Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Respiratory Medicine 172 (2020) 106130

Contents lists available at ScienceDirect

Respiratory Medicine

journal homepage: http://www.elsevier.com/locate/rmed

COVID-19 patients in a tertiary US hospital: Assessment of clinical course and predictors of the disease severity

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ARTICLE INFO

Keywords:
COVID-19
Ventilators
Intubation
Coronavirus
Respiratory failure

ABSTRACT

Introduction: Patients with severe COVID-19 can develop ventilator-dependent acute hypoxic respiratory failure (VDAHRF), which is associated with a higher mortality rate. We evaluated the clinical course of hospitalized COVID-19 patients and compared them with the patients who received invasive mechanical ventilation. Characteristics of intubated patients who were successfully weaned from the ventilator were compared with the patients who failed to be extubated or died in the hospital.

Objective: To investigate the clinical course of hospitalized COVID-19 patients, and assess the possible predictors of the disease severity leading to VDAHRF.

Methods: This is a single-center, retrospective study. The first 129 patients (18 years or older) with COVID-19 admitted to Monmouth Medical Center from March 1st to April 25th, 2020 were included.

Results: Out of 129 patients, 23.25% (n = 30) required invasive mechanical ventilation, and of those, six patients were successfully weaned from the ventilator. Multivariable logistic regression analysis showed increased odds of intubation associated with hypoxemia (odds ratio 17.23, 95% CI 5.206–57.088; $p < 0.0001$), elevated d-dimer by one unit mg/L of FEU (odds ratio 1.515, 95% CI 5.206–57.088; $p = 0.0430$) and elevated ferritin by one unit ng/ml (odds ratio 1.001, 95% CI 1.000–1.001, $p = 0.0051$) on admission, adjusted for other covariates.

Conclusions: Patients who required invasive mechanical ventilation were more likely to have older age, male gender, coronary artery disease, diabetes, and obesity. The patients who were successfully weaned from the ventilator were more likely to be younger in age, and none of them had heart failure or CAD.

1. Background

In the United States, New Jersey (NJ) was second only to the state of New York in the number of COVID-19 cases until June 2020 [1]. Patients with severe COVID-19 can develop ventilator-dependent acute hypoxic respiratory failure (VDAHRF), which is associated with a higher mortality rate. Older age, male sex, D-dimer greater than 1 μg/mL, high Sequential Organ Failure Assessment (SOFA) score, and lower lymphocyte count have been linked with poor outcomes in COVID-19 [2,3]. Data regarding successful extubation in COVID-19 is still evolving. We evaluated the clinical course of hospitalized COVID-19 patients. Characteristics of intubated patients who were successfully weaned from the ventilator were compared with patients who failed to be extubated or died in the hospital. An observational study from Wuhan, China with complete follow-up in patients who received invasive mechanical ventilation reported a mortality rate of 97%. Comparatively, an observational study from New York with incomplete follow up reported a lower mortality rate among intubated patients [3,4]. To our knowledge, this is the first observational study from New Jersey that characterized the clinical picture of hospitalized COVID-19 patients, evaluated their clinical course, and studied possible predictors of intubation.

2. Objective

To investigate the clinical course of hospitalized COVID-19 patients, and assess the possible predictors of the disease severity leading to

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https://doi.org/10.1016/j.rmed.2020.106130
Received 17 June 2020; Received in revised form 24 August 2020; Accepted 25 August 2020
Available online 28 August 2020

ventilator-dependent acute hypoxic respiratory failure (VDAHRF).

3. Methods

This is a single-center institutional review board (IRB) approved, retrospective study. Inclusion criteria were adults 18 years of age or older who had RT-PCR confirmed SARS-CoV-2 infection. These were the first 129 patients with COVID-19 admitted to Monmouth Medical Center from March 1st to April 25th, 2020. The final date of follow-up to monitor clinical outcomes was May 2, 2020. Clinical characteristics of the patients who received invasive mechanical ventilation were compared to the patients who did not receive invasive mechanical ventilation (Table-1). Clinical characteristics of the patients who were successfully weaned from the ventilator were compared to the patients who failed to be extubated (Table-2). Data were extracted manually using the hospital electronic medical record. Multivariate logistic regression was modeled following stepwise selection to choose the best predictors. Odds ratio with 95% confidence intervals were calculated. Categorical variables were compared by conducting chi-square test or Fisher's exact test while continuous ones were compared by conducting median two-sample test. A standard two-sample *t*-test; two-sided and unpaired was used. F test was used for equal variances. Multiple imputation was used to handle the missing data. The *P*-value of <0.05 was considered significant. Statistical analysis was done with SAS software.

4. Results

A total of 129 patients were included in the study; 98 were discharged, 20 died, 10 patients were still in the hospital, and 1 patient was transferred to another hospital at the time of last follow-up. The median age of all patients was 63.0 years (IQR 45.0–72.0), 62.8% were males and 61.2% were Caucasian. The most common comorbidities were hypertension (43.4%), diabetes mellitus (19.4%), and obesity (14.0%). The most common symptoms on admission were fever (79.1%), dry cough (62.8%), and shortness of breath (55.8%). The most common complications were acute respiratory distress syndrome (ARDS, 32.6%), acute kidney injury (AKI, 22.5%), septic shock (14.7%), suprainfection (10.1%), acute cardiac injury (ACI, 7%), and new-onset cardiac arrhythmia (6.2%). Six patients had thrombotic complications: bilateral pulmonary embolism (n = 1), deep venous thrombosis (n = 2), cerebrovascular vascular accident (n = 1), acute popliteal artery occlusion (n = 1), and one patient had an upper extremity deep venous thrombosis (n = 1). A total of 39 patients received ICU level of care during hospitalization. The median duration from hospital admission to ICU upgrade in patients requiring mechanical ventilation was 1.0 day (IQR 1.0–2.0) for those initially admitted to the non-ICU level of care.

4.1. Patients who received invasive mechanical ventilation vs patients who did not receive invasive mechanical ventilation (Table-1)

Out of 129 patients, 23.25% (n = 30) required invasive mechanical ventilation. Respiratory rate (RR) and oxygen (O2) saturation at admission differed statistically between the patients who received invasive mechanical ventilation and who did not receive invasive mechanical ventilation. Median values of inflammatory markers (CRP, LDH, and D-dimer) at admission, and peak values during hospitalization showed statistically significant differences among the patients who received invasive mechanical ventilation and those who did not. QSOFA score, modified early warning score (MEWS), and CURB-65 score are delineated in Table-1. There was a higher frequency of complications among intubated patients; 100% had ARDS, 56.7% developed septic shock, 53.3% had AKI, 43.3% had suprainfection, and 26.7% had ACI. Of the 16 patients with AKI, 3 patients eventually required renal replacement therapy (RRT). Thrombotic events were more common among patients who did not receive invasive mechanical ventilation as shown in Table- 1. In a multivariate logistic regression analysis, odds of intubation were higher in patients with hypoxemia (oxygen saturation without supplemental oxygen $<90\%$) at admission, and with elevated ferritin (ng/ml) and D-dimer per unit (mg/L of FEU).

4.2. Patients who were successfully weaned from the ventilator vs the patients who failed to be extubated

30 patients required invasive mechanical ventilation and of those, 6 patients were successfully weaned from the ventilator, 12 patients died, 8 were still intubated and critically ill, 3 were discharged to a long term acute care facility after tracheostomy, and 1 was transferred to another hospital. Median age varied significantly between patients who were successfully weaned off the ventilator and the patients who failed extubation [48.5 years (41.0–57.0) vs 68.5 years (62.5–72.0); p-value 0.0071]. Patients who were successfully weaned had lower median values of inflammatory markers (ferritin, IL-6, D-dimer). Rates of complications including severe ARDS (50% vs 62.5%), AKI (33.3% vs 58.3%), suprainfections (33.3 vs 45.8%), septic shock (33.3% vs 62.5%) were lower in successfully weaned patients. None of the successfully weaned patients had ACI, cardiac arrhythmias, new RRT, nor thrombotic events. The median duration from illness onset to discharge in successfully weaned patients was 22.5 days.

5. Discussion

Information regarding the disease trajectory in severe COVID-19 leading to invasive mechanical ventilation is still evolving. A large case series from New York suggested a high mortality rate among intubated patients compared to those who were not [5]. We retrospectively analyzed whether demographic and clinical characteristics might predict clinical outcomes including extubation among VDAHRF patients. Of the 129 hospitalized patients, 85 patients received supplemental oxygenation via nasal cannula ($\geq$1 day) and 35 patients received high flow oxygen (Median 1 day, IQR 0.0–3.0 days). The patients who had a progressive escalation of oxygen requirements, increased work of breathing (respiratory rate >30 breaths/minute), and no improvement on >60 L/min of high flow (HF) oxygen and a fraction of inspired oxygen (FiO2) >0.9, or hemodynamic instability were intubated. In our study, 23.25% of patients required invasive mechanical ventilation (Table- 1). Pressure regulated volume control (PRVC) with a low tidal volume (6–8 mL/kg), and a goal of plateau pressure $<$ 30 cmH2O was initially used to keep oxygen saturation above 90%. Ultimately, 20% of these patients were successfully weaned from the ventilator and were discharged (Table- 2). Spontaneous breathing trials (SBT) were performed with pressure support ventilation (PSV 6 cm H2O) for 30–120 min to determine the readiness for extubation. The patients who failed SBT trials had a rapid shallow breathing index >105 breaths/min/L, RR $>$ 25–30 breaths/min, desaturation or hemodynamic instability. The overall case-fatality rate among hospitalized COVID-19 patients was 15.5% and noted in our study to be 40% among patients requiring invasive mechanical ventilation. The overall case-fatality rate among hospitalized patients was similar to that reported by studies from Wuhan [6]. However, the reported mortality rate among intubated patients has varied from study to study. Patients who required invasive mechanical ventilation were more likely to have older age, male gender, coronary artery disease, diabetes, and obesity. All these parameters have been implicated independently with increased in-hospital mortality [7]. The patients who were weaned from the ventilator successfully were more likely to be younger in age (median age 48.5 years; IQR 41.0–57.0), and none of them had heart failure or CAD. The frequency of obesity and hypertension were not significantly different between patients who were weaned successfully and those who were not. In the absence of effective antivirals against SARS-CoV-2 and rapidly evolving treatment guidelines, 64.3% received hydroxychloroquine, 25.6% received an IL-6 inhibitor (tocilizumab), 25.6% received therapeutic anticoagulation, and

Table 1
Characteristics of all hospitalized patients with COVID-19.

Characteristics	p-value	All Patients (n = 129)	Patients who received invasive mechanical ventilation (n = 30)	Patients who did not require invasive mechanical ventilation (n = 99)
Demographic				
Median age (IQR), years	0.2201	63.0 (45.0–72.0)	65.5 (57.0–71.0)	60.0 (39.0–72.0)
Males-n, (%)	0.0079	81 (62.8%)	25 (83.3%)	56 (56.6%)
Caucasian-n, (%)	0.0216	79 (61.2%)	13 (43.3%)	66 (66.7%)
Presentation				
Median duration of symptoms prior to hospitalization (IQR), days	0.4341	6.0 (3.0–9.0)	6.0 (3.0–10.0)	7.0 (3.0–9.0)
Fever-n, (%)	0.5123	102 (79.1%)	25 (83.3%)	77 (77.8%)
Dry cough-n, (%)	0.2212	81 (62.8%)	16 (53.3%)	65 (65.7%)
Productive cough-n, (%)	0.5266	16 (12.4%)	5 (16.7%)	11 (11.1%)
Dyspnea-n, (%)	0.0741	72 (55.8%)	21 (70.0%)	51 (51.5%)
Malaise-n, (%)	0.3102	50 (38.8%)	14 (46.7%)	36 (36.4%)
Nausea-n, (%)	0.7313	13 (10.1%)	2 (6.7%)	11 (11.1%)
Vomiting-n, (%)	0.1967	8 (6.2%)	0 (0%)	8 (8.1%)
Diarrhea-n, (%)	0.3102	26 (20.2%)	8 (26.7%)	18 (18.2%)
Poor appetite-n, (%)	0.7324	19 (14.7%)	5 (16.7%)	14 (14.1%)
Sore throat-n, (%)	0.0520	10 (7.8%)	5 (16.7%)	5 (5.1%)
Headache-n, (%)	0.9187	31 (24.0%)	7 (23.3%)	24 (24.2%)
Anosmia-n, (%)	0.2307	4 (3.1%)	2 (6.7%)	2 (2.0%)
Altered mental status-n, (%)	0.6228	6 (4.7%)	2 (6.7%)	4 (4.0%)
Comorbidities				
Heart failure-n, (%)	0.7313	12 (9.3%)	2 (6.7%)	10 (10.1%)
Hypertension-n, (%)	0.6813	56 (43.4%)	14 (46.7%)	42 (42.4%)
Coronary artery disease-n, (%)	0.2402	10 (7.8%)	4 (13.3%)	6 (6.1%)
Diabetes mellitus-n, (%)	0.0063	25 (19.4%)	11 (36.7%)	14 (14.1%)
Chronic obstructive pulmonary disease-n, (%)	0.4334	9 (7.0%)	3 (10.0%)	6 (6.1%)
Obesity-n, (%)	0.0334	18 (14.0%)	8 (26.7%)	10 (10.1%)
Obstructive sleep apnea-n, (%)	0.3298	5 (3.9%)	2 (6.7%)	3 (3.0%)
Asthma-n, (%)	0.1348	3 (2.3%)	2 (6.7%)	1 (1.0%)
Chronic kidney disease-n, (%)	0.6972	10 (7.8%)	3 (10.0%)	7 (7.1%)
Medications				
On ACE-I n, (%)	1.0000	13 (10.1%)	3 (10.0%)	10 (10.1%)
On ARB-n, (%)	1.0000	21 (16.3%)	5 (16.7%)	16 (16.2%)
Admission				
Median systolic blood pressure (IQR)	0.1028	130.0 (114.0–142.0)	122.2 (107.0–139.0)	132.0 (116.0–143.0)
Median diastolic BP (IQR)	0.1068	76.0 (67.0–87.0)	71.5 (64.0–88.0)	78.0 (69.0–87.0)
Respiratory rate >20-n, (%)	<.0001	66 (51.2%)	25 (83.3%)	41 (41.4%)
O2 saturation (without supplemental O2) <90%-n, (%)	<.0001	46 (35.7%)	24 (80.0%)	22 (22.2%)
Bilateral infiltrates on CXR-n, (%)	0.0044	84 (65.1%)	26 (86.7%)	58 (58.6%)
Bilateral infiltrates on CT scan-n, (%)	–	17 (100.0%)	2 (100.0%)	15 (100.0%)
Laboratory data at admission [within 24 hours of hospitalization]				
Median WBC count, K/CMM (IQR)	0.0332	6.9 (4.9–9.6)	9.0 (6.4–11.7)	6.5 (4.6–9.1)
WBC <4.5, K/CMM-n, (%)	0.1707	29 (22.5)	4 (13.3)	25 (25.3)
Median lymphocyte count, %	0.0555	12.0 (8.0–18.0)	8.0 (4.0–15.0)	13.0 (9.0–18.0)
Lymphocyte <1, %	0.7329	87 (67.4)	21 (70.0)	66 (66.7)
Median platelet count, K/CMM (IQR)	0.4335	196.0 (153.0–265.0)	175.0 (142.0–251.0)	198.0 (154.0–265.0)
Platelet <140, K/CMM-n, (%)	0.2966	22 (17.1)	7 (23.3)	15 (15.2)
Median CRP, mg/L (IQR)	0.0178	136.1 (53.1–202.4)	197.0 (119.2–283.2)	118.6 (48.6–168.0)
Median LDH, IU/L (IQR)	0.0003	408.0 (321.0–547.0)	540.5 (414.5–805.0)	373.0 (301.0–483.0)
Median Ferritin, ng/mL (IQR)	0.0694	848.0 (397.0–1606.0)	1414.0 (559.5–2603.5)	810.0 (362.0–1393.0)
Median IL-6, pg/mL (IQR)	0.0122	73.82 (44.04–188.42)	148.8 (52.4–1642.0)	47.8 (25.1–98.4)
Median D-dimer, mg/L of fibrinogen equivalent units (FEU) (IQR)	0.0569	1.0 (0.6–2.3)	1.7 (0.9–4.4)	0.9 (0.5–2.1)
QSOFA score		1.0 (0.0–1.0)	1.0 (1.0–2.0)	0.0 (0.0–1.0)
CURB-65		1.0 (0.0–2.0)	1.0 (1.0–2.0)	1.0 (0.0–1.0)
MEWS		2.0 (1.0–4.0)	3.0 (2.0–5.0)	2.0 (1.0–3.0)
Hospital course				
Median of peak CRP, mg/L (IQR)	0.0217	154.7 (108.0–254.4)	262.7 (137.4–333.5)	144.6 (76.0–201.1)
Median of peak LDH, IU/L (IQR)	0.0003		723.0 (559.5–976.5)	418.0 (321.0–560.0)

(*continued on next page*)

Table 1 (*continued*)

Characteristics	p-value	All Patients (n = 129)	Patients who received invasive mechanical ventilation (n = 30)	Patients who did not require invasive mechanical ventilation (n = 99)
		493.0 (369.0–686.0)		
Median of peak ferritin, ng/mL (IQR)	0.0110	1379.0 (557.0–1908.0)	1602.0 (1131.0–3241.0)	1069.0 (494.0–1735.0)
Median of peak D-dimer, mg/L (FEU) (IQR)	<.0001	2.4 (1.0–4.4)	4.4 (4.4–4.4)	1.5 (0.7–3.3)
Positive blood cultures-n, (%)	<.0001	11 (12.4%)	11 (39.3%)	0 (0%)
Positive lower respiratory tract cultures-n, (%)	0.0014	11 (33.3%)	10 (58.8%)	1 (6.3%)
Medications				
Hydroxychloroquine-n, (%)	<.0001	83 (64.3%)	29 (96.7%)	54 (54.6%)
Steroids-n, (%)	<.0001	27 (20.9%)	23 (76.7%)	4 (4.0%)
IL-6 Inhibitor-n, (%)	<.0001	33 (25.6%)	23 (76.7%)	10 (10.1%)
Remdesivir-n, (%)	<.0001	15 (11.6%)	15 (50.0%)	0 (0%)
Full dose anticoagulation-n, (%)	<.0001	33 (25.6%)	23 (76.7%)	10 (10.1%)
Convalescent plasma-n, (%)	<.0001	13 (10.1%)	13 (43.3%)	0 (0%)
Outcomes				
ARDS-n, (%)	<.0001	42 (32.6%)	30 (100.0%)	12 (12.1%)
AKI-n, (%)	<.0001	29 (22.5%)	16 (53.3%)	13 (13.1%)
Suprainfection-n, (%)	<.0001	14 (10.9%)	13 (43.3%)	1 (1.0%)
Acute Cardiac Injury-n, (%)	<.0001	9 (7.0%)	8 (26.7%)	1 (1.0%)
Cardiac arrythmia-n, (%)	0.0844	8 (6.2%)	4 (13.3%)	4 (4.0%)
Septic shock-n, (%)	<.0001	19 (14.7%)	17 (56.7%)	2 (2.0%)
Thrombotic event-n, (%)	1.0000	6 (4.7%)	1 (3.3%)	5 (5.1%)
New onset of dialysis-n, (%)	0.1348	3 (2.3%)	2 (6.7%)	1 (1.0%)
Discharged-n, (%)	<.0001	95 (73.6%)	4 (13.3%)	91 (91.9%)
Died-n, (%)	0.0001	20 (15.5%)	12 (40.0%)	8 (8.1%)
Still in the hospital-n, (%)	<.0001	10 (7.8%)	10 (33.3%)	0 (0%)
Median duration from illness onset until death/ discharge or last follow up (IQR), days	<.0001	13.0 (8.0–20.0)	24.0 (19.0–34.0)	11.0 (8.0–16.0)
Median duration of hospital admission to ICU upgrade (IQR), days	0.0036	1.0 (0–2.0)	0.0 (0.0–2.0)	1.0 (1.0–2.0)

20.9% received moderate to high-intensity intravenous steroids. In addition, 13 patients received compassionate treatment with remdesivir, and 15 received convalescent plasma (CP). Our study found that hypoxemia (oxygen saturation<90%) on room air at admission was significantly associated with higher odds of mechanical ventilation [8]. Proposed pathophysiology for severe COVID-19 has included cytokine storm syndrome and multi-organ failure secondary to viremia [9]. The higher median values of inflammatory markers (ferritin, D-dimer, and IL-6) were observed in the patients who failed to be extubated or died, when compared with the patients who were successfully weaned. These are indicative of a severe hyper-inflammatory state. Of those patients who remained on the ventilator or died, 62.5% had septic shock requiring pressors, 58.3% had acute kidney injury (AKI), 45.8% had a secondary infection, and 33.3% had an acute cardiac injury [10]. Multivariable logistic regression analysis showed increased odds of intubation associated with hypoxemia (odds ratio 17.23, 95% CI 5.206–57.088; $p < 0.0001$), elevated d-dimer by one mg/L of FEU (OR 1.515, 95% CI 5.206–57.088; $p = 0.0430$) and elevated ferritin by one ng/ml (OR 1.001, 95% CI 1.000–1.001, $p = 0.0051$) on admission. Results of lung biopsies reported from Italy have shown platelet-fibrin thrombi in the context of coagulopathy in severe COVID-19. This information suggests that anticoagulation should be considered in COVID-19 patients who have an elevated D-dimer level at admission. Our study revealed that in future predictive models, data from our study can be used to help guide clinicians in the identification of those patients who have higher odds of intubation and those who may be weaned from the ventilator successfully. The major limitation of our study is that the data is from a single-center. In addition, there is lack of consistent guidelines for supportive treatment. There is also a small sample size of extubated patients. The retrospective study design resulted in missing laboratory findings. Studies with larger sample sizes and complete follow up will better characterize the course of successful extubation and further validate the clinical impact of our clinical findings.

6. Conclusions

Patients who required invasive mechanical ventilation were more likely to be older, male, obese and have, coronary artery disease, and diabetes. Our study revealed that elevated levels of D-dimer, ferritin and hypoxemia (oxygen saturation <90%) at admission are associated with increased odds of ventilator-dependent acute hypoxic respiratory failure in (VDAHRF) in COVID-19 patients. The patients who were successfully weaned from the ventilator were more likely to be younger in age (median age 48.5 years; IQR 41.0–57.0), and none of them had heart failure or CAD.

Funding

None.

Declaration of competing interest

The authors declare that they have no known competing interests.

CRediT authorship contribution statement

Mohsin Sheraz Mughal: Conceptualization, Methodology, Data curation, Writing - original draft, Writing - review & editing, Formal analysis, Analysis, Writing-review & share first authorship, had full access to all the data in the study and take responsibility for the integrity of the data. **Ikwinder Preet Kaur:** Conceptualization, Methodology, Data curation, Writing - original draft, Analysis, Writing-review & share first authorship, had full access to all the data in the study and take responsibility for the integrity of the data. **Ali R. Jaffery:** Investigation, Data curation, Formal analysis, Writing - review & editing. **Denise L. Dalmacion:** Investigation, Data curation, Formal analysis, Writing - review & editing. **Chang Wang:** Statistical analysis. . **Sai Koyoda:** Data curation. **Violet E. Kramer:** Writing - review & editing, Review &

Table 2
Characteristics of mechanically ventilated COVID-19 patients.

Characteristics	p-value	Mechanically ventilated patients (n = 30)	Patients who were weaned from the ventilator successfully (n = 6)	Patients who failed to be extubated (n = 24)
Demographic				
Median age (IQR)- years	0.0071	65.5 (57.0–71.0)	48.5 (41.0–57)	68.5 (62.5–72.0)
Males-n, (%)	0.5526	25 (83.3%)	6 (100%)	19 (79.2%)
Caucasian-n, (%)	0.1961	13 (43.3%)	1 (16.7%)	12 (50.0%)
Comorbidities				
Heart failure-n, (%)	1.0000	2 (6.7%)	0 (0%)	2 (8.3%)
HTN-n, (%)	1.0000	14 (46.7%)	3 (50.0%)	11 (45.8%)
CAD-n, (%)	0.5569	4 (13.3%)	0 (0%)	4 (16.7%)
DM-n, (%)	0.3717	11 (36.7%)	1 (16.7%)	10 (41.7%)
COPD-n, (%)	1.0000	3 (10.0%)	0 (0%)	3 (12.5%)
Obesity-n, (%)	0.3003	8 (26.7%)	3 (50.0%)	5 (20.8%)
OSA-n, (%)	0.3655	2 (6.7%)	1 (16.7%)	1 (4.2%)
Asthma-n, (%)	0.3655	2 (6.7%)	1 (16.7%)	1 (4.2%)
CKD-n, (%)	1.0000	3 (10.0%)	0 (0%)	3 (12.5%)
Presentation				
Median duration of symptoms before being admitted to hospital (IQR), days	0.3471	6.0 (3.0–10.0)	5.0 (3.0–7.0%)	6.0 (3.0–11.0)
Fever-n, (%)	0.5526	25 (83.3%)	6 (100.0%)	19 (79.2%)
Dry cough-n, (%)	0.3778	16 (53.3%)	2 (33.3%)	14 (58.3%)
Productive cough/expectoration-n, (%)	1.0000	5 (16.7%)	1 (16.7%)	4 (16.7%)
Dyspnea-n, (%)	0.6371	21 (70.0%)	5 (83.3%)	16 (66.7%)
Generalized weakness/malaise-n, (%)	0.6567	14 (46.7%)	2 (33.3%)	12 (50.0%)
Nausea-n, (%)	1.0000	2 (6.7%)	0 (0%)	2 (8.3%)
Vomiting-n, (%)	–	0 (0%)	0 (0%)	0 (0%)
Diarrhea-n, (%)	1.0000	8 (26.7%)	1 (16.7%)	7 (29.2%)
Poor appetite-n, (%)	1.0000	5 (16.7%)	1 (16.7%)	4 (16.7%)
Sore throat-n, (%)	1.0000	5 (16.7%)	1 (16.7%)	4 (16.7%)
Headache-n, (%)	0.2901	7 (23.3%)	0 (0%)	7 (29.2%)
Anosmia-n, (%)	1.0000	2 (6.7%)	0 (0%)	2 (8.3%)
Altered Mental Status-n, (%)	1.0000	2 (6.7%)	0 (0%)	2 (8.3%)
Medications				
On ACE-I-n, (%)	1.0000	3 (10.0%)	0 (0%)	3 (12.5%)
On ARB-n, (%)	1.0000	5 (16.7%)	1 (16.7%)	4 (16.7%)
Admission				
Median SBP (IQR), mmHg	0.3529	122.0 (107.0–139.0)	117.0 (100.0–136.0)	123.0 (109.0–141.0)
Median DBP (IQR), mmHg	1.0000	71.5 (64.0–88.0)	69.5 (60.0–90.0)	71.5 (64.0–87.5)
RR > 20/minute-n, (%)	1.0000	25 (83.3%)	5 (83.3%)	20 (83.3%)
O2 sat (w/o supplemental O2) <90%-n, (%)	0.3021	24 (80.0%)	6 (100.0%)	18 (75.0%)
Bilateral infiltrates on chest x-ray-n, (%)	0.5569	26 (86.7%)	6 (100.0%)	20 (83.3%)
Bilateral infiltrates on computerized tomography scan-n, (%)	–	2 (100.0%)	0 (0%)	2 (100.0%)
Laboratory data at admission (within 24 hours of hospitalization)				
Median WBC count, K/CMM (IQR)	0.0726	9.0 (6.4–11.7)	10.2 (9.3–14.1)	8.4 (5.8–11.2)
WBC <4.5, K/CMM-n, (%)	0.5569	4 (13.3)	0 (0)	4 (16.7)
Lymphocyte <1%-n, (%)	0.3287	21 (70.0)	3 (50.0)	18 (75.0)
Median platelet count, K/CMM (IQR)	0.0071	175.0 (142.0–251.0)	260.5 (191.0–282.0)	170.0 (122.5–221.5)
Platelet <140, K/CMM-n, (%)	0.2901	7 (23.3)	0 (0)	7 (29.2)
Median CRP, mg/L (IQR)	0.9257	197.0 (119.2–283.2)	209.7 (124.2–385.6)	197.0 (116.0–283.2)
Median LDH, IU/L (IQR)	1.0000	540.5 (414.5–805.0)	558.5 (416.0–655.0)	540.5 (413.0–879.0)
Median Ferritin, ng/mL (IQR)	0.0704	1414.0 (559.0–2603.5)	756.0 (390.0–1337.0)	1605.5 (651.0–2910.0)
Median IL-6, pg/mL (IQR)	0.0118	148.8 (52.4–1642.0)	40.6 (30.0–108.4)	334.6 (107.5–3130.8)
Median D- dimer, mg/L of fibrinogen equivalent units (IQR)	0.1894	1.7 (0.9–4.4)	0.8 (0.7–1.7)	2.3 (1.0–4.4)
Median HbA1C, mmol/L (IQR)	0.5127	6.2 (5.8–6.9)	6.9 (6.1–11.6)	5.9 (2.0–6.5)
Hospital course				
Median SOFA score on ICU admission (IQR)	0.3053	6.0 (4.0–7.0)	4.5 (4.0–6.0)	6.0 (4.0–7.0)
Median of peak CRP, mg/L (IQR)	0.3657	262.7 (137.4–333.5)	211.8 (141.2–536.5)	286.6 (108.0–328.0)
Median of peak LDH, IU/L (IQR)	1.0000	723.0 (559.5–976.5)	780.5 (582.0–1084.0)	723.0 (537.0–925.0)
Median of peak Ferritin, ng/mL (IQR)	0.4190	1602.0 (1131.0–3241.0)	1452.0 (408–1822)	1609.0 (1240–3846.0)
Median of peak D-dimer, mg/L of fibrinogen equivalent units (IQR)	0.0539	4.4 (4.4–4.4)	4.4 (3.2–4.4)	4.4 (4.4–4.4)
Positive blood cultures-n, (%)	1.0000	11 (39.3%)	2 (40.0%)	9 (39.1%)
Positive lower respiratory tract cultures-n, (%)	0.4853	10 (58.8%)	2 (100.0%)	8 (53.3%)
Medications				
HCQ-n, (%)	1.0000	29 (96.7%)	6 (100.0%)	23 (95.8)

(*continued on next page*)

Table 2 (*continued*)

Characteristics	p-value	Mechanically ventilated patients (n = 30)	Patients who were weaned from the ventilator successfully (n = 6)	Patients who failed to be extubated (n = 24)
Steroids-n, (%)	1.0000	23 (76.7%)	5 (83.3%)	18 (75.0)
IL-6 Inhibitor-n, (%)	0.2901	23 (76.7%)	6 (100.0%)	17 (70.8%)
Remdesivir-n, (%)	1.0000	15 (50.0%)	3 (50.0%)	12 (50.0%)
Full dose anticoagulation-n, (%)	0.2901	23 (76.7%)	6 (100.0%)	17 (70.8%)
Convalescent plasma-n, (%)	0.6725	13 (43.3%)	2 (33.3%)	11 (45.8%)
IL-6 inhibitor administered before intubation-n, (%)	0.3808	12 (40.0%)	3 (50.0%)	9 (37.5)
Outcomes				
ARDS-n, (%)	–	30 (100.0%)	6 (100.0%)	24 (100.0%)
Severity of ARDS (mild)-n, (%)	0.5569	4 (13.3%)	0 (0%)	4 (16.7%)
Severity of ARDS (moderate)-n, (%)	0.3003	8 (26.7%)	3 (50.0%)	5 (20.8%)
Severity of ARDS (severe)-n, (%)	0.6599	18 (60.0%)	3 (50.0%)	15 (62.5%)
AKI-n, (%)	0.3778	16 (53.3%)	2 (33.3%)	14 (58.3%)
Suprainfection-n, (%)	0.6725	13 (43.3%)	2 (33.3%)	11 (45.8%)
Acute Cardiac Injury-n, (%)	0.1550	8 (26.7%)	0 (0%)	8 (33.3%)
Cardiac arrhythmia-n, (%)	0.5569	4 (13.3%)	0 (0%)	4 (16.7%)
Septic shock-n, (%)	0.3598	17 (56.7%)	2 (33.3%)	15 (62.5%)
Thrombotic event-n, (%)	1.0000	1 (3.3%)	0 (0%)	1 (4.2%)
New onset of dialysis-n, (%)	1.0000	2 (6.7%)	0 (0%)	2 (8.3%)
Discharged-n, (%)	0.0005	4 (13.3%)	4 (66.7%)	0 (0%)
Died-n, (%)	0.0568	12 (40.0%)	0 (0%)	12 (50.0%)
Still in the hospital-n, (%)	1.0000	10 (33.3%)	2 (33.3%)	8 (33.3%)
Median duration from Illness onset until death/ discharge or last follow-up (IQR), days	0.6423	24.0 (19.0–34.0)	22.5 (20.0–34.0)	27.0 (18.0–34.5)
Median length of ICU stay, (IQR), days	0.3694	15.5 (10.0–24.0)	14.5 (10.0–17.0)	16.5 (10.0–25.0)
Median duration of hospital admission to ICU upgrade, (IQR), days	0.7400	1.0 (1.0–2.0)	1.0 (1.0–2.0)	1.0 (1.0–2.0)

editing. **Chandler D. Patton:** Writing - review & editing, Review & editing. **Sharon Weiner:** Writing - review & editing, Review & editing. **Margaret H. Eng:** Writing - review & editing, Review & editing. **Kenneth M. Granet:** Project administration, Supervision, Validation, had full access to all the data in the study and take responsibility for the integrity of the data.

Acknowledgments

We thank Dr. Jason Roy Ph.D. (Department of Biostatistics and Epidemiology, Rutgers University, New Jersey) for statistical analysis; Anthony Ricca, MD for helping with the manuscript revision; Joseph Jaeger DrPH for administrative support; Richard Eng and Nicole Keegan DNP, APN for their assistance.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rmed.2020.106130.

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