Characteristics, Comorbidities, Complications, and Outcomes Among 802 Patients With Severe Acute Respiratory Syndrome Coronavirus 2 in a Community Hospital in Florida

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OBJECTIVES: Coronavirus disease 2019 continues to increase throughout the United States. Despite the rapid progression of the disease, there is limited information of the factors associated with mortality in Florida. This study aims to review the demographics, characteristics, comorbidities, complications, and outcomes of hospitalized patients, and their association with mortality.

DESIGN: Cohort study.

SETTING: A community-based tertiary-care hospital of Orlando Health, Orlando Regional Medical Center.

PATIENTS/SUBJECTS: Data of hospitalized patients who tested positive for severe acute respiratory syndrome coronavirus 2 between March 1, 2020, and August 31, 2020, at the Orlando Regional Medical Center.

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: Main data assessed included patient demographics, clinical characteristics, comorbidities, complications, outcomes, and inhospital mortality. The median age for hospitalized patients was 61 years; among them, 56% were males. Most were of African American ($n = 288$, 35.9%), Hispanic ($n = 237$, 29.6%), and Caucasian ($n = 217$, 27.1%) descent. More patients presented with symptoms developing at home ($n = 589$, 75.9%) than from skilled nursing and long-term acute care facilities. The most common comorbidities were diabetes mellitus (42.8%), obesity (39.2%), lung disease (23.3%), coronary artery disease (20.2%), and congestive heart failure (18.3%). Complications with higher odds of mortality were mechanical ventilation (odds ratio, 148.00, $p < 0.001$), coinfections (odds ratio, 56.42, $p < 0.001$), acute kidney injury (odds ratio, 84.01, $p < 0.001$), atrial fibrillation (odds ratio, 28.30, $p < 0.001$), acute myocardial infarction (odds ratio, 23.29, $p < 0.001$), and acute venous thromboembolism (odds ratio, 26.43, $p < 0.001$).

CONCLUSIONS: We identified an increase of severity of coronavirus disease 2019 within older patients of African American and Hispanic descent with comorbidities such as diabetes, coronary artery disease, congestive heart failure, chronic kidney disease, cancer, liver disease, or cerebrovascular disease. Noninvasive positive-pressure ventilation and high-flow nasal cannula oxygen may have helped avert mechanical ventilation, and this may have improved patient outcomes over the course of the study period.

The first cases of severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) infection were documented in Wuhan, China, on December 31, 2019. Facilitated by international air travel, the novel virus spread to Europe, Africa, Asia, and North America, establishing a global pandemic, which quickly led to a scarcity of medical equipment and overburdened medical services. The first confirmed case of coronavirus disease 2019 (COVID-19) in the United States was reported in the state of Washington on January 31, 2020. On March 1, 2020, Florida reported the first case of COVID-19, and Governor DeSantis signed an executive order to declare a public health emergency in Florida. The World Health Organization declared COVID-19 a pandemic on March 11. The following day, on March 12, the greater Orlando area diagnosed its first patient with COVID-19. As it spread rapidly in the Northeast, New York became the first epicenter in the United States in April 2020. Florida saw a gradual increase in the number of patients, but there was a significant spike in June and July that led to what was described as the second epicenter in the United States. During this peak, Florida saw as many as 15,000 new cases/d. As of September 30, 2020, Florida reported more than 700,000 positive cases of COVID-19 and more than 14,000 deaths (1–6).

Previous case series have reported information on hospitalized patients with COVID-19 in China, Italy, France, and the United States. However, limited information is available on the demographics, characteristics, comorbidities, complications, and outcomes of patients requiring hospitalization in the second epicenter in Florida because many hospitalized COVID-19 patients were still undergoing active treatment, and there was no consensus on management (7–10). This study reviewed the demographics, characteristics, complications, and outcomes of hospitalized COVID-19 patients at a single community hospital in Orlando, Florida.

MATERIALS AND METHODS

This cohort study was conducted at Orlando Regional Medical Center (ORMC), the flagship academic community-based tertiary-care hospital of Orlando Health.

ORMC is an 808-bed level-one trauma center situated in Orange County, Orlando, Florida. Only patients who tested positive for SARS CoV-2 between March 1, 2020, and August 31, 2020, were included in the study (**Fig. 1**). A SARS CoV-2-positive test result was defined as positive results on a quantitative test using the Roche reverse transcriptase-polymerase chain reaction test (Cobas 6800 system F. Hoffmann-La Roche, Basel, Switzerland), rapid molecular ID NOW COVID-19 test (Abbott Laboratories, Abbott Park, IL), or SARS CoV-2 RNA assay (Mayo Clinic Laboratories, Jacksonville, FL) of a nasopharyngeal swab collected by trained nurses from patients who presented to ORMC. Each hospital admission was a clinical decision based on a combination of history, comorbidities, presentation, laboratory findings, and imaging. Those whose clinical presentation suggested inpatient clinical management for supportive medical care were admitted to the hospital under appropriate isolation precautions.

This study was conducted according to the Orlando Health Institutional Review Board (IRB) guidelines with approval obtained on September 16, 2020 (IRB No. 20.154.09) under exempt status. Research was determined to be "exempt" if it was no more than "minimal risk" to the IRB and fit one of the six federally designated exempt review categories. In our case, informed consent was waived as our research involved the collection or study of existing data, documents, records, pathologic specimens, or diagnostic specimens with the information recorded in such a manner that subjects could not be identified, directly or through identifiers linked to the subjects.

DATA COLLECTION

Data were collected (**Supplemental Digital Citation of Main Data**, http://links.lww.com/CCX/A600) from patient electronic medical records (Sunrise Clinical Manager Version 16.3, AllScripts Healthcare Solutions, Chicago, IL). Data variables were obtained by means of a comprehensive manual chart review by the authors. Data on demographics, therapies used (steroids, remdesivir, and convalescent plasma), complications (new-onset organ dysfunction, need for intubation, mechanical ventilation, ICU admission, and need for renal-replacement therapy for acute kidney injury), and outcomes (length of stay and discharge disposition) were collected for all hospitalized patients included in
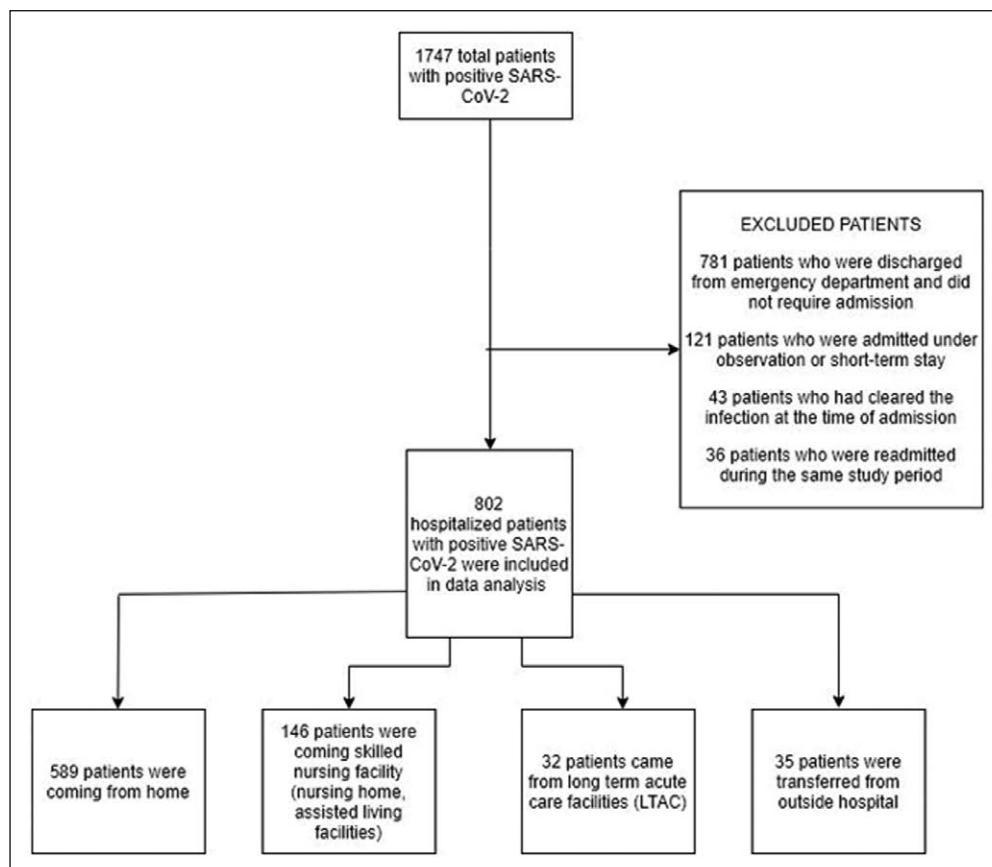
Figure 1. Flow diagram of positive tests advancing to admission with coronavirus disease 2019. Inclusion and exclusion groups, and prior-to-admission location. LTAC = long-term acute care, SARS CoV-2 = severe acute respiratory syndrome coronavirus 2.

the study and used to determine the disease burden among hospitalized patients. Demographics and comorbidity data were obtained from the index admission record. For readmitted patients, only the first admission was considered. Once data collection was completed, all personally identifying information was removed from the final dataset prior to statistical analysis.

Interrater agreement was conducted by five physicians who performed all data collection. These physicians were members of the original study team and were not blinded. A consensus was achieved on each case. If a consensus was not reached the first time, an independent physician cross-checked the charts to ensure an agreement was reached and to maintain accuracy. Obesity was defined as a body mass index (BMI) greater than 30 kg/m², acute kidney injury was defined as an increase in serum creatinine by greater than or equal to 0.3 mg/dL within 48 hours, or an increase in serum creatinine to greater than or equal to 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days. End-stage renal disease

(ESRD) was defined as an irreversible, severe decline in kidney function enough to be fatal in the absence of dialysis or transplantation.

Descriptive statistics were calculated for the majority of demographic, characteristic, comorbidity, complication, and outcome data. All analyses were performed using statistical computing of Microsoft Excel (Redmond, WA) and SPSS software V27.0 (Chicago, IL). Pearson's chi-square test was used to compare categorical variables, and the proportion t test was used to compare continuous variables. Statistical significance was determined by two-sided p value of less than 0.05.

RESULTS

Data analysis was performed on 802 consecutive patients who tested positive for SARS CoV-2 and were hospitalized. Between March 1, 2020 and August 31, 2020, a total of 1,747 patients tested positive for SARS CoV-2, as illustrated in Figure 1. Of these, 781 (44.7%) patients were stable enough to be discharged from the emergency department, 121 (6.9%) were admitted under observation/short stay status, 43 (2.5%) were free of infection at the time of admission, and 36 (2%) needed readmission during the same time frame. The median age of patients discharged from the emergency department was 37 years (interquartile range [IQR], 28–50 yr), and the median age for patients admitted was 61 years (IQR, 47–73 yr). The median age was higher among nonsurvivors (73; IQR, 61–84) than among survivors (61; IQR, 47–73). Fifty-six percent (n = 451) of our patients were males. Most patients were African Americans (n = 288, 35.9%), Hispanics (n = 237, 29.6%), and Caucasians (n = 217, 27.1%). More patients presented with symptoms developing at home

(n = 589, 75.9%) than from skilled nursing and long-term acute care facilities. Complete data were obtained for 802 patients (45.9%) admitted to the hospital with baseline characteristics shown in **Table 1**.

The most common comorbidities were diabetes mellitus (42.8%), obesity (39.2%), lung disease (23.3%), coronary artery disease (20.2%), and congestive heart failure (18.3%). The least common comorbidities were HIV/AIDS (1.9%), liver disease (3.5%), organ transplantation (0.5%), and ESRD (2.9%). The odds of mortality were 14.74 times greater for patients with chronic kidney disease versus no chronic kidney disease ($p < 0.001$). The odds of mortality was 3.85 times greater for diabetes mellitus ($p < 0.05$), 6.76 times greater for coronary artery disease ($p = 0.007$), 3.91 times greater for congestive heart failure ($p = 0.040$), 5.10 times greater for cancer ($p = 0.017$), 4.95 times

greater for cerebrovascular disease ($p = 0.019$), and 6.82 times greater for liver disease ($p = 0.003$). More patients reported they had never smoked (73.4%), whereas 3.7% of patients had no smoking status listed at the time of admission.

Our hospital admitted fewer patients in March, April, and May (19, 32, and 23 patients, respectively) than in June, July, and August (181, 378, and 169 patients, respectively), consistent with the first peak in Florida in July 2020. The highest inhospital all-cause mortality was 15.2% in March 2020, and the lowest was 10.5% in June 2020. **Table 2** shows the number of admissions and mortality rate each month during the 6-month study period at ORMC.

As of September 30, 2020, discharge disposition (**Fig. 2**) was available for 799 patients (99.6%), with three patients still being treated in the hospital. A total

TABLE 1.
Baseline Characteristics

Categories	Survivors, n (%)	Nonsurvivors, n (%)	Total, n (%)	OR	p
Total number of admissions	696 (86.8)	106 (13.2)	802 (100)		
Age, median (interquartile range) (range)	61 (47–73) (17–97)	73 (61–84) (24–94)	61 (47–73) (17–97)		<0.001
Gender					
Female	312 (44.8)	39 (36.8)	351 (43.7)	2.059	0.154
Male	384 (55.2)	67 (63.2)	451 (56.2)		
Race/ethnicity					
African American	252 (36.2)	36 (34.0)	288 (35.9)	7.092	0.042
Caucasian	188 (27)	29 (27.4)	217 (27.1)		
Hispanic	211 (30.3)	26 (24.5)	237 (29.6)		
Other/unknown	45 (6.5)	15 (14.1)	60 (7.5)		
Place of origin prior to admission					
Home	528 (75.9)	61 (57.5)	589 (73.4)	17.303	<0.001
Skilled nursing facilities/acute living facilities (nursing home, assisted living)	120 (17.2)	26 (24.5)	146 (18.2)		
Long-term acute care	22 (3.2)	10 (9.4)	32 (4.0)		
Transfer from outside hospital	26 (3.7)	9 (8.5)	35 (4.4)		

(*Continued*)

TABLE 1. (*Continued*).
Baseline Characteristics

Categories	Survivors, n (%)	Nonsurvivors, n (%)	Total, n (%)	OR	p
Comorbidities					
Atrial fibrillation	65 (9.3)	14 (13.2)	79 (9.9)	1.446	0.212
Cancer	75 (10.8)	19 (17.9)	94 (11.7)	5.103	0.017
Cerebrovascular disease	87 (12.5)	21 (19.8)	108 (13.5)	4.953	0.019
Chronic kidney disease	86 (12.4)	28 (26.4)	114 (14.2)	14.742	<0.001
End-stage renal disease	20 (2.9)	3 (2.8)	23 (2.9)		
Congestive heart failure	121 (17.4)	26 (24.5)	147 (18.3)	3.907	0.040
Coronary artery disease	131 (18.8)	31 (29.2)	162 (20.2)	6.759	0.007
Deep venous thrombosis	34 (4.9)	7 (6.6)	41 (5.1)	0.477	0.475
Diabetes	288 (41.4)	55 (51.9)	343 (42.8)	3.851	0.049
HIV-AIDS	13 (1.9)	2 (1.9)	15 (1.9)	0	0.996
History of being on anticoagulation	81 (11.6)	14 (13.2)	95 (11.8)	0.168	0.678
Immunosuppression	50 (7.2)	12 (11.3)	62 (7.7)	2.963	0.067
Liver disease (cirrhosis, hepatitis)	19 (2.7)	9 (8.5)	28 (3.5)	6.817	0.003
Chronic respiratory illness (chronic obstructive pulmonary disease, asthma, sleep apnea)	162 (23.3)	25 (23.6)	187 (23.3)	0.076	0.783
Obesity (BMI ≥ 30)	285 (40.9)	29 (27.4)	314 (39.2)		<0.001
Class II obesity (BMI ≥ 35)	156 (22.4)	12 (11.3)	168 (20.9)		
BMI data unavailable	16 (2.3)	75 (70.8)	91 (11.3)		
Organ transplant	4 (0.6)	0 (0)	4 (0.5)	1.152	0.431
Peripheral vascular disease	28 (4.0)	4 (3.8)	32 (4)	0.006	0.937
Pulmonary embolism	26 (3.7)	6 (5.7)	32 (4)	0.756	0.362
>2 comorbidities	193 (27.7)	47 (44.3)	240 (29.9)		
Smoking status					
Never smoked	508 (73.0)	81 (76.4)	589 (73.4)	1.223	0.766
Former smoker	98 (14.1)	15 (14.2)	113 (14.1)		
Active smoker	63 (9.1)	7 (6.6)	70 (8.7)		
Smoking status unavailable	27 (3.9)	3 (2.8)	30 (3.7)		

BMI = body mass index, OR = odds ratio.

of 696 patients (86.8%) survived to hospital discharge, and 106 patients (13.2%) died from all causes in the hospital over the study period. Most patients admitted had COVID-19 disease and tested positive (*n* = 563, 70.2%), whereas the rest were admitted for non-COVID-19 reasons but tested positive for SARS CoV-2

TABLE 2.
Admissions/Mortality Data

Months of year 2020	March	April	May	June	July	August	Total
Total number of admissions	19	32	23	181	378	169	802
All-cause inhospital mortality	15.8%	12.5%	13.0%	10.5%	14.0%	14.2%	13.2%
Number of COVID-19 disease admissions	19	27	19	138	263	97	563
COVID-19 disease mortality as %	15.8%	14.8%	15.8%	12.3%	18.6%	18.6%	16.7%
Number of SARS CoV-2 RNA + (but no COVID-19 illness) admissions	0	5	4	43	115	72	239
SARS CoV-2 RNA + (but no COVID-19 disease) mortality as %	0%	0%	0%	4.7%	3.5%	8.3%	5.0%
Remdesivir, n (%)	0 (0)	0 (0)	10 (43.5)	68 (37.6)	89 (23.5)	40 (23.7)	207 (25.8)
Steroids, n (%)	2 (10.5)	2 (6.2)	4 (17.4)	59 (32.6)	164 (43.4)	64 (37.9)	295 (36.8)

COVID-19 = coronavirus disease 2019, SARS CoV-2 = severe acute respiratory syndrome coronavirus 2.

after incidental testing ($n = 239$, 29.8%). We also listed the use of remdesivir and steroids during these months. After the publication of new therapeutic trials, our utilization of remdesivir and steroids increased over the study period (10–15). **Figure 3** displays the mortality by age group. The highest mortality was seen in patients greater than or equal to 81 years. As age increased, there was a higher percentage of mortality. Specifically, mortality was higher in the patients admitted with primary respiratory COVID-19 symptoms ($n = 81$, 17.8%) than in patients with nonrespiratory symptoms ($n = 26$, 7.5%).

Table 3 shows the length of stay data and complications during hospitalization. The median length of stay was 5.8 days for survivors versus 9.7 days for nonsurvivors prior to death. The most common complications that developed during hospitalization included coinfection (26.3%), acute kidney injury (24.8%), myocardial infarction (12.8%), mechanical ventilation (12.5%), atrial fibrillation (7.1%), newly diagnosed venous thromboembolism (6.0%), and cerebrovascular accidents (4.5%). Among the deceased, the most prevalent complications were coinfections (50.9%), acute kidney injury (46.2%), myocardial infarction (28.3%), atrial fibrillation (21.7%), venous thromboembolism (16.0%), and pneumothorax/pneumomediastinum (15.1%). Mechanical ventilation (55.7%) was the most common risk factor for complications.

Acute kidney injury occurred as a complication in 199 (24.8%) COVID-19 patients. Forty-nine patients (46.2%) who died and 150 (21.6%) who survived were diagnosed with acute kidney injury. In addition, 24 patients required renal-replacement therapy during their hospitalization, of whom 17 died. Our sample consisted of 169 patients (21.1%) who were admitted to the ICU. Here, 100 (12.5%) were on mechanical ventilation, 107 (13.3%) on high-flow nasal oxygen, and 73 (9.1%) on noninvasive positive-pressure ventilation. Many of these patients were placed on overlapping oxygen therapies if needed during the hospitalization course, such that they could have been on high-flow nasal oxygen, noninvasive positive-pressure ventilation, and then on mechanical ventilation during the admission. Of the 106 deceased patients, 59 (55.7%) were on mechanical ventilation. The odds of mortality were 148 times increased for patients on mechanical ventilation ($p < 0.001$) versus those not on mechanical ventilation. Other complications associated with higher odds of mortality were coinfections (odds ratio [OR], 56.42; $p < 0.001$), new acute kidney injury (OR, 84.01; $p < 0.001$), new atrial fibrillation (OR, 28.30; $p < 0.001$), acute myocardial infarction (OR, 23.29; $p < 0.001$), and acute venous thromboembolism (OR, 26.43; $p < 0.001$). The most commonly used medical management was steroids (36.8%), remdesivir (25.8%), convalescent plasma (10.0%), tocilizumab (5.5%), and hydroxychloroquine (4.2%). Anticoagulation dosing regimens varied in our sample with full therapeutic dosing (20.2%), prophylactic dosing (65.3%), and partial anticoagulation (7.4%) regimens.
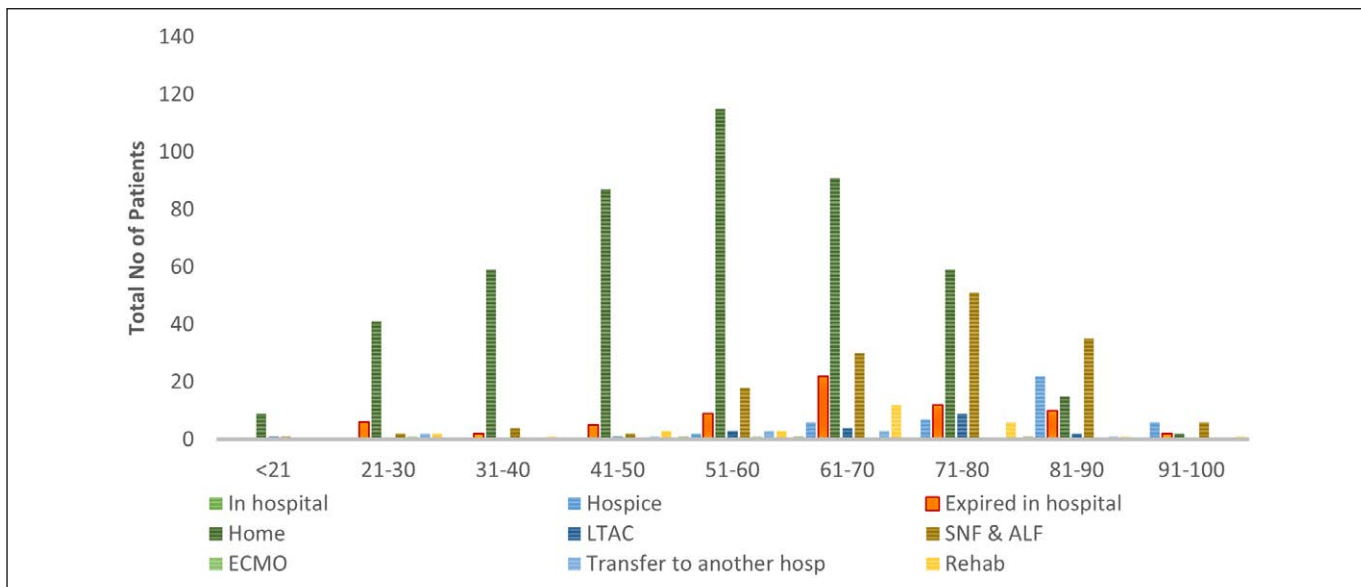
Figure 2. Discharge disposition by age group. The majority of patients were discharged to their homes in most age groups under 81–90 yr. As age increased, patients were discharged to skilled nursing facilities (SNF), acute living facilities (ALF), and long-term acute care (LTAC) facilities. ECMO = extracorporeal membrane oxygenation.
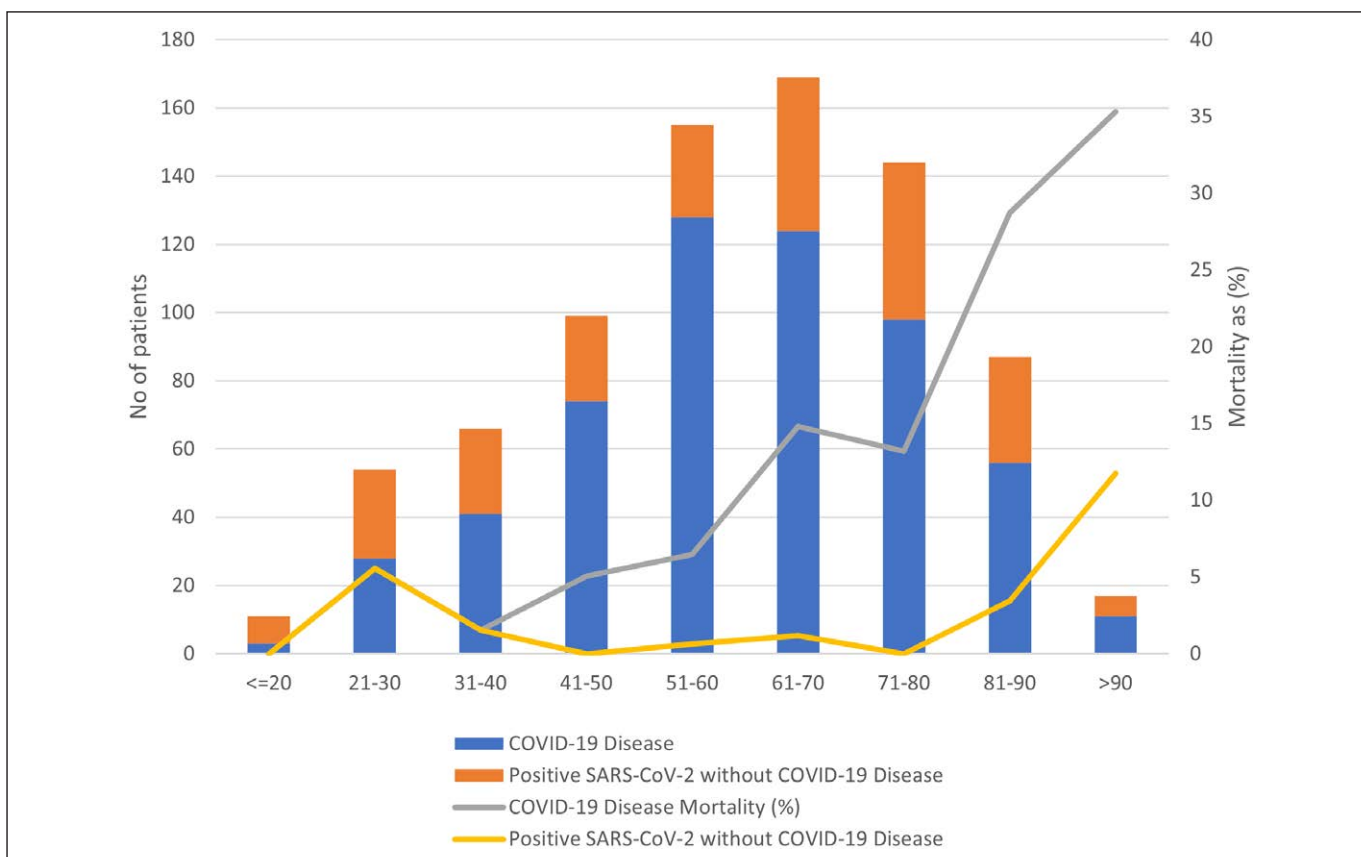

Figure 3. Coronavirus disease 2019 (COVID-19) admissions and mortality by age deciles. As age increased, the number of hospitalized COVID-19 patients and the percentage of mortality increased. Low mortality was discovered in hospitalized patients who tested positive with severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) RNA testing but were without COVID-19 disease (asymptomatic carriers).

TABLE 3.
Length of Stay and Complications

Categories	Survivors, n (%)	Nonsurvivors, n (%)	Total, n (%)	OR	p
Total number of admissions	696 (86.8)	106 (13.2)	802 (100)		
Complications					
AKI	150 (21.6)	49 (46.2)	199 (24.8)	84.007	<0.001
AKI needing renal replacement therapy	7 (1.0)	17 (16.0)	24 (3)		
End-stage renal disease at baseline	20 (2.9)	3 (2.8)	23 (2.9)		
Atrial fibrillation	34 (4.9)	23 (21.7)	57 (7.1)	28.300	<0.001
Cerebrovascular accident	27 (3.9)	9 (8.5)	36 (4.5)	4.674	0.070
Myocardial infarction	73 (10.5)	30 (28.3)	103 (12.8)	23.285	<0.001
Venous thromboembolism (pulmonary embolism or deep venous thrombosis)	31 (4.5)	17 (16.0)	48 (6)	26.434	<0.001
Pneumothorax or pneumomediastinum	16 (2.3)	16 (15.1)	32 (4)	2.869	0.057
Coinfections	157 (22.6)	54 (50.9)	211 (26.3)	56.422	<0.001
Respiratory therapy					
Intensive care admission	98 (14.1)	71 (67.0)	169 (21.1)	125.438	<0.001
Mechanical ventilation	41 (5.9)	59 (55.7)	100 (12.5)	148.308	<0.001
Prone positioning	22 (3.2)	23 (21.7)	45 (5.6)		
Use of high-flow nasal oxygen	55 (7.9)	52 (49.1)	107 (13.3)		
Use of noninvasive positive-pressure ventilation	42 (6.0)	31 (29.2)	73 (9.1)		
Medical management given					
Steroids	223 (32.0)	73 (68.9)	295 (36.8)	53.797	<0.001
Remdesivir	155 (22.3)	52 (49.1)	207 (25.8)	30.259	<0.001
Convalescent plasma	49 (7.0)	31 (29.2)	80 (10.0)	37.253	<0.001
Tocilizumab	25 (3.6)	18 (17.0)	44 (5.5)	25.491	<0.001
Hydroxychloroquine	6 (0.9)	28 (26.4)	34 (4.2)	0.518	0.455
Anticoagulation				30.697	<0.001
Therapeutic dosing	120 (17.2)	42 (39.6)	162 (20.2)		
Prophylactic dosing	478 (68.7)	46 (43.4)	524 (65.3)		
Partial anticoagulation (half of therapeutic dosing)	45 (6.5)	12 (11.3)	57 (7.1)		
Not on therapeutic or prophylactic dosing	53 (7.6)	6 (5.7)	59 (7.4)		
Length of stay, d, median (interquartile range)	5.8 (3–11.5)	9.7 (4.5–16.3)	6 (3–12.2)		<0.001

AKI = acute kidney injury, OR = odds ratio.

DISCUSSION

We performed a MEDLINE search of the English language from January 1, 2020, to January 1, 2021, using the keywords "COVID-19," or "coronavirus," or "SARs CoV-2,"or "SARs CoV2," and "Orlando, Florida." We found multiple studies on COVID-19; however, there were no epidemiological studies on hospitalized patients with confirmed COVID-19 in Orlando, Florida. Older patients, male patients, and those with preexisting diabetes mellitus, obesity, and chronic lung diseases were highly prevalent in this study. In addition, we had a high proportion of African American (35.9%) and Hispanic (29.6%) patients who tested positive for SARS CoV-2 in our study. We compared our results with the 2019 census population of Orlando. Orlando has a population of 1,393,452 people with a median age of 35.6 years, and 18% of the population are above 60 years, with a 51% female population. We recorded a higher median age, a greater proportion above 60 years old, and a high percentage of males than recorded in the 2019 census data of Orlando, suggesting that elderly males are more prone to COVID-19 hospitalization. The population of Orange County is 39% Caucasian, 20% African American, and 33% Hispanic (16).

Interestingly, we had a higher proportion of African Americans in our sample than the general population in the greater Orlando area, suggesting that African Americans may contract the virus in ways other racial groups do not (11). This may be explained by low socioeconomic status, poor healthcare access, and disease disparities. Another factor that may explain the higher disease infectivity and worse outcomes could be a higher prevalence of concomitant comorbidities in African Americans such as hypertension, diabetes, obesity, and cardiovascular disease.

The most significant complications in our study were coinfections, new acute kidney injury, new atrial fibrillation, acute myocardial infarction, and acute venous thromboembolism. Mechanical ventilation was the most common factor of risk for complications. The low mortality rate might be due to the increased use of noninvasive positive-pressure ventilation, high-flow nasal oxygen, and therapeutic agents, and the improved management of patients with confirmed COVID-19 disease. This may have been supported by a lower mortality percentage in June 2020 than that in March 2020. In contrast, the months of July and August had higher COVID-19 mortality than March. This could be due to Florida having its first peak surge in COVID-19 admissions during these 2 months with 263 and 97 COVID-19 disease admissions in July and August, respectively. This was confirmed by the higher COVID-19 admissions during the months of July and August than all the other months in the study period. Surprisingly, all-cause inhospital mortality was highest in March at 15.8%. We identified higher mortality rates in those who suffered inhospital complications and those on mechanical ventilation. This study only reported mortality rates for patients with definitive outcomes (discharge or death) by the study end point. Long-term studies may determine different mortality rates depending on hospital type, patient variables, and rates of complications.

One factor contributing to the lower total inpatient mortality observed in our sample, than that reported in other studies, was a lower median age (61 yr) (12–15, 17, 18). In addition, patients greater than 50 years with comorbidities, including diabetes mellitus, coronary artery disease, congestive heart failure, chronic kidney disease, cancer, liver disease, or cerebrovascular disease, were the most likely to die. Even though obesity was prevalent in our study, of the 106 patients who died, 72.6% had a BMI of less than or equal to $30 \, kg/m^2$. Furthermore, among those patients who died, many were administered steroids, remdesivir, and convalescent plasma as medical management given the severity of their disease. This was important to understand as new clinical trials and management strategies came after previously published epidemiological data. This information would be essential in identifying those comorbidities associated with higher odds of mortality and would help future prospective studies identify possible risk factors.

As the prevalence of the disease increased over the study period, a number of patients were admitted with symptoms inconsistent with COVID-19 disease yet tested positive for SARS CoV-2 through nasopharyngeal swab testing. Testing these patients was deemed necessary as the patients reported an exposure history at their home or nursing homes or needed an elective procedure that could lead to the inadvertent infection of healthcare workers. A highlight of our study was the distinction of patients with COVID-19 disease from those that were incidentally positive and considered asymptomatic carriers based on a physician's

assessment. Thus, we identified the "true" burden of COVID-19 in our study. The mortality rate of patients with positive SARS CoV-2 test results without symptoms was 5%, and that of those with COVID-19 disease was 16.7%, suggesting that these are two separate entities and should not be combined to determine disease mortality. This is an important distinction as previous epidemiological studies did not exclude asymptomatic carriers from their disease mortality data, thereby skewing their inhospital mortality rates lower (9, 10).

As a cohort study, we were limited in reporting causation based on our data. However, we attempted to identify trends, calculate ORs for mortality associated with each categorical variable, compare continuous variables, and report all findings. Though this process was as highly structured as possible, interrater discrepancies in primary COVID-19 disease diagnosis and incidental (asymptomatic) categorization may be inaccurate. To minimize this, an independent physician cross-checked the charts of asymptomatic positive SARS CoV-2 patients to ensure accuracy and obtained a large sample size of 802 patients. We relied on the primary admitting team to document accurate past medical diagnoses, which may have been missing for some critically ill patients who were unable to provide relevant history at the time of admission. However, we do not believe this to be of sizable concern as the number of patients with comorbidities in our study is comparable with previously published data at other hospitals (12–15, 17, 18). We collected patient data until hospital discharge but did not collect outpatient or follow-up data if patients were readmitted to another hospital for the same illness. Finally, our study was performed at a single community hospital in one state in the United States, making our results less generalizable to other health systems, other U.S. states, and the world.

We recommend that the demographics, characteristics, comorbidities, complications, and outcomes associated with higher mortality be evaluated further in studies that aim to determine COVID-19 patient prognoses in community hospitals. With the continued rise in cases across the United States, we suspect the risk factors associated with mortality to be vitally important information. Information on patient characteristics, comorbidities, and complications can help identify those at a high risk of COVID-19 mortality at other community hospitals in the United States. This information can help us improve the quality of care we provide.

CONCLUSIONS

Our cohort study in a community hospital in Florida identified an increase in the severity of COVID-19 in older patients of African American and Hispanic descent with comorbidities such as diabetes, coronary artery disease, congestive heart failure, chronic kidney disease, cancer, liver disease, or cerebrovascular disease. Noninvasive positive-pressure ventilation and high-flow nasal cannula oxygen may have helped avert mechanical ventilation, and this might have improved patient outcomes over the course of the study. Future quality improvement studies are needed on the clinical management of COVID-19 based on these characteristics, comorbidities, and complications.

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