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Hospital presentations and outcomes of hematologic malignancy patients with respiratory viral infections

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Keywords

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Abstract

RATIONALE: Respiratory viruses cause substantial morbidity and mortality among patients with hematologic malignancy and/or hematopoietic cell transplantation (HCT), yet their hospital courses and outcomes remain underdescribed. We aimed to determine the clinical outcomes of hospitalized patients with hematologic malignancy and viral respiratory illnesses, and to identify pathogen and host factors related to these outcomes.

METHODS: We performed a retrospective cohort study of all adult patients with hematologic malignancies and/or HCT who were hospitalized at an NCI-designated Comprehensive Cancer Center between 01/01/2019 and 06/30/2023. We included patients with positive viral polymerase chain reaction tests in the 7 days before or after admission, as well as those with ICD-10 codes for viral pneumonia. We further restricted the cohort to patients with abnormal respiratory physiology (> 20 respirations per minute, new oxygen use, or SpO2 < 92%). We extracted data on patient characteristics, care processes, and hospital outcomes from the electronic health record. The primary outcome was the composite of death and discharge to hospice. Secondary outcomes were hospital length of stay, antibiotic treatment, respiratory support requirements, and ICU admissions.

RESULTS: We identified 67 respiratory viral infection hospitalizations for patients with hematologic malignancy (6 HCT, 40 acute leukemia, 11 lymphoma, 7 multiple myeloma). SARS-CoV-2 was the most frequently identified pathogen (Table 1, n = 23, 34%), followed by rhinovirus/enterovirus (n = 16, 24%) and influenza (n = 9, 13%). The incidence of each pathogen did not differ significantly by type of malignancy (p = 0.14). All patients were hypoxemic. While over 60% (n = 42) of patients were febrile on admission, only 21% (n = 14) met Sepsis-3 criteria. The primary outcome occurred in 16 admissions (18%, 12 died in the hospital and 4 were discharged to hospice). Thirty-two (48%) were admitted to the ICU, 25 (37%) of whom received mechanical ventilation. Eight patients (32%) who received mechanical ventilation died and 2 (8%) were discharged to hospice.

CONCLUSION: Viral respiratory illnesses have stark outcomes for patients with hematologic malignancies. Future work should explore the extent to which viruses contribute to these outcomes – that is, whether patients die from, and not with, viral infections.

Table 1. Patient characteristics and outcomes				
Characteristic	**HCT, n= 6**	**Leukemia, n= 41**	**Lymphoma/Myeloma, n= 18**	**p-value**
Age, years, median (IQR)	64 (57, 71)	62 (46, 72)	62 (53, 73)	0.874
Female gender, n (%)	1 (17)	16 (39)	7 (39)	0.559
Tachypnea, n (%)	6 (100)	41 (100)	17 (94)	0.266
Hypoxemia, n (%)	6 (100)	41 (100)	18 (100)	
Virus, n (%)				0.14
SARS-CoV-2	1 (17)	13 (32)	8 (44)	
Rhinovirus/ enterovirus	2 (33)	10 (24)	4 (22.2)	
Influenza	1 (17)	7 (17)	1 (5.6)	
Human metapneumovirus	0 (0.0)	1 (2.4)	3 (17)	
Human Parainfluenza	2 (33)	2 (4.9)	0 (0.0)	
Other Coronavirus	0 (0.0)	5 (12)	1 (5.6)	
Respiratory syncytial virus	0 (0.0)	3 (7.3)	1 (5.6)	
Met Sepsis-3 Criteria, n (%)	3 (50)	9 (22)	2 (11)	0.133
qSOFA $\geq$ 2, n (%)	3 (50)	13 (33)	5 (28)	0.603
SIRS $\geq$ 2, n (%)	5 (83)	37 (90)	15 (83)	0.715
ICU admission, n (%)	2 (33)	23 (56)	7 (39)	0.341
HFNC, n (%)	2 (33)	12 (29)	5 (28)	0.967
NIV, n (%)	2 (33)	11 (27)	2 (11)	0.344
IMV, n (%)	1 (17)	21 (51)	3 (17)	0.022
Hospital LOS, median (IQR)	6.9 (5.3, 16)	10.0 (3.1, 17)	8.0 (5.0, 16)	0.932
Death or hospice, n (%)	1 (17)	10 (24)	5 (28)	0.86
Death, n (%)	1 (17)	7 (17)	4 (22)	0.889
Hospice, n (%)	0 (0.0)	3 (7)	1 (5.6)	0.779
HCT, Hematopoietic Cell Transplant; ICU, Intensive Care unit; HFNC, High Flow Nasal Cannula; NIV, non-invasive ventilation; IMV, Intermittent mandatory ventilation; LOS, Length of stay				