#1055

Comparison of Scoring Systems in Predicting Clinical Outcomes in Patients Hospitalized with COVID 19

Anderson Huang [1], Lisa Chirch MD [2], Jessica Abrantes-Figueiredo MD [4], Roopjeet Bath MD [3], Jennifer Onwochei MD [3], Neelam Tailor MD [2], Assaf Holtzman MD [2], Chia-Ling Kuo PhD [5], Kevin Dieckhaus MD [2]
University of Connecticut School of Medicine, Farmington, CT [1]; University of Connecticut School of Medicine Division of Infectious Disease, Dept. of Medicine, Farmington, CT [2];
University of Connecticut School of Medicine Division of Gastroenterology, Dept. of Medicine, Farmington, CT [3]; Saint Francis Hospital Division of Infectious Disease, Dept. of Medicine, Hartford, CT [4];
University of Connecticut Dept. of Biostatistics, Farmington, CT [5]

Background

- COVID19 continues to affect millions worldwide with significant associated morbidity and mortality. Previous studies have associated individual risk factors and COVID outcomes. Scoring systems have been proposed to predict COVID outcomes, but none have been universally adopted. Many of these scoring systems require labs such as CRP, D Dimer, Procalcitonin, BUN, CBC with differential [1,2,3].

- Scoring systems of interest in this study:
  - Monoclonal Antibody Screening Score (MASS) – Originally created to prioritize patients in the outpatient setting for monoclonal antibody treatment based on risk of hospitalization
  - Oral Antiviral and Monoclonal Antibody Screening Score (OMASS) - A modified version of the MASS originally used to prioritize patients for oral antiviral therapies for COVID19 in the outpatient setting
  - UCH2021 – A modified scoring system created by our institution based on the OMASS that incorporates vaccination status with slightly different weights for comorbidities.

- None of these scoring systems (table 1) have been used to predict inpatient clinical outcomes. These scoring systems do not require blood tests and allow for more rapid triage than previously proposed scoring systems.

- The aim of this study is to investigate the ability of these scoring systems to predict mortality and oxygen requirements in hospitalized COVID19 patients.

Table 1: MASS, OMASS, UCH2021 Scoring Criteria

Variables	MASS	OMASS	UCH2021
Age	≥65: 2	≥65: 2	65-74: 1 ≥75: 2
BMI	≥35: 1	≥35: 2	≥35: 2
Diabetes Mellitus	2	2	2
Chronic kidney disease in ≥55 y.o.	3	3	3
Cardiovascular disease in ≥55 y.o.	2	2	2
Chronic Respiratory Disease in ≥55 y.o.	2	3	3
Hypertension in ≥55 y.o.	1	1	1
Immunocompromise	3†	3¥	Highly suppressed€: 6 Moderately suppressed*: 3
Pregnancy	N/A	4	5
BIPOC status	N/A	1	1
Vaccination status	N/A	N/A	Unvaccinated: 2 Vaccinated, eligible for booster but not boosted: 1

† Immunocompromise for MASS defined as fitting any one of these criteria: s/p stem cell or solid organ transplant; active chemotherapy for acute leukemia, lymphoma, or myeloma; received lymphocyte depleting monoclonal Ab therapy
¥ Immunocompromise for OMASS defined as: Received lymphocyte depleting monoclonal Ab therapy, BTK inhibitors, campath, recent CART, s/p organ transplant, or receiving any drug on CDC's immune suppression drug list
€ "Highly Suppressed" for UCH2021 defined as: Received lymphocyte depleting monoclonal Ab therapy, BTK inhibitors, campath, recent CART, s/p organ transplant
* "Moderately Suppressed" defined as: Receiving any drug on CDC's immune suppression drug list

Methods

- A retrospective chart review was performed on 133 hospitalized patients at two tertiary care centers between March and September 2020 with RT-PCR confirmed SARS-CoV-2. Baseline risk factors were collected and MASS, OMASS, and UCH2021 scores were calculated.

- Primary outcomes of interest:
  - In-hospital mortality
  - Need for intubation during hospitalization
  - Need for supplemental oxygen >6L during hospitalization

- A secondary analysis was performed to assess if any individual risk factors were more strongly associated with these outcome measures

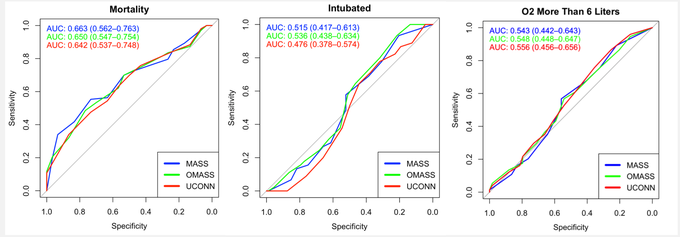
Results

Table 2: MASS, OMASS, UCH2021 Scores and Mortality in Hospitalized COVID19 Patients

	Area Under Curve	Mean Score Survived	Mean Score Deceased	P Value
MASS	0.663 ± 0.100	3.96 ± 3.40	5.87 ± 3.17	0.0070
OMASS	0.650 ± 0.103	4.78 ± 3.64	6.70 ± 3.51	0.0113
UCH2021	0.642 ± 0.105	6.70 ± 3.60	8.50 ± 3.60	0.0172

Scoring systems were evaluated via area under the curve calculations. Difference in mean score for Survived vs Deceased for each scoring system was compared using Two Sample T-Test, with an alpha level of 0.05

Figure 1: Predictive Power of MASS, OMASS, UCH2021 Scores for Clinical Outcomes in Hospitalized COVID19 Patients



Area Under the Curve Calculations at the 95% confidence interval

Table 3: Secondary outcomes with Statistical Significance

	Mean Survived	Mean Deceased	P Value
Age	61.54 ± 16.71	76.83 ± 10.53	<0.0001
	≤6L Supplemental O2	**>6L Supplemental O2**	**P Value**
BMI	28.98 ± 6.56	33.13 ± 6.98	0.0008
	Not requiring intubation	**Requiring Intubation**	**P Value**
BMI	28.92 ± 6.48	33.70 ± 6.95	0.0001

Two groups based on an outcome were compared using two-sample t-tests, with an alpha level of 0.05

Table 4: Secondary Outcomes without Statistical Significance

	Mortality	P Value	>6L Supplemental O2	P Value	Intubated	P Value
Male	20.7%	0.5300	61.0%	0.1511	36.6%	0.4536
Female	25.5%		47.1%		29.4%	
Diabetic	27.9%	0.3757	55.8%	1.0000	39.5%	0.4334
Non-Diabetic	20.0%		55.6%		31.1%	
CKD	24.2%	0.8124	48.5%	0.4198	24%	0.2081
Non-CKD	22.0%		58.0%		37%	

Two groups based on an outcome were compared using Fisher's exact tests, with an alpha level of 0.05

Discussion

Findings:

- MASS, OMASS, UCH2021 all demonstrated some discriminative power for mortality (table 2, figure 1).

- None of the scores demonstrated any significant discriminative power for supplemental oxygen and intubation requirements during hospitalization (figure 2)

- There was statistically significant difference in age between survivors versus deceased and in BMI for oxygen requirements (table 3). Other individual risk factors were not predictive of mortality or oxygen requirements during hospitalization.

Limitations:

- Retrospective chart review

- Small sample size

- Study only included 3 pregnant patients and no vaccinated patients (study was conducted prior to vaccine distribution in US), possibly limiting the true discriminative power of UCH2021 scoring

Conclusions

- The MASS, OMASS, and UCH2021 score all had predictive power in determining in-hospital mortality, though with only moderate accuracy. None were predictive of oxygen requirements.

- Age and BMI were good predictors of mortality and oxygen requirements respectively.

- Further study would be helpful to assess if UCH2021 score has greater discriminative power in samples with vaccinated patients and those with greater proportion of pregnant patients.

References

1. Knight S R, Ho A, Pius R, Buchan I, Carson G, Drake T M et al. Risk stratification of patients admitted to hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: development and validation of the 4C Mortality Score *BMJ* 2020; 370 :m3339 doi:10.1136/bmj.m3339
2. Yufeng Shang, Tao Liu, Yongchang Wei, Jingfeng Li, Liang Shao, et al. Scoring systems for predicting mortality for severe patients with COVID-19, *EClinicalMedicine, Volume 24*. 2020; 100426, ISSN 2589-5370 doi.org/10.1016/j.eclinm.2020.100426.
3. Gopalan N, Senthil S, Prabakar NL, Senguttuvan T, Bhaskar A, et al. (2022) Predictors of mortality among hospitalized COVID-19 patients and risk score formulation for prioritizing tertiary care—An experience from South India. PLOS ONE 17(2): e0263471. doi.org/10.1371/journal.pone.0263471