

Exploring Independent Predictors of Mortality in Hospitalized COVID-19 Patients with a Focused Impact on a High-Risk Cancer Diagnosis, Vaccination Status and Other Severe Co-Morbid Conditions

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Purpose

- This study explores how vaccination status impacts COVID-19 mortality, in a matched cohort of patients with/without active cancer.

Background



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COVID-19 viral infection

- The emergence of the novel severe acute respiratory syndrome, SARS-CoV-2 (COVID-19), originated in Wuhan, China, sparking the ongoing global pandemic responsible for approximately 7 million deaths worldwide^[1].
- While symptoms vary widely among infected patients, severe manifestations of the disease exhibit a pronounced risk of thromboembolic events and severe respiratory failure.

Cancer and COVID-19

- The interplay between COVID-19 infection and cancer treatment adds complexity to the thrombotic risk profile in these patients. Other serious adverse outcomes arising from COVID-19 include the need for mechanical ventilation, need for ICU care, and unfavorable discharge status specifically in-hospital mortality or hospice discharge.
- Despite the acknowledged increased risk of serious adverse events in individuals with both COVID-19 infection and cancer, there exists a notable gap in the literature and a lack of clear evidence regarding the impact of vaccination status in this specific patient population^{[3][4]}.

- In addition, high-quality data around vaccination status, additional vaccinations given (booster, bivalent and monovalent) as well as timing of last vaccination dose and onset of symptomatic COVID-19 has contributed to this gap.
- Addressing this gap is crucial for developing informed recommendations and optimizing the management of serious adverse outcomes in patients grappling with the dual challenges of COVID-19 and cancer.

Methods



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Study design

- Retrospective cohort study
- Patient data retrieved from the Charleston Area Medical Center's COVID-19 Clinical Registry
- We identified 5,479 adult, symptomatic PCR positive COVID-19 inpatients from March 1, 2020-January 20, 2024.
- Cohorts:
 - COVID-19 PCR positive, symptomatic adult patients with active cancer
 - COVID-19 PCR positive, symptomatic adult patients without active cancer

Sample

- **Inclusion criteria:**

- Positive PCR for COVID-19
- Symptomatic COVID-19
- Admission to observation or hospital/ICU
- Known active cancer or active treatment for cancer
- Patients 18 years and older

- **Exclusion criteria:**

- Patients age <18
- Surveillance tested patients (asymptomatic)
- Pregnancy at the time of admission
- Those who were partially vaccinated or whose vaccination status could not be confirmed.



Sample: Propensity Matching

- A 3:1 propensity matching of non-cancer vs cancer patients based on age and sex resulted in a total of 1,433 patients remaining for analysis.
- Cancer patients represented 25% ($n= 358$) of the total.

Sample

- Of the 1,433 patients studied 38% were vaccinated ($N=546$) vs 62% unvaccinated ($N=887$).
- Vaccination in active cancer patients

| Vaccination Status | Frequency | Percentage | Cumulative Frequency | Cumulative Percentage |
|--------------------|-----------|------------|----------------------|-----------------------|
| Unvaccinated | 173 | 48.32 | 173 | 48.32 |
| Vaccinated | 185 | 51.68 | 358 | 100 |

P <.0001

Variables Studied

- Comorbidities: (operationally defined, abstracted from EMR)

Active cancer, metastatic disease, coronary artery disease, chronic kidney disease stage III-V (CKD), chronic obstructive pulmonary disease (COPD), current smoker, diabetes mellitus, congestive heart failure, hypertension, liver disease/cirrhosis of any cause, pharmacologically immunocompromised

Vaccination status:

Unvaccinated (zero doses prior to admission), vaccinated (a minimum of at least 1 Johnson and Johnson or 2 Pfizer or Moderna +/-subsequent available additional doses).

Composite outcome: In-hospital mortality or hospice discharge/subsequent death.

Statistical Tests

SAS 9.4 was utilized to process the data for this investigation.

- ***Descriptive analysis:***
Means \pm standard deviation(SD) for continuous variables
Proportions (%) for categorical variables.
- ***Univariate analysis:***
Mantel-Haenszel Chi-Square, Chi-square or Fishers Exact, students
T-test
- ***Multivariate analysis:***
Logistic regression

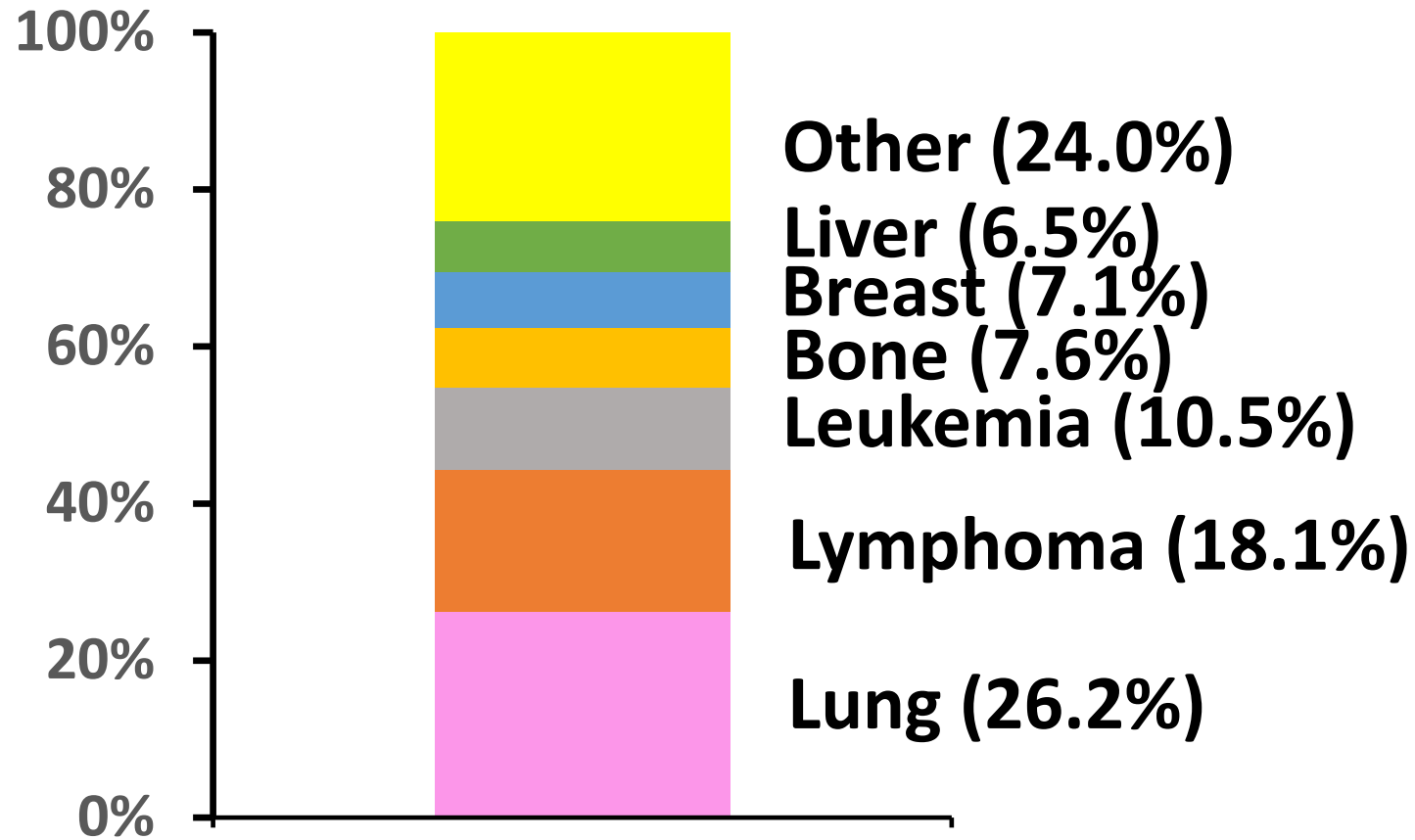
Results



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Cancer types and frequency



Univariate Analysis of Comorbidities

| Variable | DC Home/SNF/L-tac | Death, Hospice | P value |
|-------------------------|-------------------|----------------|---------|
| Hypertension | 75.1% | 73.5% | .56 |
| Diabetes | 48.8% | 45.3% | .27 |
| Coronary Artery Disease | 36.5% | 28.7% | .47 |
| COPD | 31.9% | 42.6% | .0004 |
| CKD | 27.8% | 39.3% | .0001 |
| Heart Failure | 24.1% | 32.7% | .002 |
| Cancer | 21.9% | 35.5% | <.0001 |
| Current smoker | 17.7% | 17.3% | .88 |
| Liver Disease | 5.6% | 9.8% | .007 |

Logistic Regression to In-hospital Death/Hospice Subsequent Death

| Variable | Odd Ratio | 95% Confidence Interval | P value |
|---------------|-----------|-------------------------|---------|
| Cancer | 2.2 | 1.6-2.9 | < .0001 |
| Unvaccinated | 1.6 | 1.2-2.1 | .0004 |
| COPD | 1.7 | 1.3-2.2 | < .0001 |
| Liver Disease | 1.8 | 1.1-2.9 | .01 |

Conclusions



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Conclusions

- An active cancer diagnosis in the setting of acute COVID-19 was not unexpected as a significant predictor of mortality.
- However, unvaccinated status was an independent predictor of mortality similar to other serious chronic conditions such as chronic lung disease or liver disease.
- As complacency in adherence to recommended vaccination has waned, this study supports the ongoing role of providers to remain vigilant in encouraging patients with high-risk conditions, particularly cancer, to follow vaccination guidelines.

References

1. COVID-19 cases. (n.d.). Datadot. Retrieved January 17, 2024, from <https://data.who.int/dashboards/covid19/cases?n=c>
2. Paredes-Ruiz, D., Gómez-Cuervo, C., Gómez-Martín, C., Sánchez-Guerrero, Á., González-Olmedo, J., López-López, F., Bover-Larroya, M., Yarza-Barrio, R., Jara-Casas, D. D., Castelo-Laureiro, A., Revilla-Ostolaza, Y., Paz-Ares, L., Lumbreras-Bermejo, C., & Díaz-Pedroche, C. (2022). Incidence of venous thromboembolism in patients with non-hematological cancer admitted for COVID-19 at a third-level hospital in Madrid. *Journal of Thrombosis and Thrombolysis*, 53(2), 471–478. <https://doi.org/10.1007/s11239-021-02448-w>
3. Impact of vaccination status and anticoagulation on venous thromboembolism risk and outcomes in coronavirus disease 2019 patients; [https://www.jvsvenous.org/article/S2213-333X\(22\)00446-2/fulltext](https://www.jvsvenous.org/article/S2213-333X(22)00446-2/fulltext)
4. Risk of posthospital venous thromboembolism in patients with COVID-19 varies by SARS-CoV-2 period and vaccination status; <https://ashpublications.org/bloodadvances/article/7/1/141/486839/Risk-of-posthospital-venous-thromboembolism-in>
5. COVID-19 and Cancer: Special Considerations for Patients Receiving Immunotherapy and Immunosuppressive Cancer Therapies; <https://pubmed.ncbi.nlm.nih.gov/35658503/>



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