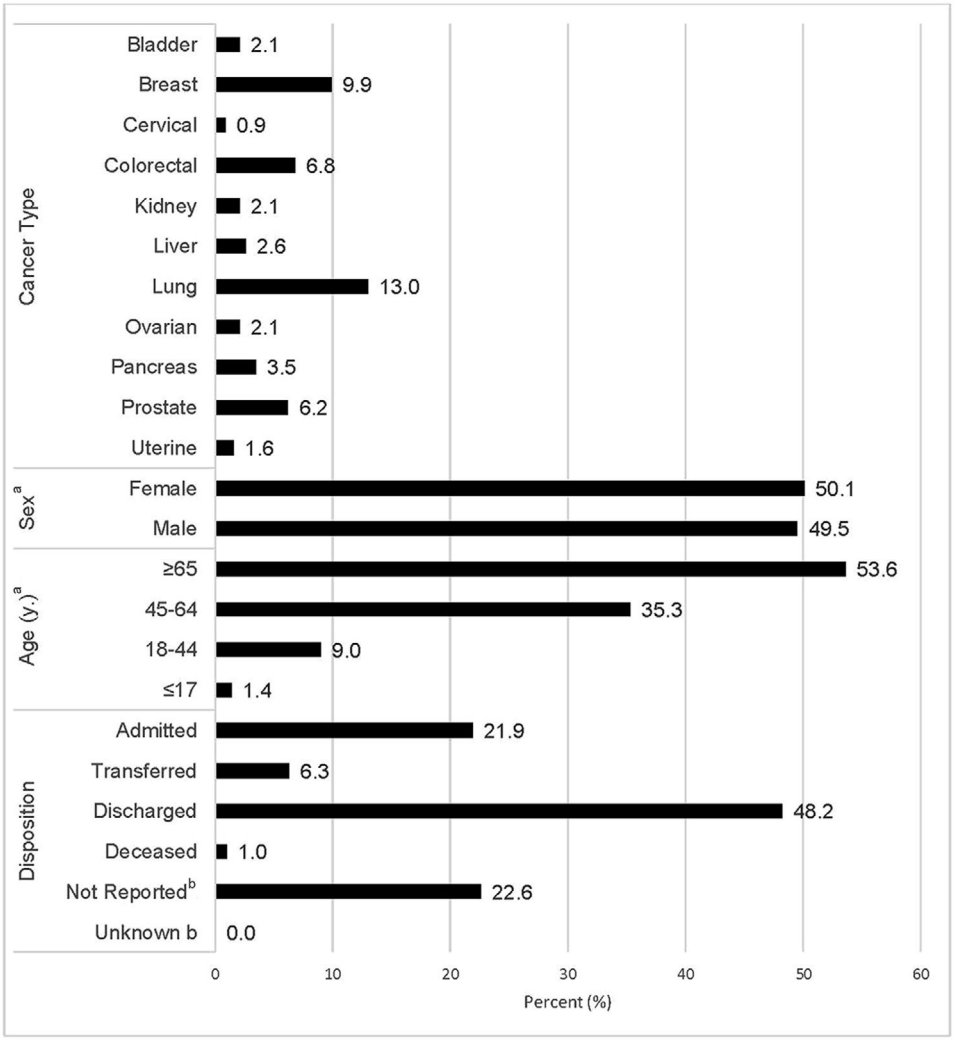

FIGURE 1 Percentage of cancer types and characteristics of emergency department visits among people with cancer (N = 710,297). [a]Percentages do not add to 100% owing to unknown values (not shown). [b]ED visit disposition data (ie, discharge status after the ED encounter) listed as unknown (0.03%) or was not reported (22.6%) of visits; records that contained specific disposition information were examined

(P, 23.8%; GI, 25.3%), kidney (P, 24.0%; GI, 15.6%), liver (P, 28.2%; GI, 27.2%), ovary (P, 23.1%; GI, 23.8%), pancreas (P, 26.7%; GI, 28.0%), or uterus (P, 20.3%; GI, 17.1%) compared to all cancers combined (P, 19.1%; GI, 13.8%). Pain was also significantly higher among males with prostate cancer (19.7%) compared to all cancers combined. Respiratory (R) and neurologic (N) complaints were higher among those with lung cancer (R, 25.9%; N, 5.8%) compared to all cancers combined (R, 11.5%; N, 5.3%). Neurologic complaints were also higher among those with liver cancer (6.3%) compared to all cancers combined. Fever (F) was higher among those with liver (5.2%) or pancreas (7.1%) cancers, injury (I) was highest among males with prostate cancer (5.2%), and bleeding (B) was higher among people with colon and rectum (5.1%), liver (4.3%), or pancreas (2.9%) cancers compared to all cancers combined (F, 4.9%; I, 4.1%; B, 2.4%).

Chief complaints and symptoms also significantly differed by age (Table 3). Pain and gastrointestinal complaints were higher among those aged 18–44 years (P, 22.8%; GI, 15.7%) and 45–64 years (P, 20.8%; GI, 14.8%) compared to all ages combined (P, 19.1%; GI, 13.8%). Respiratory complaints and injury were higher among those aged ≥65 years (R, 12.9%; I, 5.1%) compared to all ages combined (R, 11.5%; I, 4.1%). Fever and bleeding were higher among those aged ≤17 years (F, 34.5%; B, 4.2%) compared to all ages combined (F, 4.9%; B, 2.4%).

Men with cancer who visited the ED had significantly higher percentages of respiratory complaints (11.8%), neurologic complaints (5.4%), fever (5.2%), and bleeding (2.6%) compared to women (Table 4). Women with cancer had higher percentages of pain (19.7%), gastrointestinal complaints (14.9%), and hypertension (0.8%) compared to men.

3.3 | Limitations

This study is subject to at least 5 limitations. First, NSSP definitions might underestimate or overestimate visits grouped into certain categories because of differences in coding practices between hospitals, the completeness of ICD-10-CM diagnostic codes, and the quality of chief complaint data.[30] Second, the data may miss ED visits by patients

TABLE 3 Percentage of chief complaints and symptoms for emergency department visits among people with cancer, stratified by age

	All cancers				
Chief complaint	Total (N = 710,297)	Aged ≤17 (N = 10,024)	Aged 18-44 (N = 64,115)	Aged 45-64 (N = 250,806)	Aged ≥65 (N = 380,721)
Pain	19.1	12.9	22.8†	20.8†	17.4
Gastrointestinal (GI)	13.8	14.4	15.7†	14.8†	12.8
Nausea/vomiting	5.7	9.0†	7.2	6.2	5.1
Diarrhea	1.6	1.9†	1.4	1.4	1.7
Abdominal pain	7.2	5.0	9.4†	8.3	6.1
Respiratory	11.5	8.9	7.1	10.6	12.9†
Respiratory distress/					
Shortness of breath	7.3	0.9	3.7	6.7	8.4†
Cough	1.8	4.2†	1.5	1.6	1.9
Hemoptysis	0.4	0.3	0.3	0.5	0.5
Pneumonia	0.7	0.2	0.3	0.6	0.9†
Neurologic	5.3	5.4	4.4	4.6	5.8†
Altered mental status	2.1	0.8	0.8	1.6	2.5†
Dizziness	2.0	1.3	1.7	1.8	2.2†
Fever	4.9	34.5†	5.6	4.4	4.3
Neutropenia	1.5	10.3†	1.9	1.3	1.2
Injury	4.1	3.1	2.8	3.0	5.1†
Fall	2.7	1.1	0.8	1.6	3.9†
Cut or pierce	0.2	0.3†	0.2	0.2	0.3
Poisoning	0.3	0.3	0.5†	0.3	0.2
Bleeding	2.4	4.2†	1.9	2.1	2.6
Malaise/fatigue	1.6	2.1†	1.0	1.3	1.9†
Medication refill	0.9	1.3†	1.1†	1.0	0.8
Dehydration	0.9	0.5	0.5	0.8	1.0†
Hypertension	0.7	0.1	0.4	0.7	0.8†

†Chi-square test ($P < 0.01$) used to assess differences in symptom categories between age categories.

who went to hospitals that do not participate in NSSP, and some visits may include the same patient counted multiple times at the same or a different hospital. Although this study is one of the largest to date of ED cancer-related visits in the United States (about 66% of all ED visits),[24] our findings may not be generalizable to hospitals not participating in NSSP. Third, we could not determine from the data the difference between cancer-related versus non-cancer-related symptoms, the severity of symptoms, how long ago a patient was diagnosed with cancer, cancer stage, or any treatment received. Although we do not have any data on the timing of the ED visit in relation to the cancer diagnosis, our study found that ED visits were more common among people with the 5 cancers that cause the most US cancer deaths annually.[31] Fourth, although state and local health departments that use NSSP have access to detailed case-level data, for this study, all data were aggregated nationally and included a subset of visit characteristics. Also, for this reason we were unable to directly adjust the *P* value to control for multiple statistical comparisons. For example, because our study conducted ≈264 statistical *z*-tests of chief complaint by cancer type, it possible by chance alone (5%) we would have expected to identify ≈13 significant results. Thus, we opted to use a more stringent *P* value (<0.01) to identify statistically significant differences. Finally, other reasons, beyond symptoms, are known to influence ED use. Examples include fearfulness, cultural background, insufficient language and communication skills, delays in seeking help, medication non-adherence, lack of social support, insurance status, race, and gender.[32,33] We did not have information on these factors.

4 | DISCUSSION

This study analyzed estimates from ≈4500 US hospitals and found that over 700,000 visits were made to EDs by people with cancer in a 1-year period. It identifies discernible differences in people with cancer who visited the ED by their chief complaints and cancer type. The results of this study can be used to guide recommended best practices designed to increase coordination of care and appropriate

TABLE 4 Percentage of chief complaints and symptoms for emergency department visits among people with cancer, stratified by sex

	All cancers		
Chief complaint (%)	Total (N = 710,297)	Male (N = 351,641)	Female (N = 355,741)
Pain	19.1	18.4	19.7†
Gastrointestinal (GI)	13.8	13.9	14.9†
Nausea/vomiting	5.7	4.8	6.7†
Diarrhea	1.6	1.3	1.8†
Abdominal pain	7.2	6.7	7.8†
Respiratory	11.5	11.8†	11.4
Respiratory distress/shortness of breath	7.3	7.4†	7.2
Cough	1.8	1.8	1.8
Hemoptysis	0.4	0.5†	0.3
Pneumonia	0.7	0.8†	0.7
Neurologic	5.3	5.4†	5.2
Altered mental status	2.1	2.2†	2.0
Dizziness	2.0	2.0	2.0
Fever	4.9	5.2†	4.7
Neutropenia	1.5	1.5	1.5
Injury	4.1	4.2	4.1
Fall	2.7	2.8	2.8
Cut or pierce	0.2	0.3†	0.2
Poisoning	0.3	0.3†	0.3
Bleeding	2.4	2.6†	2.2
Malaise/fatigue	1.6	1.6	1.6
Medication refill	0.9	0.9	0.9
Dehydration	0.9	0.9	0.9
Hypertension	0.7	0.7	0.8†

†Chi-square test ($P < 0.01$) used to assess differences in symptom categories between sex categories.

management of symptoms, ensure timely referral to palliative or supportive care, and improve models of care.[34]

Our findings that the most common symptoms among all people with cancer who visited an ED were pain; gastrointestinal, respiratory, and neurologic complaints; fever; injury; and bleeding are consistent with previous studies.[8,11,12,17–22] Pain is generally the most common chief complaint across all studies.[8,11,18–22] Although people with cancer who complain of pain commonly are released without hospitalization,[8] inadequate pain control can be a major contributor to subsequent ED visits and poor quality of life.[35] Controlling pain (acute, chronic, or due to latent or late side effects of treatment) is a key part of cancer treatment, and most cancer-related pain can be managed collaboratively between patients and their care team with medicine and other treatments in a defined pain control plan.[36] One approach that has shown promise is a standardized web-based questionnaire that physicians can give their patients to help them understand the short- and long-term level of pain to expect and how it can be controlled.[26]

Our study showed ED visits were more common among older adults (≥65 years) and that chief complaints for this population were more often related to respiratory complaints, neurologic complaints, injury, or fatigue. Among the youngest age group (≤17 years), chief complaints were more often fever, nausea/vomiting, diarrhea, or bleeding. Previous studies have shown ED visits were more common among older people[8,11,17,37,38] and males with cancer.[11,17,20,35] However, in a study that examined specific symptoms among ED visits,[8] older people with cancer were more likely to report endocrine/metabolic, circulatory, respiratory, or gastrointestinal symptoms. The differences reported may be because of population differences or differences in symptom definitions. Because our sample covers a majority of the US population, it may be more representative of all people with cancer who visit the ED. ED visits among older people with cancer may be higher because of reduced physical functioning, comorbid conditions, and more severe symptoms,[37,38] and older people with cancer may require more time to manage.[8,20] A previous study evaluating patients with head and neck cancer outcome symptom scores identified that ED visits were mostly strongly associated with pain, appetite, shortness of breath, and tiredness suggesting the need for proactive symptom management in high-risk patients.[39]

Other large population studies examining ED visits among people with cancer have approximated that as many as 4% of those visiting EDs were cancer patients or cancer survivors.[21,22] In this study, we identified that ≈<1% of persons visiting the ED were cancer patients. Reasons for discordance between previous studies and the current study are likely owing to the way in which cancer patients were identified. In the current study using NSSP BioSense Platform data, cancer patients were identified using ICD-CM-10 diagnostic codes, as opposed to a specific question (in a chart or patient history) that asked patients if they had ever had cancer. Thus, if an ICD-CM-10 code was not reported in the patient record for chief complaint, they would not be identified for the current study. This likely resulted in undercounting of persons with cancer and overcounting of cancer-related symptoms.

Symptoms for each cancer type in our study that were reported significantly more frequently than compared to all other cancers in aggregate were as follows: lung (respiratory complaints), liver (gastrointestinal and neurologic complaints), pancreas (neurologic complaints, fever, bleeding), prostate (injury), and colorectal (bleeding) cancer. To our knowledge, these are novel findings, as few studies have compared the prevalence of symptoms across people with different types of cancer. One study in North Carolina[11] also reported increased symptoms of respiratory complaints among people with lung cancer and injuries among those with prostate cancer. However, a systematic review of 15 studies[17] concluded that ED use was higher for those with gynecologic or colon cancer compared to those with breast, prostate, or lung cancer and pointed to a need for more accurate descriptions of symptoms across cancer types. Increased injuries among persons with prostate cancer may likely reflect the older age demographic of persons with this type of cancer, as we are not aware of any other previous studies of prostate cancer that would explain this outcome.

Our findings provide the most comprehensive comparison of symptoms to date for ED visits by people with 11 specific types of cancer. Although people with cancer are a small percentage of total ED visits,[8,11,20,40,41] they have higher admission rates, require more extensive care, and have a higher mortality rate than other patients.[8] These findings could be used by physicians treating cancer patients and cancer survivors to better understand why they may seek out an ED.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by MSG and NI. The first draft of the manuscript was written by MSG, NI, and ET, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. MSG takes final responsibility for all contents of this manuscript.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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