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Characterization of older adults with cancer seeking acute emergency department care: A prospective observational study

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Authors' contributions: JJB and JMC conceived the study. JJB, MIE, and JMC were responsible for data acquisition and curation specific for this project. MIE performed the statistical analysis under the supervision of JJB, JFPB, and JMC. JJB, MIE, AER, CJP, and JMC drafted the manuscript, and all authors contributed substantially to its revision. JJB takes responsibility for the paper as a whole.

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Declarations:

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Abstract

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Introduction: Disparities in care of older adults in cancer treatment trials and emergency department (ED) use exist. This report provides a baseline description of older adults ≥65 years old who present to the ED with active cancer.

Materials and Methods: Planned secondary analysis of the Comprehensive Oncologic Emergencies Research Network observational ED cohort study sponsored by the National Cancer Institute. Of 1,564 eligible adults with active cancer, 1,075 patients were prospectively enrolled, of which 505 were ≥65 years old. We recruited this convenience sample from eighteen participating sites across the United States between February 1, 2016 and January 30, 2017.

Results: Compared to cancer patients younger than 65 years of age, older adults were more likely to be transported to the ED by emergency medical services, have a higher Charlson Comorbidity Index score, and be admitted despite no significant difference in acuity as measured by the Emergency Severity Index. Despite the higher admission rate, no significant difference was noted in hospitalization length of stay, 30-day mortality, ED revisit or hospital admission within 30 days after the index visit. Three of the top five ED diagnoses for older adults were symptom-related (fever of other and unknown origin, abdominal and pelvic pain, and pain in throat and chest). Despite this, older adults were less likely to report symptoms and less likely to receive symptomatic treatment for pain and nausea than the younger comparison group. Both younger and older adults reported a higher symptom burden on the patient reported Condensed Memorial Symptom Assessment Scale than to ED providers. When treating suspected infection, no differences were noted in regard to administration of antibiotics in the ED, admissions, or length of stay ≤2 days for those receiving ED antibiotics.

Discussion: We identified several differences between older (≥65 years old) and younger adults with active cancer seeking emergency care. Older adults frequently presented for symptom-related diagnoses but received fewer symptomatic interventions in the ED suggesting that important opportunities to improve the care of older adults with cancer in the ED exist.

Keywords

Older patients with cancer; emergency department; acute care; emergency service; unscheduled care; neoplasm complications; neoplasm epidemiology

Introduction:

Adults with cancer account for more than 4.5 million US emergency department (ED) visits per year.[1] It is predicted that this number will increase given the aging American population.[2] Older adults (≥65 years of age) are increasingly recognized as an important subpopulation of patients with cancer and of patients presenting to the ED for acute care. Unfortunately, this population is known to be underrepresented in clinical trials, resulting in treatment disparities.[3,4] The treatment of older patients has been identified as a knowledge gap by the National Institutes of Health.[5]

Limited literature characterizing the acute care of patients with cancer in the ED exists with a paucity of literature relating to the impact of aging in this population, an identified knowledge gap.[6] Prior efforts to describe ED utilization are limited to retrospective studies which fail to comprehensively describe the ED utilization and patient characteristics of older

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patients with active cancer.[1,7–11] The National Cancer Institute sponsored Comprehensive Oncologic Emergencies Research Network (CONCERN) accelerated knowledge generation and translation in this important topic area through an eighteen-site multicenter research collaboration across oncology and emergency medicine.[12,13] The prospective observational cohort study characterizes ED visits by patients with cancer. Within this cohort, nearly half of subjects where older adult patients allowing for this analysis to describing the impact of older age on the ED care of patients with cancer.

This manuscript reports a secondary analysis of the CONCERN cohort study, providing a baseline assessment of ED utilization by older patients (≥ 65 years of age) with active cancer. This important work will provide a comparison point for future studies studying this vulnerable population. As noted in clinical prediction models for cancer treatment related hospitalization, we hypothesized that older patients with cancer experience a higher symptom burden and are more likely to be hospitalization than younger patients with cancer.[14,15]

Material and Methods:

Design and Setting

We conducted a planned secondary analysis of older patients with cancer (≥ 65 years of age) in the ED-based CONCERN dataset. The eighteen-site prospective observational cohort study was conducted from February 1, 2016 to January 30, 2017 and descriptions of the convenience sample and protocol have been previously published.[13] The convenience sample of 1,075 patients with cancer presenting to a study site ED for acute care consisted of adults ≥18 years with active cancer. We defined active cancer as (1) antineoplastic therapy within the past twelve months, (2) previously diagnosed or ED physician-diagnosed cancer recurrence, metastasis, or advanced disease, or (3) patient-reported symptoms related to known cancer. Exclusion criteria included pregnancy, incarceration, psychiatric chief complaint, primary evaluation as a trauma response, non-English speaking, previous enrollment in this same study, or too ill or otherwise unable to participate in survey administration. The sites consisted primarily of urban academic EDs, thirteen of which are affiliated with National Cancer Institute-designated comprehensive cancer centers. Each participating site's Institutional Review Board approved all study procedures.

Data Collection

Trained study personnel administered the study questionnaire in the ED and conducted a subsequent 30-day chart abstraction for enrolled patients. Information collected included demographics, cancer type and status, medical history, current treatments and medications, functional status, symptom burden, palliative/hospice care utilization, clinical data including ED lab tests, ED disposition, hospital use/length of stay, Eastern Cooperative Oncology Group performance status (ECOG), Condensed Memorial Symptom Assessment Scale (CMSAS), and up to four ED diagnoses using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.[16–18] The ECOG and CMSAS allow for the assessment of functional status and symptom burden. In particular, the fourteen

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symptoms and three subscales (SUM, PHYS, PSYCH) of CMSAS correlate significantly with survival.[18]

We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for this investigation.[19] A description of the missing values and interrater reliability has been previously published.[13]

Statistical Analysis

We presented descriptive statistics for categorical variables as counts and percentages. We reported continuous variables as means, medians. We compared baseline characteristics, symptoms, and medical histories for older vs. younger patients with active cancer presenting to the ED using χ^2 tests for categorical variables and Wilcoxon two sample tests for continuous variables. We used Fisher's exact tests to examine the associations between older age status and categorical variables with an expected cell count less than five in more than 20% of all cells. We examined the association between older age status and the individual components of the CMSAS to discern the significant symptoms driving the difference in the sum CMSAS score. To account for multiple comparisons, we adjusted the p-values obtained from tests of the individual CMSAS components by older age status using the Holm-Bonferroni method. We considered a significance level of 0.05 for 2-sided tests statistically significant. We reported all 95% confidence intervals (CIs) when applicable. We performed analyses using SAS 9.4 (SAS Institute, Inc, Cary, NC). Missing data is reported in the respective tables and no imputation of missing data was performed.

Results:

During the one-year study period, we screened 2,337 patients with active cancer; of these 1,564 were eligible and 1,075 were enrolled. We report patient demographics in Table 1, including the subset of 505 (49.1%) patients that were older (≥65 years of age) adults with cancer. Significant differences between the two age populations were noted for race, marital status, educational attainment, mode of ED arrival, ECOG score, and ED disposition. Although older patients were less likely to have completed a bachelor's degree, they were more likely to be White, married, transported by Emergency Medical Services, have lower ECOG scores, and admitted to the hospital. No significant differences were noted for sex, ethnicity, arrival time to ED, Emergency Severity Index, hospital or ED readmission within 30 days of index encounter, and 30-day mortality. The proportion of admitted patients was significantly higher in older vs. younger patients (61.6% vs. 53.3%; P<0.01). The mean length of stay (LOS) for admitted patients was not significantly different in older compared to younger patients (5.8 vs. 5.9 days; P=0.16).

Older patients had a significantly higher mean Charlson Comorbidity Index score than younger patients (3.8 vs. 4.3; P= 0.02). This difference was driven by significantly higher prevalence of myocardial infarction (4.3% vs. 11.2%; P=<0.01), congestive heart failure (3.1% vs. 9.3%; P<0.01), peripheral vascular disease (2.7% vs. 7.2%; P<0.01), and chronic kidney disease (6.7% vs. 16.2%; P<0.01).

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We list the most common ED diagnoses for the population of older patients with active cancer in Appendix 1. The top three ED diagnoses (fever, abdominal and pelvic pain, pain in the throat and chest) and five of the top ten (nausea and vomiting, malaise and fatigue) were symptom related. We also noted laboratory abnormalities as three of the top ten diagnoses (other disorders of fluid, electrolytes, and acid-base balance; other anemia; and neutropenia).

Table 2 lists active cancer types and cancer treatment histories encountered in this ED sample. Gastrointestinal tract, lung, genitourinary, prostate, and leukemia were the top five reported primary cancer types in the older population compared to gastrointestinal track, breast, lung, leukemia, and genitourinary in the younger population. There were no statistically significant differences in treatment modalities between the two groups despite there being fewer patients with advanced cancer in the older population. A significantly larger proportion of older patients reported having a living will or advanced directive and a significantly smaller proportion of older patients reported currently receiving palliative care or hospice care.

We report patient symptoms at time of ED visit as documented in the medical record by providers in Table 3. Among those reporting pain, the mean initial pain score was clinically comparable between the two groups (6.59 ±2.6 vs. 6.02 ±2.52, p=0.01). However, older patients were less likely to report any pain or to receive any ED pain medication. Amongst patients who reported any pain symptoms (i.e., any pain, abdominal pain, or chest pain), older patients we less likely to receive pain medications compared to younger patients (160 [55.0%] vs. 273 [65.3%] p=0.01). When pain medications were administered in the ED, the older population was significantly less likely to receive an opioid. This difference was not noted when limiting the population to those reporting moderate or severe pain, however a difference did remain in the type of opioid provided, with a smaller proportion of the older population receiving long-acting opioid agents. No significant difference was noted in the proportion of patients reporting shortness of breath or nausea. A difference was noted in the proportion of patients receiving antiemetics in the ED, with fewer being provided to older patients. Notably, when assessing patient-reported symptoms using the CMSAS, significant differences existed between the two groups (1.69 ±0.77 vs. 1.54 ±0.72, p<0.01) (Table 4). The younger population was more likely to report pain, difficulty sleeping, difficulty concentrating, presence of nausea, and feeling nervous. Of note, the presence of symptoms was more prevalent on the CMSAS than what was documented in the medical record for both the younger and older groups: pain (398 vs. 454; 270 vs. 311), shortness of breath (187 vs. 260; 183 vs. 255), and nausea (194 vs. 316; 142 vs. 237), respectively.

In visits with suspected infection as indicated by ED antibiotic administration, we observed significant differences for the presence of documented fever in the ED (P=0.04), neutropenia (P=0.01), and positive urine cultures (P=0.02) in the older population. However, no differences (P>0.05) were found in outcomes relevant to infection: administration of antibiotics in the ED, admissions, or length of stay ≤2 days for those receiving antibiotics in the ED.

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Discussion:

As the US population ages, visits by older patients with cancer are becoming more frequent. Efforts to describe ED use by patients with cancer have been limited,[1,7,11,13,20–22] and to our knowledge no specific description of the older population with active cancer frequenting the ED has been published. This analysis of the CONCERN observational cohort study provides an epidemiologic baseline to inform care improvement of older adults with active cancer.

Comparing the group of older patients to those <65 years of age we noted several demographic differences (Table 1). Notably, older patients are more likely to be transported to the ED by emergency medical services despite no differences in acuity as measured by the Emergency Severity Index and an overall favorable ECOG status compared to the referent group. This finding is consistent with prior reports of increasing use of emergency medical services transport with increasing age in the population without cancer and contributes to the limited evidence of this trend in a population with cancer.[23,24] Given the similar acuity of presentations between the two groups, factors driving this trend may be different from the population without cancer, and further investigation is required to assess the role of social determinants of health affecting the utilization of emergency care resources.

The older population with cancer was more likely to be admitted than the younger population (61.6% vs. 53.3%; P<0.01), confirming our hypothesis. This finding provides additional clarification to previously reported admission rates of the general population with cancer.[1,7,13,25,26] This may be due to several factors associated with older individuals' ability, or their perceived ability, to complete activities of daily living independently. Despite a higher likelihood of admission for older patients with cancer, no differences were noted in the acuity of presentation, mean LOS, 30-day mortality, ED revisit, or hospital admission within 30 days after the index visit (Table 1). These findings are not consistent with recently published literature associating older age with longer LOS in older adults with unplanned hospitalizations and may be secondary to the exclusion of patients who were too ill to participate in enrollment.[15] Given their increased admission rates, further attention to identifying factors that would allow older patients to be cared for at home is warranted.

Poor symptom control is a primary driver of presentation to the ED in the older population. Five of the top ten ED diagnoses were for symptoms (fever, abdominal and pelvic pain, pain in the throat and chest, nausea and vomiting, malaise and fatigue; see Appendix 1) suggesting an opportunity exists to improve outpatient management of symptom burden, which is associated with subsequent ED visits.[27,28]

Additional attention should be focused on aggressive outpatient symptom management in older patients with cancer. This finding may also be due to failure to document a known, more specific diagnosis by the ED physician, diagnostic uncertainty, or limitations in diagnostic ability in the ED setting to further differentiate the etiology of symptom-related presentations in patients with cancer.

In those reporting pain or nausea, older patients were less likely to receive opioids for pain or antiemetics, respectively, while in the ED, despite no significant clinical difference in mean initial pain scores between the two age cohorts (Table 3). There may be an elevated

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perception of untoward side effects and risk of these medications on older patients among ED physicians. This finding suggests an increased area of opportunity to appropriately increase symptom control among older ED patients with cancer. National guidelines do exist and expansion of their use to the ED could be one way to bridge this gap.[29,30] Of note, nearly a third of study participants did not receive analgesia, with the proportion of patients not receiving intervention for pain decreasing with increasing pain severity.[21] This severity-related response was also noted when limiting our analysis to the older population.

Patient-reported symptom burden using the CMSAS revealed a statistically increased symptom burden in the younger cohort over a number of physical and psychological categories, suggesting that a generational difference in the perception of symptom burden may exist (Table 4). After adjusting for multiple comparisons, pain, difficulty sleeping, and difficulty concentrating remained significantly different for younger patients when compared to the older population. Additionally, the presence of pain, shortness of breath, and nausea symptoms was more prevalent on the patient-reported CMSAS than what was documented in the medical record by the providers for both groups, suggesting either underreporting of symptom burden by patients to ED providers or limited documentation of symptom burden by ED providers. Therefore, an important opportunity exists to improve symptomatic management in the ED and outpatient settings, warranting a collaborative approach by ED physicians and oncologists to either develop new clinical care models tailored to this ED population or improve ED implementation of non-ED developed symptomatic treatment guidelines. Use of palliative care services represents one such opportunity, with only a very small minority of older patients (5.7%) reporting current palliative care and just over half (57%) reporting a living will or advanced directive.

In regard to patients with suspected infection, no differences were noted in the proportion of patients either reporting a fever at home or having a documented fever in the ED, home antibiotic use, ED administered antibiotics, admission rates, or ED positive blood cultures. Older patients were more likely to be neutropenic (neutrophil count <500/μl) and have positive ED blood cultures. This is consistent with the fact that older adults may mount fevers less often than younger patients in the setting of infection and that older age is a risk factor for the development of neutropenic fever after chemotherapy, reinforcing the need for increased watchfulness for neutropenia in the older population.

Limitations:

This study represents a convenience sample of patients recruited predominantly from large, urban, academic medical centers and as such may not reflect the experience of community hospitals. Additionally, patients deemed too ill to participate in the study were excluded, resulting in a potential underestimation of the severity of patient presentations and associated outcomes (e.g., symptom burden, admission proportion, hospice utilization). A detailed description of excluded patients was included in the primary manuscript by Caterino et al.[13] Due to the study period, no data relating to cancer immunotherapy in the study population was collected. Additionally, the study was conducted prior to the COVID-19 pandemic and new emerging data on the topic may differ. Regarding pain scores specifically, our cohort data included a significant percentage of patients with

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no pain severity score documented. However, prior sensitivity analysis did not reveal significant differences between the group with missing pain scores and the overall cohort.[21] Additionally, documented symptom burden is likely to underestimate the true symptom prevalence due to poor ED documentation in older patients.[31]

Conclusion:

This report identified important opportunities to improve the care of older patients with cancer frequenting the ED, while affirming the ED provides a critical portal for addressing acute illness and symptom burden in this population. Notably, our sample of older patients were potentially undertreated for pain and nausea while in the ED and patients were more likely to report symptoms on the CMSAS when compared to physician documentation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Rivera DR, Gallicchio L, Brown J, Liu B, Kyriacou DN, Shelburne N. Trends in Adult Cancer-Related Emergency Department Utilization: An Analysis of Data From the Nationwide Emergency Department Sample. JAMA Oncol 2017;3(10):e172450. (In eng). DOI: 10.1001/jamaoncol.2017.2450. [PubMed: 28859189]
2. Balducci L, Beghe C. Cancer and age in the USA. Crit Rev Oncol Hematol 2001;37(2):137–45. (In eng). DOI: 10.1016/s1040-8428(00)00109-8. [PubMed: 11166587]
3. Scher KS, Hurria A. Under-representation of older adults in cancer registration trials: known problem, little progress. J Clin Oncol 2012;30(17):2036–8. (In eng). DOI: 10.1200/jco.2012.41.6727. [PubMed: 22547597]
4. Steinman MA, Boyd CM, Schmader KE. Expanding Evidence for Clinical Care of Older Adults: Beyond Clinical Trial Traditions and Finding New Approaches. Jama 2021;326(6):475–476. (In eng). DOI: 10.1001/jama.2021.12134. [PubMed: 34292309]
5. Bernard MA, Clayton JA, Lauer MS. Inclusion Across the Lifespan: NIH Policy for Clinical Research. Jama 2018;320(15):1535–1536. (In eng). DOI: 10.1001/jama.2018.12368. [PubMed: 30326521]
6. Bischof JJ, Caterino JM, Creditt AB, Wattana MK, Pettit NR. The current state of acute oncology training for emergency physicians: a narrative review. Emergency Cancer Care 2022;1(1):2. DOI: 10.1186/s44201-022-00002-9.
7. Mayer DK, Travers D, Wyss A, Leak A, Waller A. Why do patients with cancer visit emergency departments? Results of a 2008 population study in North Carolina. J Clin Oncol 2011;29(19):2683–8. (In eng). DOI: 10.1200/jco.2010.34.2816. [PubMed: 21606431]
8. Oatley M, Fry M, Mullen L. A cross-sectional study of the clinical characteristics of cancer patients presenting to one tertiary referral emergency department. Int Emerg Nurs 2016;24:35–8. (In eng). DOI: 10.1016/j.ienj.2015.05.007. [PubMed: 26120049]
9. Sadik M, Ozlem K, Huseyin M, AliAyberk B, Ahmet S, Ozgur O. Attributes of cancer patients admitted to the emergency department in one year. World J Emerg Med 2014;5(2):85–90. (In eng). DOI: 10.5847/wjem.j.issn.1920-8642.2014.02.001. [PubMed: 25215154]
10. Panattoni L, Fedorenko C, Greenwood-Hickman MA, et al. Characterizing Potentially Preventable Cancer- and Chronic Disease-Related Emergency Department Use in the Year After Treatment Initiation: A Regional Study. J Oncol Pract 2018;14(3):e176–e185. (In eng). DOI: 10.1200/jop.2017.028191. [PubMed: 29452549]

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11. Kim YJ, Seo DW, Kim WY. Types of cancer and outcomes in patients with cancer requiring admission from the emergency department: A nationwide, population-based study, 2016–2017. Cancer 2021;127(14):2553–2561. (In eng). DOI: 10.1002/cncr.33534. [PubMed: 33740270]
12. Greene J CONCERN for Cancer: New National Institutes of Health Network to Focus on Cancer Patients in the Emergency Department. Ann Emerg Med 2015;66(1):13a-15a. (In eng). [PubMed: 25748480]
13. Caterino JM, Adler D, Durham DD, et al. Analysis of Diagnoses, Symptoms, Medications, and Admissions Among Patients With Cancer Presenting to Emergency Departments. JAMA Netw Open 2019;2(3):e190979. (In eng). DOI: 10.1001/jamanetworkopen.2019.0979. [PubMed: 30901049]
14. Brooks GA, Kansagra AJ, Rao SR, Weitzman JI, Linden EA, Jacobson JO. A Clinical Prediction Model to Assess Risk for Chemotherapy-Related Hospitalization in Patients Initiating Palliative Chemotherapy. JAMA Oncol 2015;1(4):441–7. (In eng). DOI: 10.1001/jamaoncol.2015.0828. [PubMed: 26181251]
15. Klepin HD, Sun CL, Smith DD, et al. Predictors of Unplanned Hospitalizations Among Older Adults Receiving Cancer Chemotherapy. JCO Oncol Pract 2021;17(6):e740–e752. (In eng). DOI: 10.1200/op.20.00681. [PubMed: 33881905]
16. Oken MM, Creech RH, Tormey DC, et al. Toxicity and response criteria of the Eastern Cooperative Oncology Group. Am J Clin Oncol 1982;5(6):649–55. (In eng).
17. Yanez B, Pearman T, Lis CG, Beaumont JL, Cella D. The FACT-G7: a rapid version of the functional assessment of cancer therapy-general (FACT-G) for monitoring symptoms and concerns in oncology practice and research. Ann Oncol 2013;24(4):1073–8. (In eng). DOI: 10.1093/annonc/mds539. [PubMed: 23136235]
18. Chang VT, Hwang SS, Kasimis B, Thaler HT. Shorter symptom assessment instruments: the Condensed Memorial Symptom Assessment Scale (CMSAS). Cancer Invest 2004;22(4):526–36. (In eng). DOI: 10.1081/cnv-200026487. [PubMed: 15565810]
19. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol 2008;61(4):344–9. (In eng). DOI: 10.1016/j.jclinepi.2007.11.008. [PubMed: 18313558]
20. Adler D, Abar B, Durham DD, et al. Validation of the Emergency Severity Index (Version 4) for the Triage of Adult Emergency Department Patients With Active Cancer. J Emerg Med 2019 (In eng). DOI: 10.1016/j.jemermed.2019.05.023.
21. Coyne CJ, Reyes-Gibby CC, Durham DD, et al. Cancer pain management in the emergency department: a multicenter prospective observational trial of the Comprehensive Oncologic Emergencies Research Network (CONCERN). Support Care Cancer 2021 (In eng). DOI: 10.1007/s00520-021-05987-3.
22. Hsu J, Donnelly JP, Moore JX, Meneses K, Williams G, Wang HE. National characteristics of Emergency Department visits by patients with cancer in the United States. Am J Emerg Med 2018;36(11):2038–2043. (In eng). DOI: 10.1016/j.ajem.2018.03.025. [PubMed: 29573899]
23. Strange GR, Chen EH, Sanders AB. Use of emergency departments by elderly patients: projections from a multicenter data base. Ann Emerg Med 1992;21(7):819–24. (In eng). DOI: 10.1016/s0196-0644(05)81028-5. [PubMed: 1610039]
24. Chen B, Kanaan C, Jaiyesimi I, Ezekwudo D, Swor R. Clinical Characteristics of Patients with Cancer Presenting to the Emergency Department and Their Use of Emergency Medical Service Transport. Prehosp Emerg Care 2020;24(6):813–821. (In eng). DOI: 10.1080/10903127.2020.1718258. [PubMed: 31961753]
25. Vandyk AD, Harrison MB, Macartney G, Ross-White A, Stacey D. Emergency department visits for symptoms experienced by oncology patients: a systematic review. Support Care Cancer 2012;20(8):1589–99. (In eng). DOI: 10.1007/s00520-012-1459-y. [PubMed: 22526151]
26. Gallaway MS, Idaikkadar N, Tai E, et al. Emergency department visits among people with cancer: Frequency, symptoms, and characteristics. J Am Coll Emerg Physicians Open 2021;2(3):e12438. (In eng). DOI: 10.1002/emp2.12438. [PubMed: 33969353]

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27. Barbera L, Atzema C, Sutradhar R, et al. Do patient-reported symptoms predict emergency department visits in cancer patients? A population-based analysis. Ann Emerg Med 2013;61(4):427–437.e5. (In eng). DOI: 10.1016/j.annemergmed.2012.10.010. [PubMed: 23290526]

28. Hunold KM, Caterino JM, Bischof JJ. Diagnostic Uncertainty in Dyspneic Patients with Cancer in the Emergency Department. West J Emerg Med 2021;22(2):170–176. (In eng). DOI: 10.5811/westjem.2020.10.48091. [PubMed: 33856297]

29. Swarm RA, Paice JA, Anghelescu DL, et al. Adult Cancer Pain, Version 3.2019, NCCN Clinical Practice Guidelines in Oncology. J Natl Compr Canc Netw 2019;17(8):977–1007. (In eng). DOI: 10.6004/jnccn.2019.0038. [PubMed: 31390582]

30. Berger MJ, Ettinger DS, Aston J, et al. NCCN Guidelines Insights: Antiemesis, Version 2.2017. J Natl Compr Canc Netw 2017;15(7):883–893. (In eng). DOI: 10.6004/jnccn.2017.0117. [PubMed: 28687576]

31. Caterino JM, Stephens JA, Camargo CA, Jr., et al. Asymptomatic Bacteriuria versus Symptom Underreporting in Older Emergency Department Patients with Suspected Urinary Tract Infection. J Am Geriatr Soc 2020;68(11):2696–2699. (In eng). DOI: 10.1111/jgs.16775. [PubMed: 33460062]

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Table 1:

Adults with active cancer presenting to the Emergency Department characteristics by age groups

Variable	Age <65 Years		Age ≥65 Years		
	No. of Patients (N = 570)	Proportion, % (95% CI)	No. of Patients (N = 505)	Proportion, % (95% CI)	*P-value* *
Female	309	54.2 (50.0 – 58.4)	248	49.1 (44.7 – 53.6)	0.10
Race					<0.01
White	420	73.7 (69.9 – 77.3)	427	84.6 (81.1 – 87.6)	
Black or African American	84	14.7 (11.9 – 17.9)	45	8.9 (6.6 – 11.7)	
Other	25	4.4 (2.9 – 6.4)	13	2.6 (1.4 – 4.4)	
Missing	41	7.2 (5.2 – 9.6)	20	4.0 (2.4 – 6.1)	
Ethnicity					0.07
Hispanic/Latino	50	8.8 (6.6 – 11.4)	26	5.2 (3.4 – 7.5)	
Not Hispanic/Latino	508	89.1 (86.3 – 91.6)	469	92.9 (90.3 – 95.0)	
Missing	12	2.1 (1.1 – 3.7)	10	2.0 (1.0 – 3.6)	
Marital status					<0.01
Married or domestic partnership	325	57.0 (52.8 – 61.1)	314	62.2 (57.8 – 66.4)	
Never married	123	21.6 (18.3 – 25.2)	28	5.5 (3.7 – 7.9)	
Divorced or separated	96	16.8 (13.9 – 20.2)	57	11.3 (8.7 – 14.4)	
Widowed	20	3.5 (2.2 – 5.4)	103	20.4 (17.0 – 24.2)	
Missing	6	1.1 (0.4 – 2.3)	3	0.59 (0.12 – 1.7)	
Educational attainment					<0.01
Not high school graduate	50	8.8 (6.6 – 11.4)	35	6.9 (4.9 – 9.5)	
High school graduate or equivalent	136	23.9 (20.4 – 27.6)	134	26.5 (22.7 – 30.6)	
Some college or associate degree	149	26.1 (22.6 – 30.0)	134	26.5 (22.7 – 30.6)	
Bachelor's degree	142	24.9 (21.4 – 28.7)	83	16.4 (13.3 – 20.0)	
Graduate or professional degree	83	14.6 (11.8 – 17.7)	112	22.2 (18.6 – 26.1)	
Missing	10	1.8 (0.84 – 3.20)	7	1.4 (0.56 – 2.8)	
ED arrival on a weekend					0.75
No	490	86.0 (82.8 – 88.7)	439	86.9 (83.7 – 89.8)	
Yes	73	12.8 (10.2 – 15.8)	62	12.3 (9.5 – 15.5)	
Missing	7	1.2 (0.50 – 2.5)	4	0.79 (0.22 – 2.0)	
Mode of ED arrival					0.01
EMS	108	19.0 (15.8 – 22.4)	136	26.9 (23.1 – 31.0)	
Non-EMS	395	69.3 (65.3 – 73.1)	307	60.8 (56.4 – 65.1)	
Missing	67	11.8 (9.2 – 14.7)	62	12.3 (9.5 – 15.5)	
Emergency severity index †					0.75‡
1 (Severely unstable)	6	1.1 (0.39 – 2.3)	4	0.79 (0.22 – 2.0)	
2 (Potentially unstable)	216	37.9 (33.9 – 42.0)	214	42.4 (38.0 – 46.8)	
3 (Stable-urgent)	293	51.4 (47.2 – 55.6)	249	49.3 (44.9 – 53.8)	
4 (Stable-less urgent)	12	2.1 (1.1 – 3.7)	8	1.6 (0.69 – 3.1)	
5 (Nonurgent)	3	0.53 (0.11 – 1.5)	3	0.59 (0.12 – 1.7)	

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Variable	Age <65 Years		Age ≥65 Years		
	No. of Patients (N = 570)	Proportion, % (95% CI)	No. of Patients (N = 505)	Proportion, % (95% CI)	*P-value* *
6 (Not documented)	33	5.8 (4.0 – 8.0)	23	4.6 (2.9 – 6.8)	
Missing	7	1.2 (0.50 – 2.5)	4	0.79 (0.22 – 2.0)	
ECOG score					0.02‡
0 (Asymptomatic)	152	26.7 (23.1 – 30.5)	150	29.7 (25.8 – 33.9)	
1 (Symptomatic, but completely ambulatory)	166	29.1 (25.4 – 33.0)	158	31.3 (27.3 – 35.5)	
2 (Symptomatic, <50% of time in bed during the day)	103	18.7 (15.0 – 21.5)	99	19.6 (16.2 – 23.3)	
3 (Symptomatic, >50% of time in bed, but not bed bound)	122	21.4 (18.1 – 25.0)	77	15.3 (12.2 – 18.7)	
4 (Bed bound)	14	2.5 (1.4 – 4.1)	18	3.6 (2.1 – 5.6)	
5 (Death)	0	0.0 (0.0 – 0.65)	0	0.00 (0.0 – 0.73)	
Missing	13	2.3 (1.2 – 3.9)	3	0.59 (0.12 – 1.7)	
ED disposition					0.02‡
Admission to regular floor	253	44.4 (40.3 – 48.6)	251	49.7 (45.3 – 54.2)	
Admission to step-down unit	26	4.6 (3.0 – 6.6)	40	7.9 (5.7 – 10.6)	
Admission to ICU	25	4.4 (2.9 – 6.4)	20	4.0 (2.4 – 6.1)	
Discharge home	201	35.3 (31.3 – 39.3)	141	27.9 (24.1 – 32.1)	
Discharge to ECF or rehabilitation facility	1	0.18 (0.0 – 0.97)	3	0.59 (0.12 – 1.7)	
Transfer to another facility	15	2.6 (1.5 – 4.3)	5	1.0 (0.32 – 2.3)	
Died in ED	0	0.0 (0.00 – 0.65)	0	0.00 (0.00 – 0.73)	
ED observation	36	6.3 (4.5 – 8.6)	34	6.7 (4.7 – 9.3)	
Hospital observation	5	0.88 (0.29 – 2.0)	7	1.4 (0.56 – 2.8)	
Missing	8	1.4 (0.61 – 2.8)	4	0.79 (0.22 – 2.0)	
Hospital admission within 30 d after index encounter					0.61
No	413	72.5 (68.6 – 76.1)	377	74.7 (70.6 – 78.4)	
Yes	150	26.3 (22.7 – 30.1)	124	24.6 (20.9 – 28.6)	
Missing	7	1.2 (0.50 – 2.6)	4	0.79 (0.22 – 2.0)	
ED revisit within 30 d					0.51
No	405	71.1 (67.1 – 74.8)	373	73.9 (69.8 – 77.6)	
Yes	158	27.7 (24.1 – 31.6)	128	25.3 (21.6 – 29.4)	
Missing	7	1.2 (0.50 – 2.5)	4	0.79 (0.22 – 2.0)	
30-d mortality					0.56
Yes	30	5.3 (3.6 – 7.4)	32	6.3 (4.4 – 8.8)	
No	517	90.7 (88.0 – 93.0)	448	88.7 (85.6 – 91.3)	
Missing	23	4.0 (2.6 – 6.0)	25	5.0 (3.2 – 7.2)	

Abbreviations: ECF, extended care facility; ECOG, Eastern Collaborative Oncology Group; ED, emergency department; EMS, emergency medical services; ICU, intensive care unit; CI, confidence interval

* From Chi-Square tests for the association between each variable and age group

[†] A score of 1 indicates patient should be seen immediately by a physician; 2, within 10 minutes; and 3, within 30 minutes

[‡] P-values obtained from Fisher's Exact test

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Table 2:

Cancer type and treatment by age groups for adults with cancer presenting to the Emergency Department *

Characteristic	Age <65 Years		Age ≥65 Years		*P-value* †
	No. of Patients (N = 570)	Proportion, % (95% CI)	No. of Patients (N = 505)	Proportion, % (95% CI)	
Primary cancer type					<.01
Gastrointestinal Tract	122	21.4 (18.1 – 25.0)	98	19.4 (16.1 – 23.1)	0.42
Esophageal	12	2.1 (1.1 – 3.7)	14	2.8 (1.5 – 4.6)	
Gastric	16	2.8 (1.6 – 4.5)	6	1.2 (0.44 – 2.6)	
Hepatobiliary	15	2.6 (1.5 – 4.3)	15	3.0 (1.7 – 4.9)	
Pancreatic	22	3.9 (2.4 – 5.8)	33	6.5 (4.5 – 9.1)	
Colorectal	42	7.4 (5.4 – 9.8)	22	4.4 (2.8 – 6.5)	
Other	15	2.6 (1.5 – 4.3)	8	1.6 (0.69 – 3.1)	
Lung	64	11.2 (8.8 – 14.1)	75	14.9 (11.9 – 18.3)	
Genitourinary	40	7.0 (5.1 – 9.4)	50	9.9 (7.4 – 12.8)	
Prostate	14	2.5 (1.4 – 4.1)	43	8.5 (6.2 – 11.3)	
Hematologic leukemia	37	6.5 (4.6 – 8.8)	37	7.3 (5.2 – 10.0)	
Gynecologic	45	7.9 (5.8 – 10.4)	35	6.9 (4.9 – 9.5)	
Lymphoma	35	6.1 (4.3 – 8.4)	34	6.7 (4.7 – 9.3)	
Breast	85	14.9 (12.1 – 18.1)	33	6.5 (4.5 – 9.1)	
Hematologic myeloma	18	3.2 (1.9 – 5.0)	29	5.7 (3.9 – 8.1)	
Head and neck	27	4.7 (3.1 – 6.8)	14	2.8 (1.5 – 4.6)	
Dermatologic	17	3.0 (1.8 – 4.7)	13	2.6 (1.4 – 4.4)	
CNS	22	3.9 (2.4 – 5.8)	9	1.8 (0.82 – 3.4)	
Hematologic-other	2	0.35 (0.04 – 1.3)	9	1.8 (0.82 – 3.4)	
Sarcoma	19	3.3 (2.0 – 5.2)	8	1.6 (0.69 – 3.1)	
Endocrine	9	1.6 (0.72 – 3.0)	7	1.4 (0.56 – 2.8)	
Pulmonary-other	4	0.7 (0.19 – 1.8)	6	1.2 (0.44 – 2.6)	
Other	2	0.4 (0.04 – 1.3)	1	0.20 (0.01 – 1.1)	
Cardiac	1	0.18 (0.00 – 1.0)	0	0.0 (0.00 – 0.73)	
Missing	7	1.2 (0.50 – 2.5)	4	0.79 (0.22 – 2.0)	
Presence of advanced cancer	375	65.8 (61.7 – 69.7)	299	59.2 (54.8 – 63.5)	0.03
Cancer-related therapies within the previous 30 d					
Traditional chemotherapy	261	45.8 (41.6 – 50.0)	204	40.4 (36.1 – 44.8)	0.08
Targeted drug therapy	102	17.9 (14.8 – 21.3)	91	18.0 (14.8 – 21.7)	0.96
Systemic corticosteroids	94	16.5 (13.5 – 19.8)	68	13.5 (10.6 – 16.8)	0.17
Radiotherapy	51	9.0 (6.7 – 11.6)	49	9.7 (7.3 – 12.6)	0.67
Surgery for cancer	51	9.0 (6.7 – 11.6)	31	6.2 (4.2 – 8.6)	0.08
None of the above	137	24.0 (20.6 – 27.8)	144	28.5 (24.6 – 32.7)	0.10
Patient report living will or advanced directive					<.01
None	327	57.4 (53.2 – 61.5)	165	32.7 (28.6 – 37.0)	

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Characteristic	Age <65 Years		Age ≥65 Years		*P-value* †
	No. of Patients (N = 570)	**Proportion, % (95% CI)**	**No. of Patients (N = 505)**	**Proportion, % (95% CI)**	
Yes					
Full code	93	16.3 (13.4 – 19.6)	100	19.8 (16.4 – 23.6)	
Do not resuscitate	48	8.4 (6.3 – 11.0)	113	22.4 (18.8 – 26.3)	
Do not intubate	3	0.53 (0.11 – 1.5)	3	0.59 (0.12 – 1.7)	
Comfort care only	13	2.3 (1.2 – 3.9)	15	3.0 (1.7 – 4.9)	
Other	57	10.0 (7.7 – 12.8)	57	11.3 (8.7 – 14.4)	
Unknown	29	5.1 (3.4 – 7.2)	52	10.3 (7.8 – 13.3)	
Patient report currently receiving palliative care					<0.01
No	471	82.6 (79.3 – 85.7)	456	90.3 (87.4 – 92.7)	
Yes	57	10.0 (7.7 – 12.8)	29	5.7 (3.9 – 8.1)	
Missing	42	7.4 (5.4 – 9.8)	20	4.0 (2.4 – 6.1)	
Patient report of currently receiving hospice care					0.05
No	547	96.0 (94.0 – 97.4)	497	98.4 (96.9 – 99.3)	
Yes	14	2.5 (1.4 – 4.1)	6	1.2 (0.44 – 2.6)	
Missing	9	1.6 (0.72 – 3.0)	2	0.40 (0.05 – 1.4)	

Abbreviation: CNS, central nervous system; CI, confidence interval

*Cancer type, advanced cancer, and cancer-related therapy data are based on results of medical record review.

†From Chi-Square tests for the association between each characteristic and age group

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Table 3:

Symptoms and symptom treatment by age groups among adults with active cancer presenting to the Emergency Department

Symptoms and Symptom Treatment	Age <65 Years		Age ≥65 Years		*P-value* *
	No. of Patients (N = 570)	Proportion, % (95% CI)	No. of Patients (N = 505)	Proportion, % (95% CI)	
Patient reported symptoms on ED survey					
Any pain	398	69.8 (65.9 – 73.6)	270	53.5 (49.0 – 57.9)	<.01
Shortness of breath	187	32.8 (29.0 – 36.8)	183	36.2 (32.0 – 40.6)	0.29
Abdominal pain	207	36.3 (32.4 – 40.4)	136	26.9 (23.1 – 31.0)	<.01
Nausea	194	34.0 (30.2 – 38.1)	142	28.1 (24.2 – 32.3)	0.03
Chest pain	103	18.1 (15.0 – 21.5)	66	13.1 (10.3 – 16.3)	0.02
Urinary symptoms	65	11.4 (8.9 – 14.3)	93	18.4 (15.1 – 22.1)	<0.01
Pain severity in the ED (score) †					<.01
None	109	19.1 (16.0 – 22.6)	175	34.7 (30.5 – 39.0)	
Mild	79	13.9 (11.1 – 17.0)	77	15.3 (12.2 – 18.7)	
Moderate	70	12.3 (9.7 – 15.3)	47	9.3 (6.9 – 12.2)	
Severe	173	30.4 (26.6 – 34.3)	96	19.0 (15.7 – 22.7)	
Not documented	139	24.4 (20.9 – 28.1)	110	21.8 (18.3 – 25.6)	
Administration of any ED pain medication	310	54.4 (50.2 – 58.5)	209	41.4 (37.1 – 45.8)	<.01
Type of pain medications administered in the ED					
Nonsteroidal anti-inflammatory drug, all types	35	6.1 (4.3 – 8.4)	27	5.4 (3.6 – 7.7)	0.58
Acetaminophen (alone or as part of a combination product)	90	15.8 (12.9 – 19.1)	74	14.7 (11.7 – 18.0)	0.61
Tramadol hydrochloride	8	1.4 (0.61 – 2.8)	5	1.0 (0.32 – 2.3)	0.54
Any opioid administered in the ED	237	41.6 (37.5 – 45.8)	144	28.5 (24.6 – 32.7)	<.01
Other or unknown	13	2.3 (1.2 – 3.9)	6	1.2 (0.44 – 2.6)	0.18
Pain medication administration in patients with moderate or severe pain in the ED					
Nonsteroidal anti-inflammatory drug, all types	19	7.8 (4.8 – 11.9)	14	9.8 (5.5 – 15.9)	0.50
Acetaminophen (alone or as part of a combination product)	43	17.7 (13.1 – 23.1)	26	18.2 (12.2 – 25.5)	0.90
Tramadol hydrochloride	6	2.5 (0.91 – 5.3)	4	2.8 (0.77 – 7.0)	0.85 **
Any opioid administered in the ED	149	61.3 (54.9 – 67.5)	79	55.2 (46.7 – 63.6)	0.24
Short-acting opioid or narcotic	127	52.3 (45.9 – 58.7)	75	52.5 (43.9 – 60.9)	0.97
Long-acting opioid	37	15.2 (11.0 – 20.4)	9	6.3 (2.9 – 11.6)	0.01
Other or unknown	6	2.5 (0.91 – 5.3)	0		0.06 **
Nausea control documented in the ED medical record					

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Symptoms and Symptom Treatment	Age <65 Years		Age ≥65 Years		*P-value* *
	No. of Patients (N = 570)	Proportion, % (95% CI)	No. of Patients (N = 505)	Proportion, % (95% CI)	
Any antiemetic administered in the ED	166	29.1 (25.4 – 33.0)	94	18.6 (15.3 – 22.3)	<.01
Patients with nausea in the ED‡	106	54.6 (47.4 – 61.8)	54	38.0 (30.0 – 46.6)	<0.01
Suspected Infection					
Temperature > 38.0°C documented in the ED	56	9.8 (7.5 – 12.6)	32	6.3 (4.4 – 8.8)	0.04
Fever reported at home or documented in the ED	86	15.1 (12.3 – 18.3)	64	12.7 (9.9 – 15.9)	0.25
Neutropenia (neutrophil count <500/μL) present	7	1.2 (0.50 – 2.5)	16	3.2 (1.8 – 5.1)	0.01
ED blood culture findings					0.27
Positive	11	1.9 (1.0 – 3.4)	16	3.2 (1.8 – 5.1)	
Negative	128	22.5 (19.1 – 26.1)	100	19.8 (16.4 – 23.6)	
ED urine cultures					0.02
Positive for >10,000 pathogenic organisms†	50	8.8 (6.6 – 11.4)	69	13.7 (10.8 – 17.0)	
Negative	94	16.5 (13.5 – 19.8)	93	18.4 (15.1 – 22.1)	
Antibiotics administered in the ED	150	26.3 (22.7 – 30.1)	135	26.7 (22.9 – 30.8)	0.97

Abbreviation: ED, emergency department, CI, confidence interval

*From Chi-Square tests for the association between each symptom or symptom treatment level and age group

†Initial mean (SD) pain score among patients < 65 years was 6.59 (2.6) and 6.02 (2.52) for patients ≥ 65 years.

‡Patients with nausea in the ED n=194 for < 65 years and 142 for ≥ 65 years.

SI conversion factor: To convert neutrophil count to ×109 per liter, multiply by 0.001.

†Including Contaminant growth reported by laboratory

**P-values obtained from Fisher's Exact test

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Table 4.

Condensed Memorial Symptom Assessment Scale (CMSAS) by age groups for adults with active cancer presenting to the Emergency Department

	Age <65 Years (N = 570)	Age ≥65 Years (N = 505)	
Symptom[†]	**No. of Patients (%)**	**No. of Patients (%)**	***p- value*** [*]
CMSAS Sum [‡]			
Mean (SD)	1.69 (0.77)	1.54 (0.7)	<0.01
Median (IQR)	1.68 (1.1)	1.53 (1.1)	
Physical Symptom Score [§]			
Mean (SD)	1.74 (0.81)	1.60 (0.8)	<0.01
Median (IQR)	1.75 (1.2)	1.60 (1.2)	
Lack of Energy			0.32
Not Present	81 (14.2)	59 (11.7)	
Present			
Not at All	0 (0.00)	0 (0.00)	
A little Bit	67 (11.8)	60 (11.9)	
Somewhat	97 (17.0)	95 (18.8)	
Quite a Bit	155 (27.2)	136 (26.9)	
Very Much	161 (28.3)	153 (30.3)	
Missing	9 (1.6)	2 (0.40)	
Lack of Appetite		0.55	
Not Present	186 (32.6)	171 (33.9)	
Present			
Not at All	2 (0.35)	4 (0.79)	
A little Bit	68 (11.9)	57 (11.3)	
Somewhat	89 (15.6)	82 (16.2)	
Quite a Bit	108 (19.0)	92 (18.2)	
Very Much	108 (19.0)	97 (19.2)	
Missing	9 (1.58)	2 (0.40)	
Pain			<0.01
Not Present	109 (19.1)	192 (38.0)	
Present			
Not at All	0 (0.0)	0 (0.0)	
A little Bit	71 (12.5)	63 (12.5)	
Somewhat	91 (16.0)	70 (13.9)	
Quite a Bit	114 (20.0)	88 (17.4)	
Very Much	178 (31.2)	90 (17.8)	
Missing	7 (1.2)	2 (0.40)	
Dry Mouth			0.26[**]
Not Present	210 (36.8)	169 (33.5)	
Present			

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	Age <65 Years (N = 570)	Age ≥65 Years (N = 505)	
Symptom†	**No. of Patients (%)**	**No. of Patients (%)**	***p- value*** *
Not at All	2 (0.35)	4 (0.79)	
A little Bit	73 (12.8)	86 (17.0)	
Somewhat	81 (14.2)	83 (16.4)	
Quite a Bit	86 (15.1)	74 (14.7)	
Very Much	110 (19.3)	87 (17.2)	
Missing	8 (1.4)	2 (0.40)	
Weight Loss			0.25 **
Not Present	293 (51.4)	255 (50.5)	
Present			
Not at All	1 (0.18)	4 (0.79)	
A little Bit	82 (14.4)	78 (15.5)	
Somewhat	67 (11.8)	70 (13.9)	
Quite a Bit	64 (11.2)	61 (12.1)	
Very Much	56 (9.8)	34 (6.7)	
Missing	7 (1.2)	3 (0.59)	
Feeling Drowsy			0.61
Not Present	172 (30.2)	174 (34.5)	
Present			
Not at All	2 (0.35)	2 (0.40)	
A little Bit	109 (19.2)	78 (15.5)	
Somewhat	103 (18.2)	93 (18.4)	
Quite a Bit	104 (18.3)	96 (19.0)	
Very Much	72 (12.6)	57 (11.3)	
Missing	8 (1.4)	5 (1.0)	
Shortness of Breath			0.30
Not Present	302 (53.0)	248 (49.1)	
Present			
Not at All	0 (0.0)	0 (0.00)	
A little Bit	66 (11.6)	67 (13.3)	
Somewhat	73 (12.8)	65 (12.9)	
Quite a Bit	60 (10.5)	55 (10.9)	
Very Much	61 (10.7)	68 (13.5)	
Missing	8 (1.4)	2 (0.40)	
Constipation			0.79
Not Present	329 (57.7)	284 (56.2)	
Present			
Not at All	1 (0.18)	0 (0.00)	
A little Bit	56 (9.8)	55 (10.9)	
Somewhat	62 (10.9)	58 (11.5)	
Quite a Bit	57 (10.0)	52 (10.3)	
Very Much	57 (10.0)	53 (10.5)	

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	Age <65 Years (N = 570)	Age ≥65 Years (N = 505)	
Symptom†	**No. of Patients (%)**	**No. of Patients (%)**	***p- value*** *
Missing	8 (1.4)	3 (0.59)	
Difficulty Sleeping			<0.01
Not Present	203 (35.6)	253 (50.10)	
Present			
Not at All	1 (0.18)	2 (0.40)	
A little Bit	63 (11.1)	50 (9.9)	
Somewhat	99 (17.4)	74 (14.7)	
Quite a Bit	91 (16.0)	65 (12.9)	
Very Much	102 (17.9)	59 (11.7)	
Missing	11 (1.9)	2 (0.40)	
Difficulty Concentrating			0.01
Not Present	263 (46.1)	295 (58.4)	
Present			
Not at All			
A little Bit	80 (14.0)	68 (13.5)	
Somewhat	117 (20.5)	72 (14.3)	
Quite a Bit	60 (10.5)	35 (6.9)	
Very Much	43 (7.5)	33 (6.5)	
Somewhat	117 (20.5)	72 (14.3)	
Missing	7 (1.2)	2 (0.40)	
Nausea			
Not Present	245 (43.0)	266 (52.7)	
Present			
Not at All	1 (0.18)	0 (0.0)	
A little Bit	91 (16.0)	83 (16.4)	
Somewhat	106 (18.6)	77 (15.3)	
Quite a Bit	58 (10.2)	37 (7.3)	
Very Much	61 (10.7)	40 (7.9)	
Missing	8 (1.4)	2 (0.40)	
Psychological Symptom Score /			
Mean (SD)	1.49 (1.2)	1.33 (1.1)	0.03
Median (IQR)	1.33 (1.7)	1.33 (2.3)	
Worry			0.06
Not Present	158 (27.7)	169 (33.5)	
Present			
Rarely	43 (7.5)	37 (7.3)	
Occasionally	160 (28.1)	122 (24.2)	
Frequently	114 (20.0)	117 (23.2)	
Almost Constantly	87 (15.3)	57 (11.3)	

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	Age <65 Years (N = 570)	Age ≥65 Years (N = 505)	
Symptom†	**No. of Patients (%)**	**No. of Patients (%)**	***p- value*** *
Missing	8 (1.4)	3 (0.59)	
Feeling Sad			0.20
Not Present	243 (42.6)	249 (49.3)	
Present			
Rarely	54 (9.5)	43 (8.5)	
Occasionally	143 (25.1)	106 (21.0)	
Frequently	74 (13.0)	68 (13.5)	
Almost Constantly	46 (8.1)	35 (6.9)	
Missing	10 (1.8)	4 (0.79)	
Feeling Nervous			0.04
Not Present	256 (44.9)	264 (52.3)	
Present			
Rarely	63 (11.1)	44 (8.7)	
Occasionally	128 (22.5)	113 (22.4)	
Frequently	65 (11.4)	56 (11.1)	
Almost Constantly	49 (8.6)	25 (5.0)	
Missing	9 (1.6)	3 (0.59)	

Abbreviation: SD, Standard Deviation; IQR interquartile range

*For CMSAS Sum, Physical Symptom Score and Psychological Symptom Score the P-values are from Wilcoxon two-sample tests for the difference between the two age groups. From Chi-Square tests for association between each symptom and age group. Fisher's exact tests were performed from dry mouth, weight loss and nausea.

†For each symptom patients were asked to indicate if it was present in the past 7 days and, if present, how much this symptom bothered or distressed them in the past 7 days.

‡The CMSAS Sum is the average of the physical and psychological symptom scores

§The Physical Symptom Score is the average of all the physical symptoms

//The Psychological Symptom Score is the average of all the psychological symptoms

**P-values obtained from Fisher's Exact test