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Supplemental Information

SARS-CoV-2 Viral Load Predicts Mortality in Patients with and without Cancer Who Are Hospitalized with COVID-19

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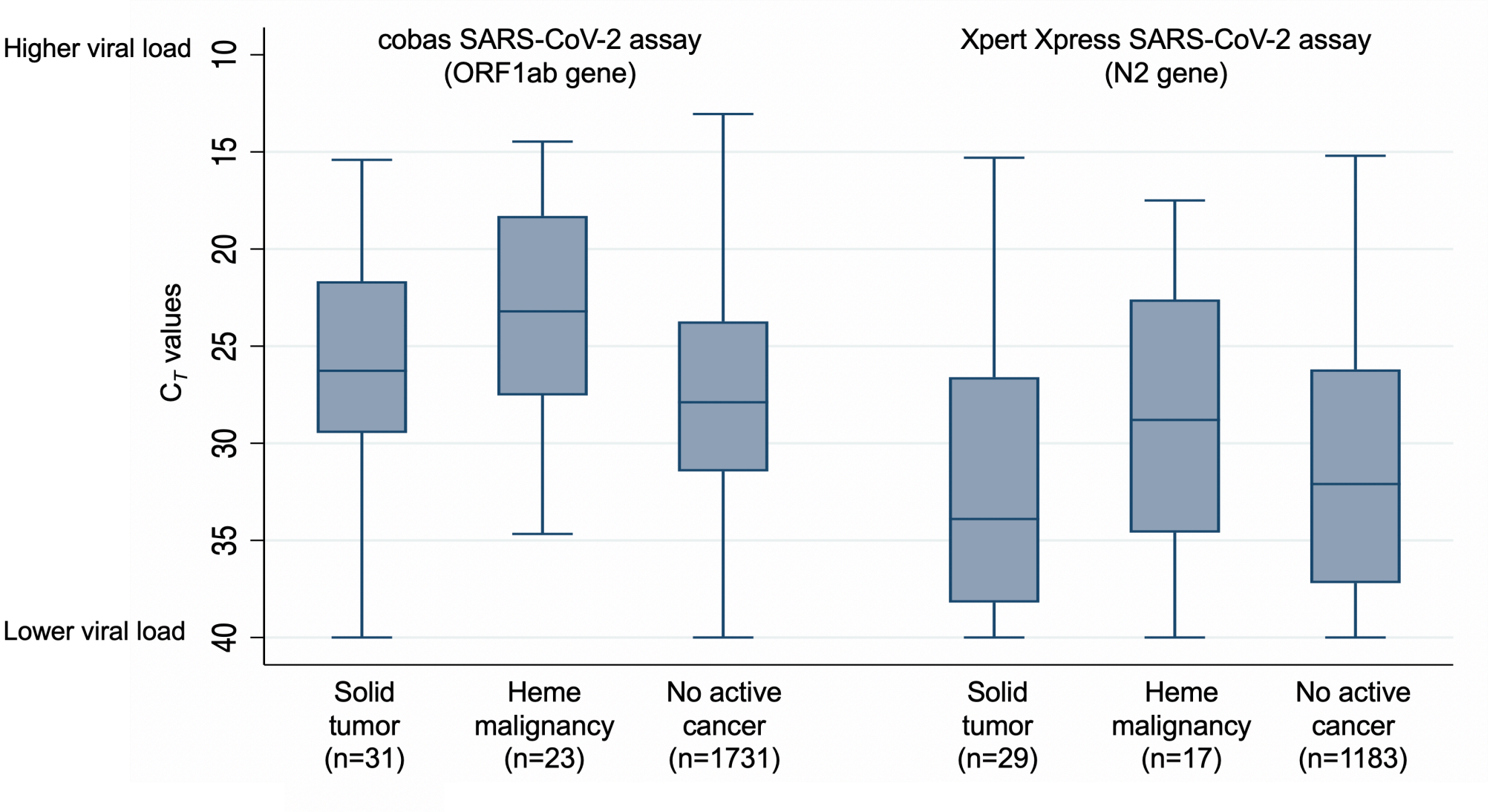
Higher viral load
Lower viral load
C_T values
10
15
20
25
30
35
40
cobas SARS-CoV-2 assay
(ORF1ab gene)
Xpert Xpress SARS-CoV-2 assay
(N2 gene)
Solid tumor (n=31)
Heme malignancy (n=23)
No active cancer (n=1731)
Solid tumor (n=29)
Heme malignancy (n=17)
No active cancer (n=1183)

SUPPLEMENTAL INFORMATION

Supplemental Figure 1. SARS-CoV-2 C_T values using SARS-CoV-2-specific gene targets in patients admitted to the hospital with COVID-19, stratified by malignancy type and assay. **Related to Figure 2A**. C_T values were generated for the ORF1ab gene target for the cobas SARS-CoV-2 assay and the N2 gene target for the Xpert Xpress SARS-CoV-2 assay. Median values are represented by horizontal lines and boxes represent 25^{th}-75^{th} percentiles.

Supplemental Table 1. Multivariate Model of Factors Associated with High SARS-CoV-2 Viral Load on Admission with Inclusion of Duration of Symptoms as a Co-Variate. Related to Table 2.

Variable	**Adjusted OR (95% CI)**	***P* value**
Cancer status		
No active cancer	Reference	
Solid tumor	0.83 (0.44-1.59)	0.58
Hematologic malignancy	2.37 (1.13-4.99)	**0.023**
Age, per year increase	1.02 (1.01-1.03)	**<0.001**
Race/ethnicity		
White (non-Hispanic)	Reference	
Black (non-Hispanic)	0.76 (0.54-1.07)	0.12
Asian (non-Hispanic)	1.20 (0.91-1.58)	0.20
Hispanic	0.79 (0.61-1.02)	0.07
Other or missing	0.90 (0.65-1.26)	0.55
Congestive heart failure	1.63 (1.13-2.35)	**0.008**
Diabetes mellitus	1.47 (1.21-1.77)	**<0.001**
Chronic kidney disease	2.51 (1.85-3.40)	**<0.001**
Inhaled or nasal steroid use as an outpatient	1.69 (1.13-2.52)	**0.01**
Nursing home/rehabilitation facility resident	1.70 (1.26-2.30)	**<0.001**
Relationship to apex of COVID-19 in New York City		
Pre-apex (March 15 - 29)	1.65 (1.30-2.09)	**<0.001**
Apex (March 30 - Apr 8)	Reference	
Post-apex (April 9 - May 14)	0.87 (0.70-1.07)	0.19
Hospital		

NYP/Queens	Reference	
NYP/WCMC	1.27 (1.01-1.60)	**0.045**
NYP/LMH	1.62 (1.25-2.11)	**<0.001**
Duration of symptoms, per day increase	1.00 (1.00-1.00)	0.79

High viral load is designated as having a C_T value <25 using the cobas SARS-CoV-2-specific gene target (ORF1ab) and a C_T value <27 using the Xpert Xpress SARS-CoV-2 assay-specific gene target (N2). The different definitions were derived from published data that indicate C_T values for the Xpert Xpress assay (N2 gene) are approximately 2 cycles greater than C_T values for the cobas assay (ORF1ab gene; Smithgall et al., 2020). Bolded *P* values indicate those that meet statistical significance.

Abbreviations: CI, confidence interval; LMH, Lower Manhattan Hospital; NYP, NewYork-Presbyterian; OR, odds ratio; WCMC, Weill Cornell Medical Center

Supplemental Table 2. Factors Associated with High SARS-CoV-2 Viral Load on Admission, Using the Same Cutoff (C_T <25) for Both the cobas SARS-CoV-2 and Xpert Xpress SARS-CoV-2 Assays. Related to Table 2.

Variable	**Univariate model Unadjusted OR (95% CI)**	***P* value**	**Multivariate model Adjusted OR (95% CI)**	***P* value**
Cancer status				
No active cancer	Reference		Reference	
Solid tumor	1.33 (0.77-2.28)	0.31	1.11 (0.62-1.99)	0.72
Hematologic malignancy	2.65 (1.42-4.95)	**0.002**	2.90 (1.48-5.69)	**0.002**
Demographics				
Age, per year increase	1.03 (1.02-1.03)	**<0.001**	1.02 (1.02-1.03)	**<0.001**
Female	0.95 (0.81-1.12)	0.56		
Race/ethnicity				
White (non-Hispanic)	Reference		Reference	
Black (non-Hispanic)	0.70 (0.52-0.95)	**0.020**	0.76 (0.55-1.05)	0.10
Asian (non-Hispanic)	1.05 (0.83-1.32)	0.69	1.21 (0.94-1.57)	0.15
Hispanic	0.52 (0.42-0.64)	**<0.001**	0.73 (0.57-0.94)	**0.013**

Other or missing	0.68 (0.51-0.91)	**0.010**	0.96 (0.70-1.31)	0.80
Comorbidities				
Obesity (BMI >30: n=2832)[a]	0.75 (0.63-0.90)	**0.002**		
Coronary artery disease[a]	1.70 (1.38-2.10)	**<0.001**		
Congestive heart failure	2.34 (1.75-3.15)	**<0.001**	1.44 (1.04-1.98)	**0.028**
Diabetes mellitus	1.71 (1.45-2.02)	**<0.001**	1.78 (1.39-2.29)	**<0.001**
Hypertension	1.60 (1.36-1.88)	**<0.001**	0.78 (0.61-1.01)	0.06
Chronic pulmonary disease[a]	1.60 (1.30-1.97)	**<0.001**		
Chronic kidney disease	2.36 (1.83-3.03)	**<0.001**	1.98 (1.50-2.61)	**<0.001**
Cirrhosis	0.86 (0.37-2.04)	0.74		
HIV infection	1.04 (0.46-2.37)	0.93		
Solid organ transplant[a]	1.90 (1.08-3.36)	**0.026**		
Inflammatory bowel disease	2.60 (0.65-10.44)	0.18		
Rheumatic disease	1.02 (0.65-1.60)	0.94		
Home medications				
Inhaled or nasal steroid	2.06 (1.46-2.90)	**<0.001**	1.77 (1.23-2.56)	**0.002**
Oral steroid	2.04 (1.37-3.03)	**<0.001**	1.73 (1.13-2.66)	**0.012**
Calcineurin inhibitor[a]	2.00 (1.09-3.64)	**0.024**		

Mycophenolate[a]	2.13 (1.19-3.80)	**0.011**		
Social characteristics				
Active smoker	1.00 (0.63-1.60)	1.00		
Former smoker[a]	1.36 (1.11-1.66)	**0.003**		
Recent international travel	0.87 (0.34-2.19)	0.76		
Known exposure to COVID-positive patient	1.01 (0.80-1.27)	0.95		
Healthcare worker	0.94 (0.56-1.58)	0.82		
Undomiciled	1.39 (0.76-2.57)	0.29		
Nursing home/rehabilitation facility resident	1.90 (1.52-2.36)	**<0.001**	1.52 (1.18-1.96)	**0.001**
Duration of symptoms prior to admission	1.00 (1.00-1.00)	0.49		
ED Presentation				
Relationship to apex of COVID-19 in New York City				
Pre-apex (March 15 - 29)	1.45 (1.19-1.77)	**<0.001**	1.65 (1.28-2.12)	**<0.001**
Apex (March 30 - Apr 8)	Reference		Reference	
Post-apex (April 9 - May 14)	0.78 (0.64-0.94)	**0.01**	0.78 (0.62-0.99)	**0.043**
Hospital				
NYP/Queens	Reference		Reference	
NYP/WCMC	1.16 (0.96-1.40)	0.13	1.22 (0.94-1.59)	0.13

NYP/LMH	1.98 (1.58-2.49)	**<0.001**	1.55 (1.17-2.04)	**0.002**
cobas SARS-CoV-2 test (vs. Xpert Xpress test)	1.94 (1.63-2.30)	**<0.001**	1.62 (1.24-2.12)	**<0.001**

High viral load is designated as having a C_T value <25 using the SARS-CoV-2-specific gene target (cobas SARS-CoV-2 assay, ORF1ab gene; Xpert Xpress SARS-CoV-2 assay, N2 gene). Bolded *P* values indicate those that meet statistical significance.

Abbreviations: BMI, body mass index; CI, confidence interval; ED, emergency department; HIV, human immunodeficiency virus; LMH, Lower Manhattan Hospital; NYP, NewYork-Presbyterian; OR, odds ratio; WCMC, Weill Cornell Medical Center

[a]Removed from final multivariate model because *P* value >0.1 in multivariate analysis.

Supplemental Table 3. In-Hospital Mortality and SARS-CoV-2 Admission Viral Load, Stratified by RT-PCR Assay, Using the cobas SARS-CoV-2 Assay C_T Value Cutoffs for Both Assays. Related to Table 3.

	cobas SARS-CoV-2 assay	**Xpert Xpress SARS-CoV-2 assay**	**Combined data from both assays**
All patients			
High viral load (n=838)	37.5%[a]	44.2%[a]	39.5%[a]
Medium viral load (n=836)	23.5%	29.9%	25.6%
Low viral load (n=1340)	12.4%	18.6%	15.7%
Patients with cancer			
High viral load (n=40)	44.4%	46.2%	45.0%[b]
Medium viral load (n=24)	35.3%	14.3%	29.2%
Low viral load (n=36)	20.0%	11.5%	13.9%

Variables are expressed as % in-hospital mortality.

High viral load, C_T value <25; medium viral load, C_T value 25-30; low viral load, C_T value >30 using SARS-CoV-2-specific target (cobas SARS-CoV-2 assay, ORF1ab gene; Xpert Xpress SARS-CoV-2 assay, N2 gene).

[a]*P* value comparing mortality by viral load using a trend analysis was <0.001.

[b]*P* value comparing mortality by viral load using a trend analysis was 0.003.

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