

Supplement

eTable 1 Medical Codes of Outcome Measures (ARDS/respiratory failure or IMV)

Criterion Name	Code Type	Code
ARDS	ICD-10-CM diagnosis	J80
respiratory failure	ICD-10-CM diagnosis	J96.0
respiratory failure	ICD-10-CM diagnosis	J96.01
respiratory failure	ICD-10-CM diagnosis	J96.02
respiratory failure	ICD-10-CM diagnosis	J96.20
respiratory failure	ICD-10-CM diagnosis	J96.21
respiratory failure	ICD-10-CM diagnosis	J96.22
Invasive Mechanical Ventilation	ICD-10-CM Diagnosis	Z99.12
Invasive Mechanical Ventilation	ICD-10-CM Diagnosis	Z99.11
Invasive Mechanical Ventilation	ICD-9-CM Diagnosis	V46.1
Invasive Mechanical Ventilation	ICD-9-CM Diagnosis	V46.11
Invasive Mechanical Ventilation	ICD-10-PCS	5A1955Z
Invasive Mechanical Ventilation	ICD-10-CM Procedure	5A1945Z
Invasive Mechanical Ventilation	ICD-10-CM Procedure	5A1935Z
Invasive Mechanical Ventilation	ICD-10-CM Procedure	0BH18EZ
Invasive Mechanical Ventilation	ICD-10-CM Procedure	0BH17EZ
Invasive Mechanical Ventilation	ICD-10-CM Procedure	0BH13EZ
Invasive Mechanical Ventilation	ICD-10-CM Procedure	0B21XEZ
Invasive Mechanical Ventilation	CPT	99504
Invasive Mechanical Ventilation	CPT	94004
Invasive Mechanical Ventilation	CPT	94003
Invasive Mechanical Ventilation	CPT	94002
Invasive Mechanical Ventilation	CPT	31730
Invasive Mechanical Ventilation	CPT	31502
Invasive Mechanical Ventilation	CPT	31500
Invasive Mechanical Ventilation	ICD-9-CM Procedure	97.23
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.72
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.71
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.70
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.7
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.05
Invasive Mechanical Ventilation	ICD-9-CM Procedure	96.04
Invasive Mechanical Ventilation	ICD-10-CM Diagnosis	Z99.1

eTable 2. Baseline Characteristics of US Hospitalized Adult COVID-19 Patients by Gender – Overall Cohort

Characteristic	Patient, No. (%)		
	All (n=67456)	Male (n=34518)	Female (n=32938)
Age, Mean[SD], y	58.3(17.3)	58.8(16.4)	57.6(18.1)
Race			
White	56.1	57.6	54.6
Black or African American	23.7	21.3	26.1
Asian	3.2	3.3	3.1
American Indian or Alaska Native	0.6	0.5	0.6
Native Hawaiian or Other Pacific Islander	0.3	0.3	0.3
Unknown	16.1	16.9	15.3
Ethnicity			
Hispanic	16.2	16.9	15.5
Site of diagnosis at inpatient setting	85.3	86.5	84.1
Mode of diagnosis			
Both	48.0	48.2	47.9
Clinical	41.8	42.2	41.4
Lab	10.2	9.7	10.7
Month of index			
February, 2020	1.2	1.4	1.1
March, 2020	6.7	7.1	6.3
April, 2020	11.1	11.4	10.7
May, 2020	7.3	7.2	7.3
June, 2020	7.8	7.7	7.8
Jul, 2020	11.1	10.9	11.3
August, 2020	6.5	6.2	6.8
September, 2020	5.3	5.1	5.4
October, 2020	8.5	8.4	8.6
November, 2020	15.9	15.6	16.1
December, 2020	17.7	17.8	17.6
January, 2021	1.0	1.1	1.0
US Census division			
Midwest	15.59	15.5	15.7
Northeast	13.10	13.2	13.0
South	45.44	44.1	46.8
West	3.95	4.1	3.8
Baseline Comorbidities			
Gastrointestinal disorders	27.3	24.7	30.0
Skin disorder	13.7	12.9	14.6
Cancer	7.9	8.3	7.6
Solid tumors	6.0	6.2	5.8
Hematologic malignancies	2.7	2.9	2.5
Cardiovascular disease	46.5	48.1	44.8
Chronic kidney disease	14.1	15.5	12.7
Chronic dialysis	0.9	1.0	0.8
Chronic lung disease	16.2	14.3	18.2
Asthma	7.4	4.8	10.2
COPD	9.8	10.1	9.6
Pulmonary fibrosis	0.9	1.1	0.8

Diabetes Mellitus

Type I	1.4	1.5	1.3
Type II, diabetic	25.4	26.1	24.5
Diabetes unknown	3.3	3.4	3.2

Liver disease

	2.6	3.1	2.1
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Hospitalization with infection in the past

	8.3	8.1	8.5
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year

eTable 2. Baseline Characteristics of US Hospitalized Adult COVID-19 Patients by Age Group – Overall Cohort

Characteristic	Patient, %			
	Age 18-34 (n= 7859)	Age 35-49 (n= 12365)	Age 50-64 (n= 20382)	Age 65+ (n= 26850)
Age, Mean[SD],y	27.39(4.6)	42.64(4.4)	57.42(4.3)	75.10(6.9)
Sex (Males)	42.4	50.4	54.5	51.6
Race				
White	47.0	46.8	54.3	64.5
Black or African American	27.1	25.2	25.7	20.4
American Indian or Alaska Native	0.6	0.8	0.6	0.4
Asian	2.8	3.3	3.4	3.1
Native Hawaiian or Other Pacific Islander	0.3	0.5	0.4	0.2
Unknown	22.2	23.3	15.7	11.3
Ethnicity				
Hispanic	24.1	25.2	17.3	8.9
Month of index				
February, 2020	0.9	1.2	1.4	1.2
March, 2020	6.5	7.8	7.3	5.8
April, 2020	11.3	12.5	11.1	10.3
May, 2020	8.5	8.5	7.1	6.4
June, 2020	9.9	9.0	7.6	6.6
Jul, 2020	12.9	12.3	11.5	9.8
August, 2020	7.6	6.7	6.3	6.2
September, 2020	5.9	5.3	5.0	5.2
October, 2020	8.0	8.3	8.5	8.8
November, 2020	12.9	13.7	15.6	17.9
December, 2020	14.6	13.7	17.6	20.5
January, 2021	0.8	0.9	1.0	1.2
US Census division				
Midwest	12.0	12.2	15.0	18.7
Northeast	17.7	14.2	12.8	11.5
South	47.8	48.8	46.0	42.9
West	6.3	5.3	4.3	2.4
Baseline Comorbidities				
<i>Gastrointestinal disorders</i>	19.7	22.3	27.2	31.8
<i>Skin disorder</i>	10.9	11.4	12.7	16.4
Atopic dermatitis	0.3	0.3	0.2	0.2
<i>Autoimmune diseases</i>				
Systemic lupus erythematosus	0.7	0.8	0.7	0.4
Rheumatoid arthritis	0.3	0.7	1.5	2.0
Psoriasis, including psoriatic arthritis	0.3	0.6	0.7	0.6
Inflammatory bowel disease	0.3	0.2	0.2	0.1
Multiple sclerosis	0.3	0.5	0.6	0.4
Glomerulonephritis	0.6	0.5	0.4	0.2
Autoimmune thyroid disease	0.3	0.3	0.2	0.2
<i>Cancer</i>	2.5	3.9	7.4	11.7
Solid tumors	1.3	2.7	5.5	9.3
Breast	0.2	0.7	1.0	1.5

Prostate	0.0	0.1	0.6	2.4
Lung	0.2	0.3	1.0	1.7
Other	1.2	2.1	4.2	5.9
Hematologic malignancies	1.5	1.6	2.7	3.5
Leukemia	0.3	0.3	0.6	0.9
Lymphoma	0.4	0.4	0.6	0.8
Multiple myeloma (MM)	0.0	0.1	0.5	0.5
Other	0.9	0.8	1.3	1.6
<i>Cardiovascular disease</i>	11.9	28.2	47.5	64.2
Coronary artery disease	0.5	3.0	9.6	21.2
Peripheral vascular disease	0.4	1.2	3.6	7.3
Cerebrovascular disease	0.5	1.2	2.6	6.8
Hypertension	11.0	26.6	44.0	58.1
Congestive heart failure	1.5	4.4	8.7	17.4
Atrial Fibrillation	0.5	1.6	5.5	17.6
<i>Chronic kidney disease</i>	3.3	7.1	12.3	21.9
Stage I	0.1	0.1	0.1	0.2
Stage II	0.3	0.6	1.3	1.8
Stage III	0.8	1.9	4.1	9.5
Stage IV	0.5	1.0	1.7	3.3
Stage V (end stage renal disease)	1.3	2.8	3.5	3.3
Unknown	2.8	6.3	10.9	19.1
<i>Chronic dialysis</i>	0.4	0.9	15.2	21.5
Hemodialysis	0.4	0.8	1.0	1.0
Peritoneal dialysis	0.0	0.0	0.0	0.0
<i>Chronic lung disease</i>	9.9	10.5	15.2	21.4
Asthma	9.3	8.5	7.9	6.0
Chronic obstructive pulmonary disease	0.6	2.4	8.6	16.9
Pulmonary fibrosis	0.2	0.5	0.7	1.6
<i>Diabetes mellitus</i>				
Type I	2.5	1.8	1.3	1.0
Type II, diabetic	7.1	17.6	28.3	32.0
Diabetes mellitus_unknown	1.3	2.4	3.6	4.0
<i>Human immunodeficiency virus</i>	0.8	1.0	1.1	0.3
<i>Liver disease</i>	0.9	2.1	3.7	2.5
Chronic hepatitis	0.3	0.6	1.3	0.7
Cirrhosis	0.4	1.5	2.8	2.0
Non-alcoholic steatohepatitis	0.2	0.4	0.7	0.5
<i>Major movement or cognitive disorder (excluding stroke)</i>	0.8	1.5	3.7	15.0
<i>Obstructive sleep apnea</i>	2.5	5.9	8.8	8.3
<i>Hospitalization with infection in the past year</i>	6.3	7.0	7.9	9.8
<i>Transplant history</i>	0.4	0.6	0.5	0.2

eTable 3. Baseline Characteristics of US Hospitalized Adult COVID-19 Patients by Time Period – Overall Cohort

Characteristics	Patient, No. (%)			
	Feb, 2020 - Apr, 2020 (n= 12800)	May, 2020 - Jul, 2020 (n= 17634)	Aug, 2020 - Oct, 2020 (n= 13635)	Nov, 2020 - Jan, 2020 (n= 23326)
Age, Mean[SD], y	57.3(17.1)	56.1(17.3)	57.8(17.4)	60.6(17.0)
18-34	11.6	13.9	12.4	9.5
35-49	20.8	20.9	18.4	15.0
50-64	31.4	30.4	29.6	29.9
65+	36.3	34.8	39.7	45.6
Sex (Male)	53.4	50.7	49.9	51.0
Race				
White	44.4	50.0	61.9	63.8
Black or African American	27.7	26.9	20.8	20.7
American Indian or Alaska Native	0.5	0.9	0.5	0.4
Asian	2.6	4.4	3.2	2.6
Native Hawaiian or Other Pacific Islander	0.1	0.4	0.4	0.3
Unknown	24.6	17.4	0.0	12.3
Ethnicity				
Hispanic	16.5	24.8	15.9	9.6
US Census division				
Midwest	9.9	11.8	15.2	21.9
Northeast	27.7	6.6	5.2	14.7
South	35.9	58.1	51.4	37.9
West	6.3	4.3	5.1	1.7
Baseline Comorbidities				
<i>Gastrointestinal disorders</i>	27.8	23.7	27.9	29.4
<i>Skin disorder</i>	15.8	11.6	13.3	14.4
Atopic dermatitis	0.4	0.2	0.2	0.2
<i>Autoimmune disease</i>				
Systemic lupus erythematosus	0.7	0.5	0.6	0.6
Rheumatoid arthritis	1.5	1.0	1.3	1.7
Psoriasis, including psoriatic arthritis	0.6	0.5	0.6	0.7
Inflammatory bowel disease	0.2	0.1	0.2	0.2
Multiple sclerosis	0.5	0.4	0.4	0.5
Glomerulonephritis	0.4	0.4	0.3	0.3
Autoimmune thyroid disease	0.3	0.2	0.2	0.2
<i>Cancer</i>	8.2	6.8	8.0	8.5
Solid tumors	6.0	5.3	6.2	6.5
Breast	1.0	0.9	1.2	1.1
Prostate	1.1	0.9	1.1	1.3
Lung	1.2	0.9	1.0	1.1
Other	4.1	3.7	4.1	4.4

Hematologic malignancies	3.2	2.1	2.7	2.8
Leukemia	0.8	0.5	0.6	0.7
Lymphoma	0.9	0.4	0.5	0.7
Multiple myeloma (MM)	0.3	0.3	0.3	0.4
Other	1.6	1.0	1.3	1.3
<i>Cardiovascular disease</i>	45.8	39.2	45.8	52.7
Coronary artery disease	11.8	9.3	11.8	14.2
Peripheral vascular disease	4.9	3.7	3.9	4.5
Cerebrovascular disease	4.1	2.8	3.4	4.6
Hypertension	42.1	35.9	42.0	48.2
Congestive heart failure	11.0	9.1	9.6	11.9
Atrial Fibrillation	9.0	6.9	8.7	10.9
<i>Chronic kidney disease</i>	14.9	11.7	13.4	15.9
Stage I	0.3	0.1	0.2	0.1
Stage II	1.5	1.1	1.2	1.3
Stage III	6.6	4.8	5.4	5.3
Stage IV	2.2	1.6	2.0	2.4
Stage V (end stage renal disease)	3.3	2.9	2.7	3.2
Unknown	12.8	10.3	11.9	14.0
<i>Chronic dialysis</i>	1.0	0.8	0.8	1.0
Hemodialysis	1.0	0.8	0.8	1.0
Peritoneal dialysis	0.0	0.0	0.0	0.0
<i>Chronic lung disease</i>	16.9	12.5	16.3	18.6
Asthma	8.0	6.0	7.4	8.1
COPD	10.1	7.3	9.8	11.7
Pulmonary fibrosis	1.2	0.7	0.9	1.0
<i>Diabetes mellitus</i>				
Type I	1.8	1.3	1.2	1.4
Type II, diabetic	25.3	22.5	24.6	27.9
Diabetes mellitus_unknown	4.1	2.6	2.5	3.8
<i>Human immunodeficiency virus</i>	1.0	0.7	0.7	0.6
<i>Liver disease</i>	3.0	2.4	2.6	2.5
Chronic hepatitis	1.2	0.8	0.7	0.6
Cirrhosis	2.0	1.8	2.1	1.9
Non-alcoholic steatohepatitis	0.5	0.4	0.6	0.5
<i>Major movement or cognitive disorder (excluding stroke)</i>	8.5	6.4	6.9	8.1
<i>Obstructive sleep apnea</i>	7.1	5.7	7.2	8.8
<i>Hospitalization with infection in the past year</i>	11.1	7.1	7.8	8.0
<i>Transplant history</i>	0.3	0.3	0.4	0.5

eTable 4 The Percentage of Hospitalized Adult COVID-19 Patient by Region in ex-US Analysis

Region	% of Hospitalized Adult COVID-19 Patients
Europe	91.4%
LATAM	8.5%
APAC	0.1%

LATAM: Latin America; APAC: Asia-Pacific

eTable 5. Drug Treatment receipt among US Adult Hospitalized COVID-19 patients – Overall Cohort

Treatment	Patient, % (N=67456)
Acetaminophen	67.11%
Enoxaparin	49.47%
Dexamethasone	37.69%
Insulin	32.74%
Opioids	31.44%
Aspirin	26.69%
Azithromycin	23.72%
Atorvastatin	21.44%
Remdesivir	20.26%
Methylprednisolone	19.82%
Heparin	14.77%
Melatonin	13.42%
Zinc	13.00%
Prednisone	11.91%
Ibuprofen	11.78%
Doxycycline	8.83%
Apixaban	8.72%
Hydroxychloroquine	7.18%
Chloroquine	7.16%
Vitamin D	6.89%
Thiamine	5.63%
Levofloxacin	5.54%
Rosuvastatin	5.41%
Clopidogrel	5.21%
Hydrocortisone	4.92%
Amoxicillin	4.25%
Budesonide	4.25%
Rivaroxaban	3.95%
Amiodarone	3.91%
Montelukast	3.46%
Formoterol	3.26%
Alteplase	3.17%
Pravastatin	2.83%
Simvastatin	2.62%
Trimethoprim	2.33%
Tacrolimus	1.68%
Warfarin	1.60%
Hemodialysis	1.42%

eTable 6. Drug Treatment receipt among ex-US Adult Hospitalized COVID-19 patients

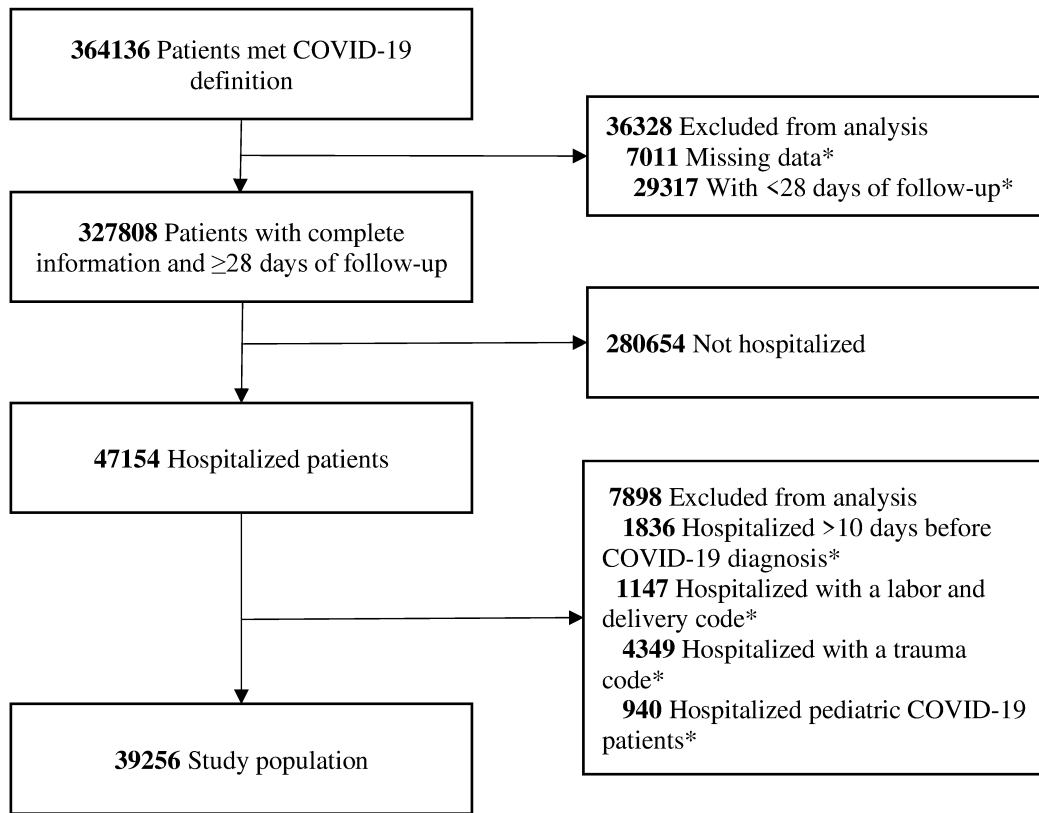
Treatment	Patient, % (N=67456)
Acetaminophen	64.6%
Azithromycin	38.9%
Hydroxychloroquine	29.0%
Methylprednisolone	21.4%
Insulin	20.2%
Dexamethasone	19.9%
Amoxicillin	18.9%
Other Bronchodilators	14.0%
Tocilizumab	8.3%
Atorvastatin	7.9%
Aspirin	7.9%
Formoterol	6.3%
Prednisone	5.5%
Levofloxacin	5.4%
Simvastatin	5.3%
Clopidogrel	1.8%
Thiamine	1.4%
Apixaban	1.2%
Rivaroxaban	1.2%
Amiodarone	1.1%
Montelukast	0.9%
Rosuvastatin	0.7%
Remdesivir	0.5%
Pravastatin	0.2%
Other Antihypertensives	0.2%
Warfarin	0.1%

eTable 7: Selected Outcomes Percentage of US Adult Hospitalized COVID-19 Patients – Overall Cohort

Category	ICU Admission		ARDS/Respiratory Failure		IMV		All-Cause Mortality	
	N	%	N	%	N	%	N	%
Gender								
Male	34518	16.89%	32560	40.98%	34518	13.65%	34518	6.14%
Female	32938	12.33%	30946	32.78%	32938	9.36%	32938	4.56%
Age								
18-34	7859	7.23%	7678	18.26%	7859	5.06%	7859	0.83%
35-49	12365	11.23%	11957	30.96%	12365	8.63%	12365	1.78%
50-64	20382	15.71%	19240	40.31%	20382	12.82%	20382	3.79%
65+	26850	17.62%	24631	43.14%	26850	13.84%	26850	9.55%
Time Period								
Feb, 2020 - Apr, 2020	12800	20.88%	11924	41.11%	12800	17.89%	12800	6.52%
May, 2020 - Jul, 2020	17634	14.46%	16805	33.04%	17634	11.53%	17634	5.33%
Aug, 2020 - Oct, 2020	13635	13.19%	12890	36.97%	13635	10.21%	13635	4.73%
Nov, 2020 - Jan, 2021	23326	12.21%	21837	37.73%	23326	8.82%	23326	5.16%

Sensitivity Analysis

eFigure 1. Patient Flow Diagram of US Adult Hospitalized COVID-19 Patients – Confirmed Cohort



*The counts were not mutual exclusive.

eTable 8. Baseline Characteristics of US Hospitalized Adult COVID-19 Patient Overall and by Gender – Confirmed Cohort

Characteristic	Patients, %		
	All (n=39256)	Male (n=19965)	Female (n=19291)
Age, Mean [SD], y	57(17.54)	58.4(16.7)	57.2(18.4)
18-34	12.6	10.4	14.8
35-49	18.5	18.5	18.6
50-64	29.8	31.7	27.9
65+	39.1	39.4	38.7
Race			
White	54.9	56.3	53.5
Black or African American	25.5	23.1	28.0
American Indian or Alaska Native	0.5	0.5	0.5
Asian	2.8	2.9	2.6
Native Hawaiian or Other Pacific Islander	0.3	0.3	0.2
Unknown	16.0	16.9	15.1
Ethnicity			
Hispanic	18.9	19.7	18.0
Site of Diagnosis			
Inpatient	83.5	84.8	82.2
Other	16.5	15.2	17.8
Mode of Diagnosis			
Both Diagnosis and lab	81.2	81.9	80.5
Lab	18.8	18.1	19.5
Month of Index			
Feb-20	0.8	1.0	0.6
Mar-20	6.6	7.1	6.2
Apr-20	11.3	11.8	10.7
May-20	7.5	7.6	7.3
Jun-20	8.0	8.1	8.0
Jul-20	11.3	11.0	11.7
Aug-20	6.3	6.0	6.7
Sep-20	5.0	4.8	5.2
Oct-20	8.5	8.4	8.5
Nov-20	16.4	16.0	16.8
Dec-20	17.3	17.2	17.3
Jan-21	1.1	1.1	1.1
US Census Division			
Midwest	19.9	19.8	20.0
Northeast	14.8	14.7	14.9
South	46.6	45.5	47.8
West	4.9	5.1	4.7
Unknown	13.8	14.91	12.58
Baseline Comorbidities			
<i>Gastrointestinal disorders</i>	25.1	22.3	28.0
<i>Skin disorder</i>	13.7	12.5	14.8
Atopic dermatitis (AD)	0.3	0.2	0.3
<i>Autoimmune disease</i>			

Systemic lupus erythematosus	0.5	0.2	0.9
Rheumatoid arthritis	1.2	0.7	1.7
Psoriasis, including psoriatic arthritis	0.6	0.5	0.6
Inflammatory bowel disease	0.2	0.1	0.2
Multiple sclerosis	0.4	0.3	0.5
Glomerulonephritis	0.3	0.3	0.4
Autoimmune thyroid disease	0.2	0.1	0.3
<i>Cancer</i>	7.0	7.4	6.6
Solid tumors	5.4	5.7	5.0
Breast	1.0	0.0	1.9
Prostate	1.1	2.1	0.0
Lung	0.9	1.0	0.8
Other	3.6	3.9	3.3
Hematologic malignancies	2.4	2.4	2.3
Leukemia	0.5	0.6	0.5
Lymphoma	0.6	0.6	0.5
Multiple myeloma (MM)	0.4	0.4	0.3
Other	1.1	1.1	1.1
<i>Cardiovascular disease</i>	41.5	42.5	40.3
Coronary artery disease	10.9	13.5	8.1
Peripheral vascular disease	3.9	4.4	3.4
Cerebrovascular disease	3.8	3.9	3.7
Hypertension	37.6	38.0	37.2
Congestive heart failure	9.1	9.5	8.7
Atrial Fibrillation	7.8	9.0	6.6
<i>Chronic kidney disease</i>	12.4	13.3	11.4
Stage I	0.1	0.1	0.1
Stage II	1.3	1.5	1.0
Stage III	5.3	5.5	5.1
Stage IV	1.9	1.9	2.0
Stage V (End stage renal disease)	2.5	2.8	2.2
Unknown	10.7	11.5	9.9
<i>Chronic dialysis</i>	0.7	0.7	0.7
Hemodialysis	0.7	0.7	0.7
<i>Chronic lung disease</i>	13.9	11.9	15.9
Asthma	6.7	4.2	9.3
COPD	8.0	8.1	8.0
Pulmonary fibrosis	0.7	0.8	0.6
<i>Diabetes mellitus</i>			
Type I	1.2	1.2	1.2
Type II, diabetic	22.2	22.5	21.9
Diabetes unknown	4.0	4.0	4.0
<i>Human immunodeficiency virus</i>	0.6	0.8	0.3
<i>Liver disease</i>	2.3	2.8	1.8
Chronic hepatitis	0.8	1.2	0.5
Cirrhosis	1.6	1.9	1.3
Non-alcoholic steatohepatitis	0.5	0.4	0.6
<i>Major movement or cognitive disorder (excluding stroke)</i>	6.2	6.0	6.4
<i>Obstructive sleep apnea</i>	7.1	7.4	6.8

<i>Hospitalization with infection in the past year</i>	7.5	7.0	7.9
<i>Transplant history</i>	0.4	0.5	0.3

eTable 9: Selected Outcomes Percentage of US Adult Hospitalized COVID-19 Patients – Confirmed Cohort

Category	ICU Admission		ARDS/Respiratory Failure		IMV		All-Cause Mortality	
	N	%	N	%	N	%	N	%
Gender								
Male	19965	15.65%	18946	36.41%	19965	12.19%	19965	4.94%
Female	19291	10.86%	18222	28.20%	19291	7.74%	19291	3.66%
Age								
18-34	4931	5.21%	4849	14.04%	4931	3.45%	4931	0.34%
35-49	7275	9.33%	7070	26.08%	7275	6.83%	7275	0.93%
50-64	11713	14.07%	11156	35.50%	11713	10.84%	11713	2.68%
65+	15337	17.19%	14093	39.40%	15337	12.98%	15337	8.43%
Time Period								
Feb, 2020 - Apr, 2020	7332	15.71%	6978	35.05%	7332	13.86%	7332	4.69%
May, 2020 - Jul, 2020	10530	14.32%	10089	28.98%	10530	10.53%	10530	4.72%
Aug, 2020 - Oct, 2020	7757	13.23%	7373	33.45%	7757	9.62%	7757	3.66%
Nov, 2020 - Jan, 2021	13626	11.24%	12718	33.02%	13626	7.75%	13626	4.16%

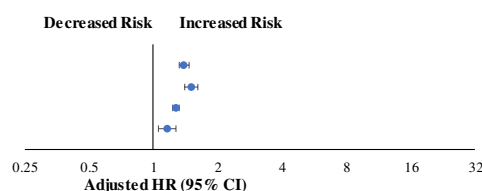
eTable 10. Treatment receipt among COVID-19 patients – Confirmed and Probable Cohorts

Treatment	Patient, %	
	Confirmed Cohort (N=39256)	Probable Cohort (N=28200)
Acetaminophen	74.4%	57.0%
Enoxaparin	54.4%	42.6%
Dexamethasone	41.5%	32.4%
Insulin	34.7%	30.0%
Opioids	32.3%	30.2%
Aspirin	28.7%	24.0%
Azithromycin	23.6%	23.9%
Atorvastatin	23.3%	18.8%
Remdesivir	22.8%	16.7%
Methylprednisolone	22.4%	16.3%
Heparin	16.1%	12.9%
Melatonin	14.1%	12.5%
Zinc	13.7%	12.0%
Ibuprofen	12.2%	11.2%
Prednisone	12.1%	11.7%
Apixaban	9.6%	7.5%
Doxycycline	9.0%	8.7%
Vitamin D	7.9%	5.5%
Hydroxychloroquine	7.4%	6.9%
Chloroquine	7.4%	6.8%
Rosuvastatin	7.0%	3.2%
Thiamine	6.3%	4.7%
Clopidogrel	5.4%	4.9%
Rivaroxaban	5.1%	2.4%
Levofloxacin	5.0%	6.3%
Hydrocortisone	4.8%	5.2%
Amoxicillin	4.2%	4.3%
Budesonide	3.8%	4.8%
Amiodarone	3.8%	4.0%
Montelukast	3.6%	3.2%
Pravastatin	3.1%	2.4%
Alteplase	3.1%	3.3%
Formoterol	3.1%	3.6%
Simvastatin	2.4%	3.0%
Trimethoprim	2.2%	2.5%
Warfarin	1.8%	1.3%
Tacrolimus	1.8%	1.6%
Hemodialysis	0.9%	2.1%

S2 Figure. The Forest Plots of Model-adjusted Hazard Ratios among US Hospitalized Adult Patients with COVID-19 by Gender, by Age Group, and by Time Period – Confirmed Cohort

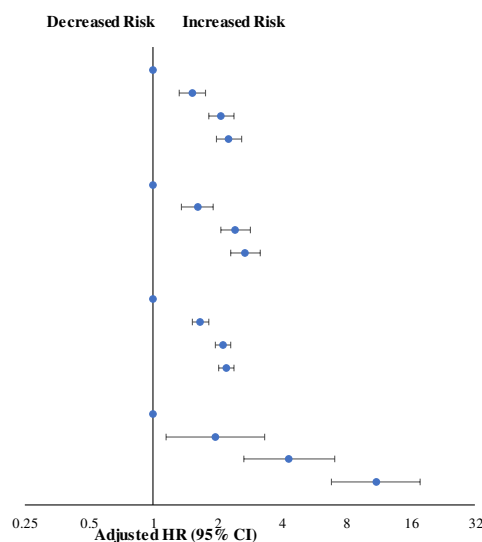
A) Gender

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
Male (Reference : Female)		
ICU Admission	1.39 (1.32-1.47)	<.0001
IMV	1.51 (1.41-1.61)	<.0001
ARDS/Respiratory Failure	1.28 (1.23-1.32)	<.0001
All-cause Mortality	1.16 (1.06-1.28)	0.0025



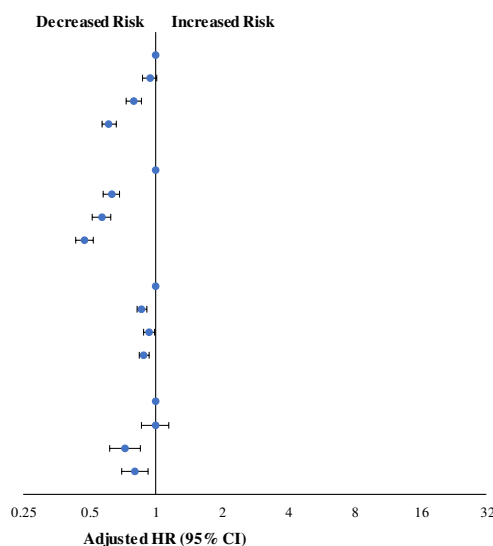
B) Age

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
ICU Admission		
18-34	1 (ref)	
35-49	1.53 (1.33-1.76)	<.0001
50-64	2.08 (1.82-2.37)	<.0001
65+	2.26 (1.98-2.58)	<.0001
IMV		
18-34	1 (ref)	
35-49	1.61 (1.35-1.91)	<.0001
50-64	2.42 (2.06-2.85)	<.0001
65+	2.69 (2.29-3.17)	<.0001
ARDS/Respiratory Failure		
18-34	1 (ref)	
35-49	1.66 (1.53-1.81)	<.0001
50-64	2.12 (1.96-2.30)	<.0001
65+	2.19 (2.02-2.38)	<.0001
All-cause Mortality		
18-34	1 (ref)	
35-49	1.95 (1.14-3.31)	0.0141
50-64	4.32 (2.65-7.03)	<.0001
65+	10.99 (6.79-17.78)	<.0001



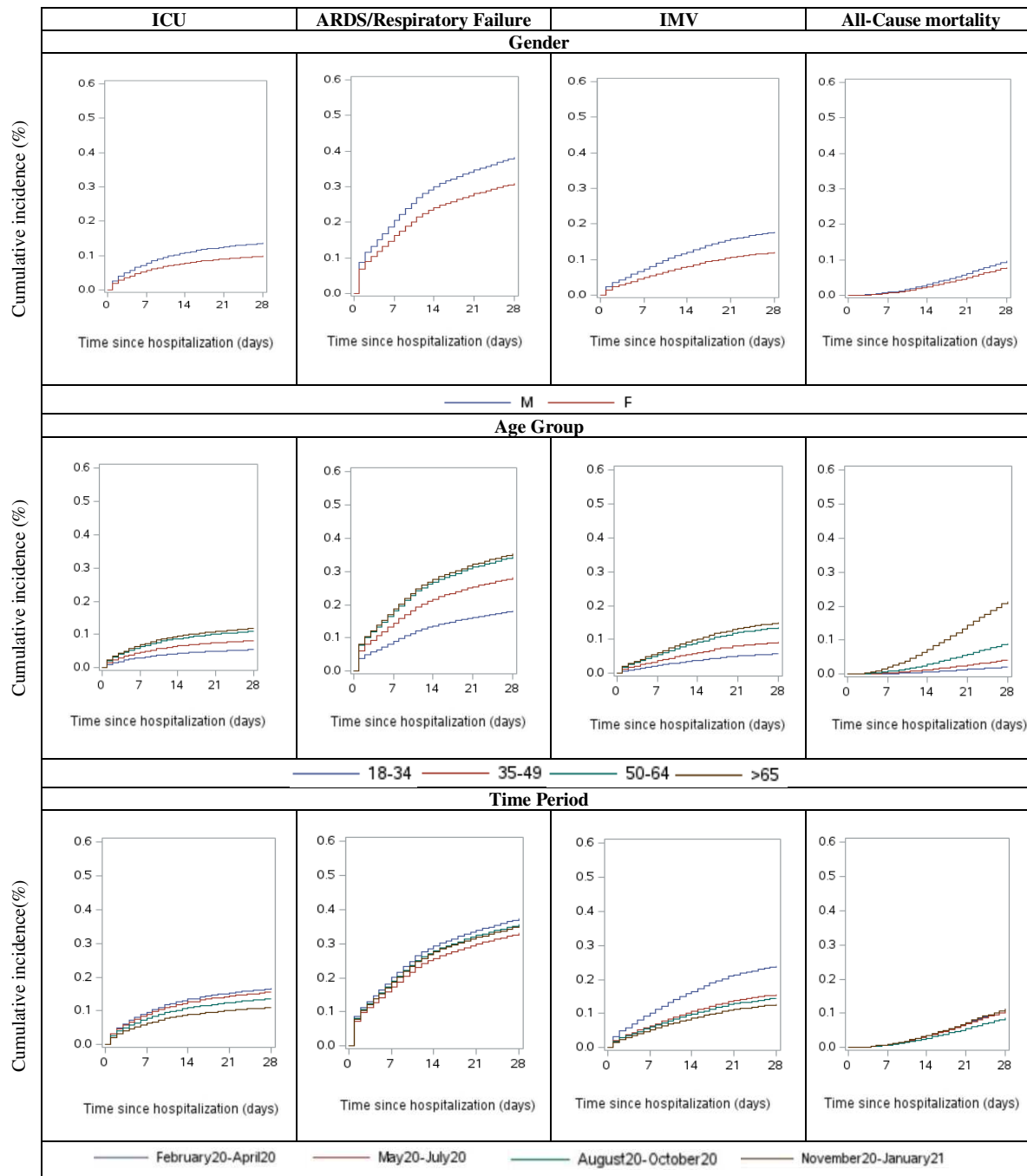
C) Time Period

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
ICU Admission		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.94 (0.87-1.02)	0.1208
Aug, 2020 - Oct, 2020	0.79 (0.73-0.87)	<.0001
Nov, 2020 - Jan, 2021	0.61 (0.57-0.66)	<.0001
IMV		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.63 (0.58-0.69)	<.0001
Aug, 2020 - Oct, 2020	0.57 (0.52-0.63)	<.0001
Nov, 2020 - Jan, 2021	0.47 (0.43-0.52)	<.0001
ARDS/Respiratory Failure		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.86 (0.82-0.91)	<.0001
Aug, 2020 - Oct, 2020	0.93 (0.88-0.99)	0.0117
Nov, 2020 - Jan, 2021	0.88 (0.84-0.93)	<.0001
All-cause Mortality		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.99 (0.86-1.14)	0.929
Aug, 2020 - Oct, 2020	0.72 (0.62-0.85)	<.0001
Nov, 2020 - Jan, 2021	0.80 (0.70-0.92)	0.0022



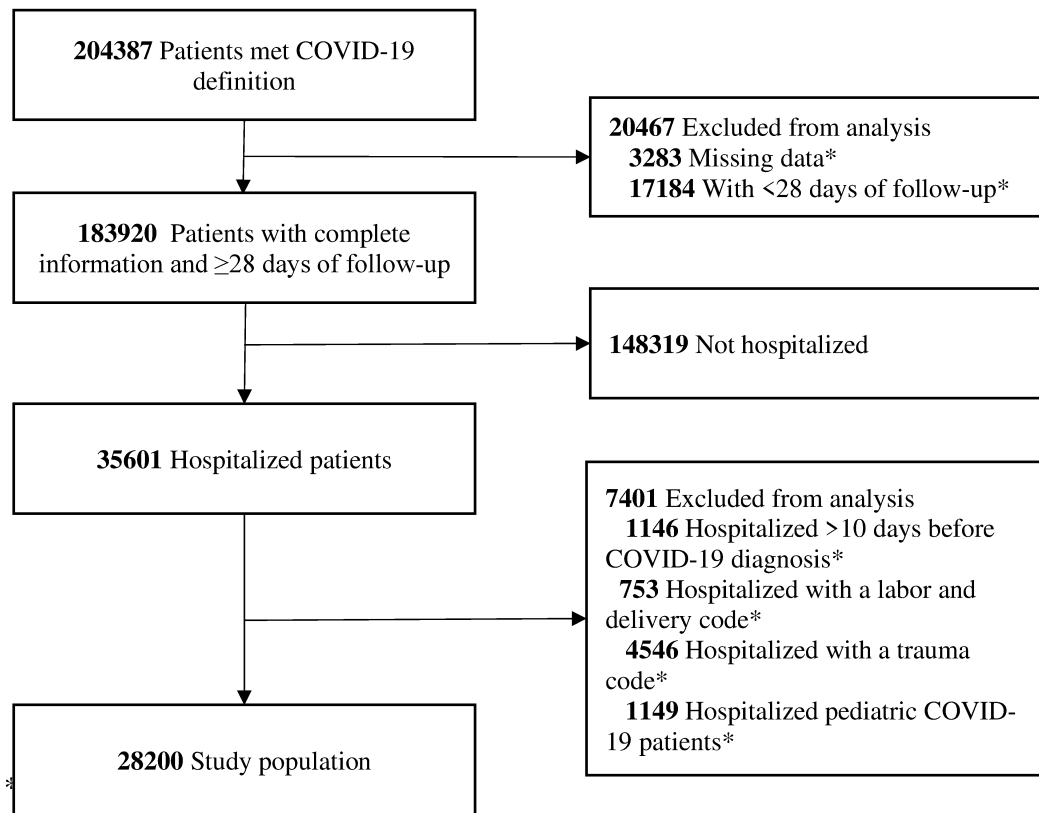
HR: the abbreviation of Hazard Ratio; ARDS: the abbreviation of acute respiratory distress syndrome; ICU: the abbreviation of intensive care unit; IMV: the abbreviation of invasive mechanical ventilation. Three separate Fine and Gray models were developed stratified by age group, gender, and time period; each model used the other two main categories of risk exposure (for example, gender and time period in the age group model) as covariates. The other covariates in each model were race, ethnicity, US region, hypertension, diabetes (Type I and II), active cancer, coronary artery disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnea.

S3 Figure. Model-adjusted Cumulative Incidence of Selected Outcomes among Hospitalized Adult Patients with COVID-19 by Gender, by Age Group, and by Time Period – Confirmed Cohort



HR: the abbreviation of Hazard Ratio; ARDS: the abbreviation of acute respiratory distress syndrome; ICU: the abbreviation of intensive care unit; IMV: the abbreviation of invasive mechanical ventilation. Three separate Fine and Gray models were developed stratified by age group, gender, and time period; each model used the other two main categories of risk exposure (for example, gender and time period in the age group model) as covariates. The other covariates in each model were race, ethnicity, US region, hypertension, diabetes (Type I and II), active cancer, coronary artery disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnea.

eFigure 4. Patient Flow Diagram of US Adults Hospitalized with COVID-19 – Probable Cohort



eTable 11. Baseline Characteristics among US Hospitalized Adult COVID-19 Patients Overall and by Gender– Probable Cohort

Characteristic	Patient, %		
	All (n= 28200)	Male (n= 14553)	Female (n= 13647)
Age, Mean[SD], y	58.8(16.9)	59.5(16.2)	58.2(17.7)
18-34	10.4	8.6	12.3
35-49	18.0	17.5	18.7
50-64	30.7	32.8	28.6
65+	40.8	41.1	40.5
Race			
White	57.8	59.5	56.0
Black or African American	21.1	18.9	23.6
American Indian or Alaska Native	0.7	0.6	0.8
Asian	3.8	3.8	3.8
Native Hawaiian or Other Pacific			
Islander	0.4	0.4	0.4
Unknown	16.2	16.9	15.4
Ethnicity			
Hispanic	12.4	12.9	11.9
Month of Index			
February, 2020	1.8	1.0	0.6
March, 2020	6.8	7.1	6.2
April, 2020	10.8	11.8	10.7
May, 2020	7.0	7.6	7.3
June, 2020	7.4	8.1	8.0
Jul, 2020	10.8	11.0	11.7
August, 2020	6.7	6.0	6.7
September, 2020	5.6	4.8	5.2
October, 2020	8.5	8.4	8.5
November, 2020	15.1	16.0	16.8
December, 2020	18.3	17.2	17.3
January, 2021	1.0	1.1	1.1
US Census division			
Midwest	9.6	9.7	9.6
Northeast	10.8	11.1	10.4
South	44.0	42.1	45.8
West	33.0	2.6	2.6
Baseline Comorbidities			
<i>Gastrointestinal disorders</i>	30.4	28.0	32.9
<i>Skin disorder</i>	13.8	13.3	14.3
Atopic dermatitis	0.2	0.1	0.2
<i>Autoimmune disease</i>			
Systemic lupus erythematosus	0.7	0.2	1.3
Rheumatoid arthritis	1.7	1.0	2.5
Psoriasis, including psoriatic			
arthritis	0.7	0.7	0.7
Inflammatory bowel disease	0.2	0.2	0.2

Multiple sclerosis	0.5	0.3	0.8
Glomerulonephritis	0.4	0.4	0.3
Autoimmune thyroid disease	0.2	0.1	0.4
<i>Cancer</i>	9.2	9.5	8.9
Solid Tumors	7.0	6.9	7.0
Breast	1.2	0.0	2.4
Prostate	1.2	2.4	0.0
Lung	1.3	1.2	1.4
Other	4.8	4.8	4.8
Hematologic malignancies	3.2	3.5	2.8
Leukemia	0.8	1.1	0.5
Lymphoma	0.7	0.9	0.6
Multiple myeloma (MM)	0.4	0.4	0.3
Other	1.5	1.5	1.5
<i>Cardiovascular disease</i>	53.4	55.6	51.1
Coronary artery disease	13.5	16.6	10.2
Peripheral vascular disease	4.7	5.6	3.8
Cerebrovascular disease	3.8	3.8	3.8
Hypertension	49.5	51.1	47.8
Congestive heart failure	12.5	13.6	11.4
Atrial Fibrillation	10.7	12.5	8.8
<i>Chronic kidney disease</i>	16.5	18.5	14.4
Stage I	0.2	0.2	0.2
Stage II	1.2	1.5	0.9
Stage III	5.7	6.0	5.3
Stage IV	2.3	2.4	2.2
Stage V (end stage renal disease)	3.8	4.4	3.1
Unknown	14.7	16.7	12.7
<i>Chronic dialysis</i>	1.2	1.5	1.0
Hemodialysis	1.2	1.5	1.0
Peritoneal dialysis	0.0	0.0	0.0
<i>Chronic lung disease</i>	19.5	17.7	21.4
Asthma	8.3	5.5	11.4
Chronic obstructive pulmonary disease	12.4	12.8	11.9
Pulmonary fibrosis	1.3	1.5	1.1
<i>Diabetes mellitus</i>			
Type I	1.6	1.8	1.5
Type II, diabetic	29.7	31.1	28.2
Diabetes mellitus, unknown	2.3	2.6	2.1
<i>Human immunodeficiency virus</i>	1.7	2.3	1.1
<i>Liver disease</i>	3.0	3.5	2.5
Chronic hepatitis	0.8	1.0	0.6
Cirrhosis	2.4	2.8	1.9
Non-alcoholic steatohepatitis	0.5	0.5	0.6
<i>Major movement or cognitive disorder (excluding stroke)</i>	9.3	9.4	9.1
<i>Obstructive sleep apnea</i>	7.6	8.5	6.7

<i>Hospitalization with infection in the past year</i>	9.5	9.6	9.4
<i>Transplant history</i>	0.4	0.4	0.3

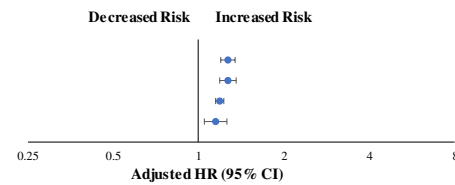
eTable 12: Selected Outcomes Percentage of US Adult Hospitalized COVID-19 Patients – Probable

Category	ICU Admission		ARDS/Respiratory Failure		IMV		All-Cause Mortality	
	N	%	N	%	N	%	N	%
Gender								
Male	14,553	18.59%	13,614	47.34%	14,553	15.64%	14,553	7.79%
Female	13,647	14.40%	12,724	39.34%	13,647	11.64%	13,647	5.84%
Age								
18-34	2,928	10.62%	2,829	25.49%	2,928	7.79%	2,928	1.64%
35-49	5,090	13.95%	4,887	38.02%	5,090	11.20%	5,090	2.99%
50-64	8,669	17.94%	8,084	46.96%	8,669	15.49%	8,669	5.29%
65+	11,513	18.19%	10,538	48.16%	11,513	14.97%	11,513	11.05%
Time Period								
Feb-20,Mar-20,Apr-20	5,468	27.82%	4,946	49.66%	5,468	23.30%	5,468	8.96%
May-20,Jun-20,Jul-20	7,104	14.65%	6,716	39.13%	7,104	13.02%	7,104	6.24%
Aug-20,Sept-20,Oct-20	5,878	13.13%	5,517	41.67%	5,878	10.99%	5,878	6.14%
Nov-20,Dec-20,Jan-21	9,700	13.56%	9,119	44.31%	9,700	10.33%	9,700	6.56%

S5 Figure. The Forest Plots of Model-adjusted Hazard Ratios among US Hospitalized Adult Patients with COVID-19 by Gender, by Age Group, and by Time Period – Probable Cohort

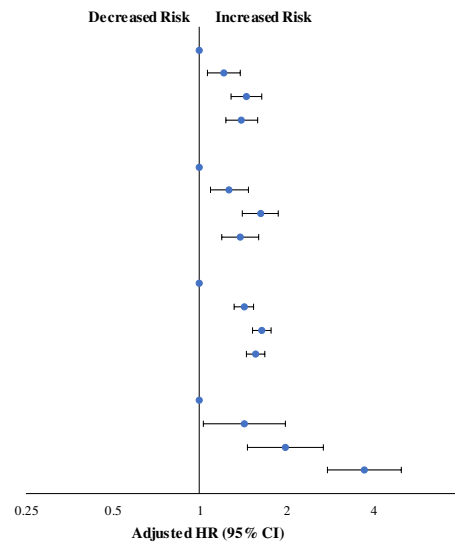
A) Gender

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
Male (Reference : Female)		
ICU Admission	1.27 (1.20-1.35)	<.0001
IMV	1.27 (1.19-1.36)	<.0001
ARDS/Respiratory Failure	1.19 (1.16-1.23)	<.0001
All-cause Mortality	1.15 (1.05-1.26)	0.0026



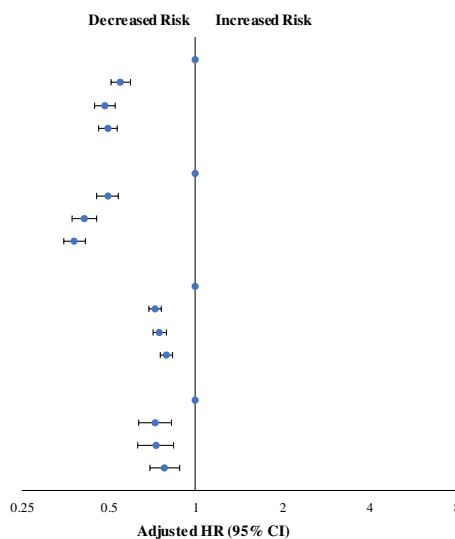
B) Age

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
ICU Admission		
18-34	1 (ref)	
35-49	1.22 (1.07-1.39)	0.0036
50-64	1.45 (1.29-1.64)	<.0001
65+	1.40 (1.24-1.58)	<.0001
IMV		
18-34	1 (ref)	
35-49	1.27 (1.09-1.48)	0.0026
50-64	1.63 (1.41-1.88)	<.0001
65+	1.38 (1.19-1.60)	<.0001
ARDS/Respiratory Failure		
18-34	1 (ref)	
35-49	1.42 (1.32-1.54)	<.0001
50-64	1.64 (1.53-1.77)	<.0001
65+	1.57 (1.45-1.69)	<.0001
All-cause Mortality		
18-34	1 (ref)	
35-49	1.43 (1.03-1.98)	0.0313
50-64	1.99 (1.47-2.69)	<.0001
65+	3.72 (2.77-4.99)	<.0001



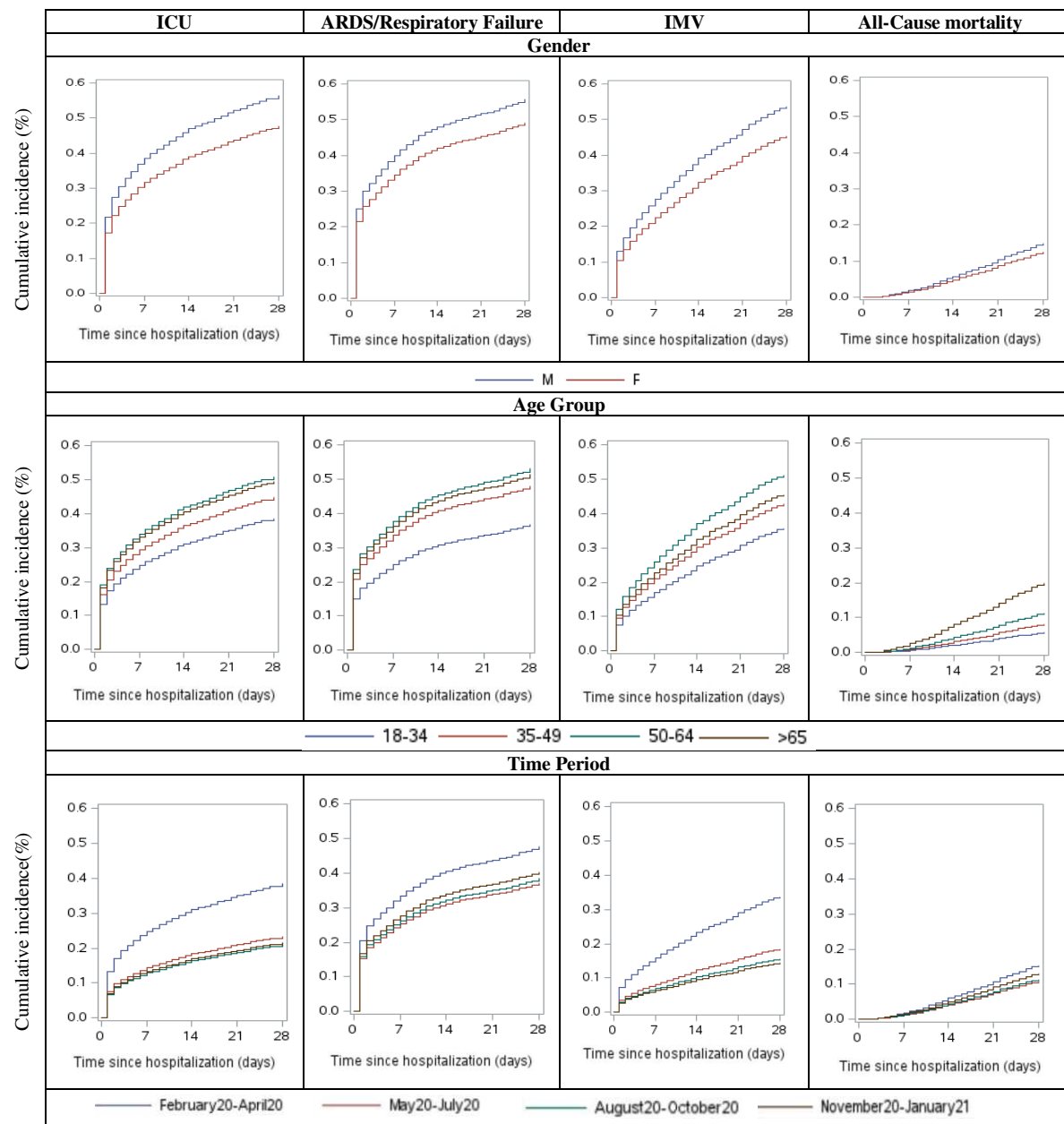
C) Time Period

Characteristics	Adjusted HR (95% CI)	Pr > ChiSq
ICU Admission		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.55 (0.51-0.60)	<.0001
Aug, 2020 - Oct, 2020	0.49 (0.45-0.53)	<.0001
Nov, 2020 - Jan, 2021	0.50 (0.46-0.54)	<.0001
IMV		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.50 (0.46-0.54)	<.0001
Aug, 2020 - Oct, 2020	0.41 (0.37-0.45)	<.0001
Nov, 2020 - Jan, 2021	0.38 (0.35-0.41)	<.0001
ARDS/Respiratory Failure		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.72 (0.69-0.76)	<.0001
Aug, 2020 - Oct, 2020	0.75 (0.71-0.79)	<.0001
Nov, 2020 - Jan, 2021	0.79 (0.76-0.83)	<.0001
All-cause Mortality		
Feb, 2020 - Apr, 2020	1 (ref)	
May, 2020 - Jul, 2020	0.72 (0.63-0.82)	<.0001
Aug, 2020 - Oct, 2020	0.73 (0.63-0.84)	<.0001
Nov, 2020 - Jan, 2021	0.78 (0.69-0.88)	<.0001



HR: the abbreviation of Hazard Ratio; ARDS: the abbreviation of acute respiratory distress syndrome; ICU: the abbreviation of intensive care unit; IMV: the abbreviation of invasive mechanical ventilation. Three separate Fine and Gray models were developed stratified by age group, gender, and time period; each model used the other two main categories of risk exposure (for example, gender and time period in the age group model) as covariates. The other covariates in each model were race, ethnicity, US region, hypertension, diabetes (Type I and II), active cancer, coronary artery disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnea.

S6 Figure. Model-adjusted Cumulative Incidence of Selected Outcomes among US Hospitalized Adult Patients with COVID-19 by Gender, by Age Group, and by Time Period – Probable Cohort



HR: the abbreviation of Hazard Ratio; ARDS: the abbreviation of acute respiratory distress syndrome; ICU: the abbreviation of intensive care unit; IMV: the abbreviation of invasive mechanical ventilation. Three separate Fine and Gray models were developed stratified by age group, gender, and time period; each model used the other two main categories of risk exposure (for example, gender and time period in the age group model) as covariates. The other covariates in each model were race, ethnicity, US region, hypertension, diabetes (Type I and II), active cancer, coronary artery disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease (COPD), asthma, and obstructive sleep apnea.