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Understanding the Mortality and Morbidity among Cancer Patients Admitted Through the Emergency Department of a Large Academic Urban Hospital

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Summary

- **Emergency departments (EDs) serve as critical entry points into the inpatient acute care setting.**
- **Fragmentation of care, lack of compliance with post-cancer surveillance recommendations, and transition points between care environments are important considerations in the care of cancer patients.**
- **The mortality rate for the 2019 University of Illinois Hospital and Health Sciences System (UI Health) ED cancer cohort was higher than the mortality rate of the non-cancer cohort.**
- **At UI Health in 2019, the cancer cohort had a higher rate of sepsis and venous thromboembolism (VTE)/ pulmonary embolus (PE) than the non-cancer cohort.**
- **The growing volume of ED visits for episodic care by cancer survivors represents a timely opportunity to not only change the current care delivery model by implementing cancer-based treatment protocols designed to effectively screen for infection and deep vein thrombosis, but also to implement care coordination with navigation to improve cancer survivorship, particularly among minority populations.**
- **The Improving Cancer Survival and Reducing Treatment Variations with Protocols for Emergency Care (ICARE) study seeks to fill these gaps and improve health outcomes for cancer survivors by implementing protocol-based treatment and patient navigation.**

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Background

Cancer is one of the most common health conditions impacting the University of Illinois Health and Hospital System (UI Health) patient population. Similarly, cancer is the number one cause of mortality in suburban Cook County and the number two cause in Chicago, in Illinois, and in the US.[1] Many cancer survivors are inadvertently lost in the transition between care environments (i.e. inpatient and outpatient) and end up seeking both episodic and routine care in the emergency department (ED). Indeed, previous studies have reported a high mortality rate in cancer patients admitted through the ED.[2,3]

Despite advances in cancer screening, treatment options, and an overall decline in cancer mortality rates, the risk of death among cancer patients due to non-cancer related causes remains substantial.[4] A recent study of infection-related mortality in cancer patients found that 60% of deaths were attributed to infection.[4] Poorer outcomes related to acute care hospitalizations for cancer patients include a 2.5-fold increased risk of developing sepsis during a hospital admission.[5] A retrospective analysis of infection-related cancer deaths from the Surveillance, Epidemiology, and End Results (SEER) database found gender and race to be additional factors accounting for significant differences in cancer survival rates.[6] In addition to sepsis, venous thromboembolism (VTE) and pulmonary embolus (PE) remain leading causes of death among cancer patients, as the incidence of fatal PE is three times higher in cancer patients than non-cancer patients.[7-9] VTE is also significantly associated with morbidity and mortality in cancer patients.[8,9]

The substantive toll of sepsis and VTE/PE on the morbidity and mortality of patients with cancer necessitates an examination of how these conditions are recognized, diagnosed, and treated in patients with malignancy. The often-atypical presentation of sepsis in patients with cancer has resulted in many hospitals adapting protocols to improve early recognition and management, leading to a demonstrated reduction in morbidity and mortality.[10, 11] As cancer-associated VTE/PE is a well described entity, validated outpatient scoring tools have been developed to risk stratify patients in the outpatient setting and direct early

evaluation. One such tool, the Khorana Scale, is validated in providing a risk assessment for patients with cancer to facilitate early detection and treatment in the outpatient setting.[12,13] Leveraging the ED as a safety net to implement interventions such as these for early recognition and treatment of VTE/PE and sepsis is paramount to decreasing death and disability among cancer patients.

EDs serve as the point of entry into the healthcare system and as a source of primary care for many high-risk patient populations, particularly minority and low-income individuals, who are not readily captured in other clinical settings due to a lack of an established medical home.[14,15] ED visits have only increased as more people are covered under the Affordable Care Act (ACA).[16] For cancer survivors, frequent ED use, defined as accessing one or more EDs four or more times a year, often results in a lack of care coordination, leading to untreated and unaddressed health care needs.[17-19] Among an at-risk and predominately minority cancer population, social determinants of health contribute to health inequities, which lead to worse morbidity and mortality outcomes in cancer patients.[20] The purpose of this brief is to assess the burden of VTE/PE- and sepsis-related morbidity and mortality in cancer patients in the UI Health ED in 2019.

Emergency Department Cancer Cohort: Retrospective Analysis

The UI Health ED serves a diverse Chicago population. The primary service area encompasses five of the ten poorest neighborhoods in the city of Chicago with a high density of publicly insured (i.e., Medicaid/Medicare/State Children's Health Insurance Program) residents. Currently, 70% of the UI Health ED population is from racial/ethnic minority backgrounds (predominantly Black and Hispanic) and low-income groups.

We performed a retrospective cohort analysis of cancer patients admitted through the ED. Electronic Medical Record (EMR) data was used to identify the cohort of cancer patients using the terms "neoplasm," "malignant," "malignancy," and "cancer." Patients were included in the cancer cohort if the International Classification of Diseases (ICD-10) code was in the Neoplasms hierarchy (including C00-D49). We excluded records that had the term "benign" included in the problem list. The final cohort included both patients with active cancer and those with a history of cancer. We assessed the rate of sepsis (identified by ED visit billing ICD-10 diagnosis codes of R65.2, R65.20, R65.21, A41.9, R7881, A40, T81.12, and T81.11) and the rates of VTE/PE (identified by codes I82, I26 and I74) in the cohort. The EMR data was also used to assess the mortality among patients in 2019. Total deaths include death in the ED or death at some point after hospital admission.

- Of the total of 51,744 ED visits in 2019, the cancer cohort accounted for 9,112 (17.61%) visits.
- A total of 32,835 unique patients were seen in the ED in 2019, of these 4,746 (14.45%) were patients diagnosed with cancer.
- Members of the cancer cohort were more likely to die than those in the non-cancer cohort. Of the 171 total deaths among patients evaluated and admitted through the ED in 2019, 134 (78.36%) occurred in the cancer cohort.

FIGURE 1: **People with cancer as a proportion of UI Health Emergency Department (ED) visits (n=51,744), patients (n=32,835), and deaths (n=171), 2019**

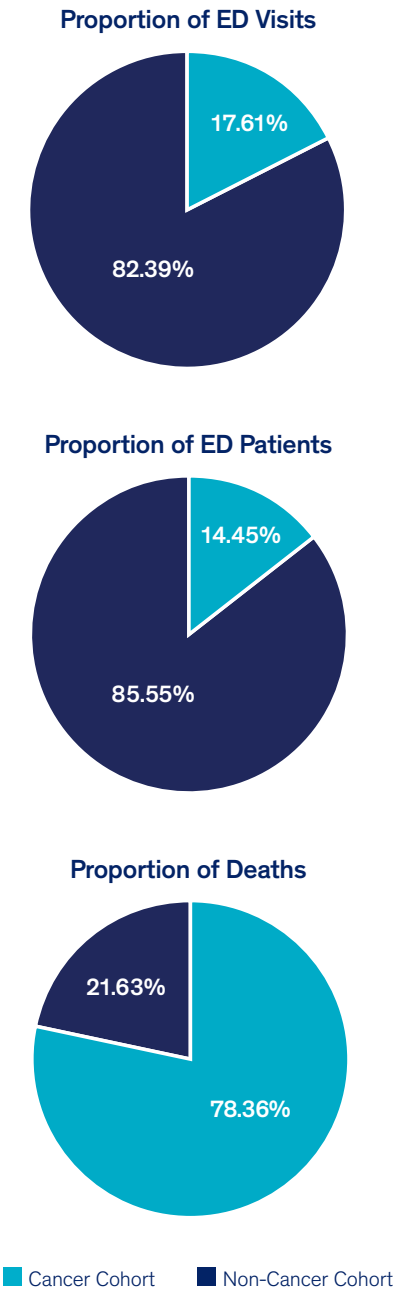


FIGURE 2: **Prevalence of sepsis and venous thromboembolism (VTE)/ pulmonary embolism (PE) by visit among UI Health Emergency Department patients (n=32,835), 2019**

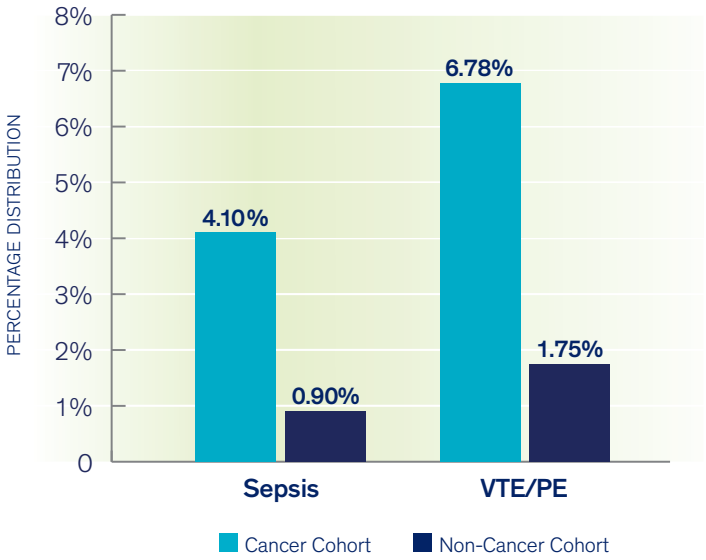
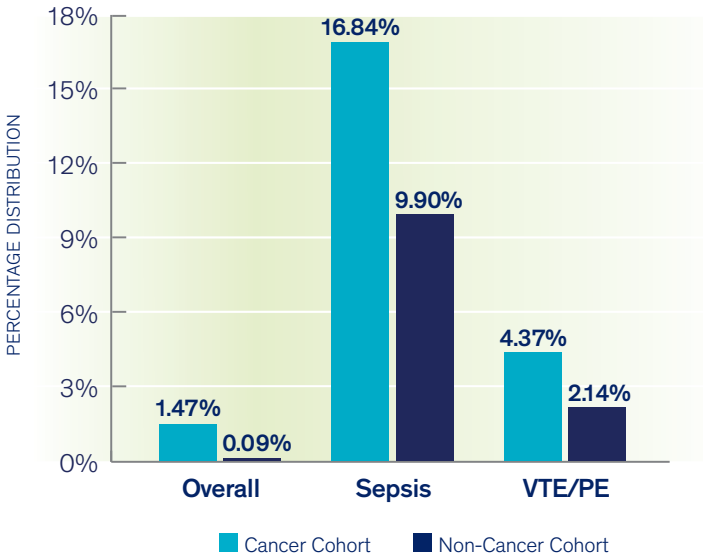


FIGURE 3: **Mortality rate by visit (n=51,744) and diagnosis in the UI Health Emergency Department, 2019**



- Members of the cancer cohort were more likely than members of the non-cancer cohort to have a diagnosis of sepsis or VTE/PE.
- Four percent (374/9,112) of the cancer cohort visits had a diagnosis of sepsis reported in the EMR, as opposed to an overall rate of 0.90% (384/42,632) in the non-cancer ED cohort.
- VTE/PE – 6.78% (618/9,112) of the cancer cohort visits had a billing diagnosis of VTE/PE compared to 1.75% (747/42,632) in the non-cancer ED cohort.

- The overall mortality rate by visit in the non-cancer cohort admitted through the ED was 0.09% (37/42,632) vs. 1.47% (134/9,112) in the cancer cohort.
- Among visits where sepsis was present, the mortality rate was 16.84% (63/374) in the cancer cohort and 9.90% (38/384) in the non-cancer ED cohort.
- Among visits where VTE/PE was present, the mortality rate was 4.37% (27/618) in the cancer cohort, which was higher than the non-cancer ED cohort mortality rate of 2.14% (16/747).

Discussion

Our study findings show that among people admitted through the ED, people who have been diagnosed with cancer are at especially high risk of morbidity and mortality. We found a higher mortality by visit (1.47% vs. 0.09%) in the cancer cohort as compared to the non-cancer ED patient cohort. We observed a similar pattern among cancer patients diagnosed with sepsis or with VTE/PE. People who have been diagnosed with cancer are more likely than other ED patients to develop either sepsis or VTE/PE, conditions which further increase their risk of death. It is likely that sepsis is only reported or coded when the patient is in obvious septic shock; therefore, sepsis may be underreported. In this study, the majority of ED-admitted patients with cancer received their initial cancer diagnosis outside the UI Health system. In addition, only 32.5% (n=1,546) of all the cancer patients seen in the ED were established UI Health Cancer Center patients. The remaining 67.5% were not Cancer Center patients. Despite the limitations of retrospective EMR data, our ED cancer cohort findings are in alignment with national statistics. These findings highlight the increased morbidity and mortality facing cancer patients, and the contributions of sepsis and VTE/PE to these outcomes. These results suggest that, as in other health care systems, fragmentation of care may contribute to cancer outcome disparities due to lack of coordination of care and limited access to sub-specialty care for underserved populations. Our findings support the need for dedicated patient navigation to prevent fragmentation of care.

EDs serve as critical entry points into the inpatient acute care setting. Many cancer survivors access the acute care setting through the ED. This offers an important opportunity to mitigate sepsis risk and complications related to VTE/PE in people with cancer by 1) increasing awareness among providers, 2) providing appropriate screening, and 3) instituting the appropriate treatment when infection is suspected. The further along a cancer survivor is in remission, the less likely it is that their cancer history will be conveyed to healthcare providers in an acute care setting, often resulting in suboptimal

outcomes.[21] There is increasing evidence suggesting that ED care coordination and treatment protocols can be effective in redirecting appropriate acute healthcare utilization. A recent study found that implementing treatment protocols and care summaries was associated with improved cancer survivor self-efficacy, and those with higher self-efficacy had a lower prevalence of emergency room visits (prevalence ratio, 0.92; 95% CI: 0.88-0.97) and inpatient hospitalizations (prevalence ratio, 0.94; 95% CI: 0.89-0.99).[22]

In addition, the ED is a promising setting to improve long-term cancer outcomes by reengaging people with a history of cancer in routine healthcare. Cancer survivorship and incidence disparities are reflective of socioeconomic inequalities that lead to inequalities in diet and nutrition, physical inactivity, screening, and treatment. The same socioeconomic conditions that lead to inequities in cancer risk factors and incidence continue to harm people with cancer after diagnosis, leading to inequities in morbidity and mortality as well. Ensuring proper linkage to primary care and resources through navigation could proactively address risk factors for sepsis and VTE/PE, making them less likely to occur. Significant challenges and gaps remain in navigating transitions between acute care and outpatient care for many cancer survivors, particularly among underserved populations. The Improving Cancer Survival and Reducing Treatment Variations with Protocols for Emergency Care (ICARE) study seeks to fill these gaps and improve health outcomes for cancer survivors by introducing evidence-based treatment protocols for conditions such as VTE/PE and sepsis in the ED. The current COVID-19 pandemic has worsened existing health inequities driven by social determinants of health due to difficulty accessing available resources. Increasing the cancer patient navigation touch points along the spectrum of healthcare engagement particularly in high-risk environments such as the ED is an opportunity to provide a connection to resources for a cancer patient population at risk for poor outcomes.

Conclusion

The ED represents an ideal environment to change the current care delivery model through the introduction of treatment protocols and ED care coordination plans for cancer survivors. The growing volume of ED visits for episodic care by cancer survivors also represents a timely opportunity to reduce outcome disparities by changing the current care delivery model. Implementing cancer-based screening and treatment protocols along with care coordination/navigation are necessary to improve cancer survivorship, particularly among minority populations. The ICARE study aims to implement changes in the ED to improve outcomes among cancer patients.

References

1. University of Illinois Hospital & Clinics (UI Health). 2019 community assessment of needs: Towards health equity (UI - CAN). https://hospital.uillinois.edu/about-ui-health/community-commitment/community-assessment-of-health-needs-ui-can. Accessed October 13, 2020.
2. Elsayem AF, Merriman KW, Gonzalez CE, et al. Intensive care unit admissions and in-hospital mortality in patients admitted through the emergency department of a comprehensive cancer center. *Intensive care unit admissions and in-hospital mortality in patients admitted through the emergency department of a comprehensive cancer center.* 2014.
3. Geraci JM, Tsang W, Valdres RV, Escalante CP. Progressive disease in patients with cancer presenting to an emergency room with acute symptoms predicts short-term mortality. *Supportive care in cancer.* 2006;14(10):1038-1045.
4. Zaorsky NG, Churilla TM, Egleston BL, et al. Causes of death among cancer patients. *Annals of oncology.* 2017;28(2):400-407.
5. Moore JX, Akinyemiju T, Bartolucci A, Wang HE, Waterbor J, Griffin R. A prospective study of cancer survivors and risk of sepsis within the REGARDS cohort. *Cancer epidemiology.* 2018;55:30-38.
6. Elfaituri MK, Morsy S, Tawfik GM, et al. Incidence of infection-related mortality in cancer patients: Trend and survival analysis. *Journal of Clinical Oncology.* 2019.
7. Connolly GC, Francis CW. Cancer-associated thrombosis. *Hematology 2013, the American Society of Hematology Education Program Book.* 2013;2013(1):684-691.
8. Næss IA, Christiansen SC, Romundstad P, Cannegieter SC, Rosendaal FR, Hammerstrøm J. Incidence and mortality of venous thrombosis: A population-based study. *Journal of thrombosis and haemostasis.* 2007;5(4):692-699.
9. Abdol Razak NB, Jones G, Bhandari M, Berndt MC, Metharom P. Cancer-associated thrombosis: An overview of mechanisms, risk factors, and treatment. *Cancers.* 2018;10(10):380.
10. Shelton B. Challenges in implementing sepsis core measure in cancer care. https://moffitt.org/media/6100/brenda-shelton-dnp.pdf. Updated 2017.
11. Thursky K, Lingaratnam S, Jayarajan J, et al. Implementation of a whole of hospital sepsis clinical pathway in a cancer hospital: Impact on sepsis management, outcomes and costs. *BMJ open quality.* 2018;7(3).
12. Khorana AA, McCrae KR. Risk stratification strategies for cancer-associated thrombosis: An update. *Thromb Res.* 2014;133:S35-S38.
13. Khurana A. Khorana risk score for venous thromboembolism in cancer patients. https://www.mdcalc.com/khorana-risk-score-venous-thromboembolism-cancer-patients Web site.
14. Thomas EJ, Burstin HR, O'Neil AC, Orav EJ, Brennan TA. Patient noncompliance with medical advice after the emergency department visit. *Ann Emerg Med.* 1996;27(1):49-55.
15. David G, Gunnarsson C, Saynisch PA, Chawla R, Nigam S. Do patient-centered medical homes reduce emergency department visits? *Health Serv Res.* 2015;50(2):418-439.
16. Janke AT, Brody AM, Overbeek DL, Bedford JC, Welch RD, Levy PD. Access to care issues and the role of EDs in the wake of the affordable care act. *Am J Emerg Med.* 2015;33(2):181-185.
17. Johnson TL, Rinehart DJ, Durfee J, et al. For many patients who use large amounts of health care services, the need is intense yet temporary. *Health Aff.* 2015;34(8):1312-1319.

18. Bieler G, Paroz S, Faouzi M, et al. Social and medical vulnerability factors of emergency department frequent users in a universal health insurance system. *Acad Emerg Med.* 2012;19(1):63-68.

19. Locker TE, Baston S, Mason SM, Nicholl J. Defining frequent use of an urban emergency department. *Emergency Medicine Journal.* 2007;24(6):398-401.

20. Singh GK, Jemal A. Socioeconomic and racial/ethnic disparities in cancer mortality, incidence, and survival in the united states, 1950–2014: Over six decades of changing patterns and widening inequalities. *Journal of environmental and public health.* 2017;2017.

21. Degett TH, Dalton SO, Christensen J, Søgaard J, Iversen LH, Gögenur I. Mortality after emergency treatment of colorectal cancer and associated risk factors—a nationwide cohort study. *Int J Colorectal Dis.* 2019;34(1):85-95.

22. Kenzik KM, Kvale EA, Rocque GB, et al. Treatment summaries and follow-up care instructions for cancer survivors: Improving survivor self-efficacy and health care utilization. *Oncologist.* 2016;21(7):817.

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