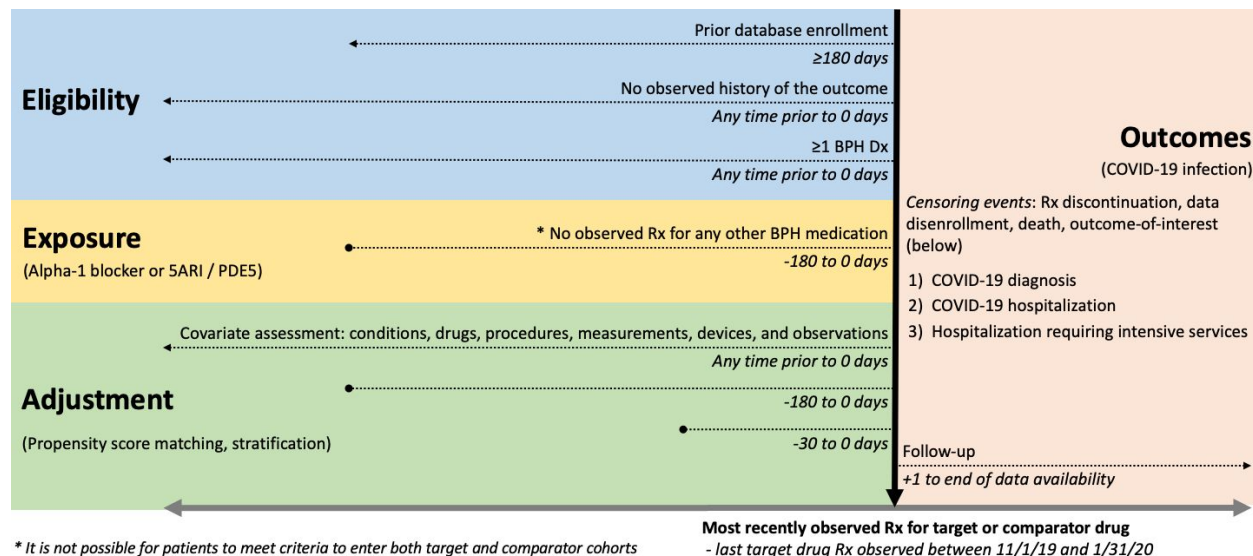


# Supplement to “Use of alpha-1 blockers and susceptibility to COVID-19 in patients with benign prostate hyperplasia: an international cohort study”

## Study design



Supplementary Figure 1. Alpha-1 blockers and susceptibility to COVID-19 study design schematic. We highlight eligibility criteria, exposure definitions, adjustment strategies, index date specification (horizontal black arrow) and outcome definitions and time-at-risk. Exposure involves prescriptions to drugs with RxNorm ingredients that map to medications indicated for treatment of BPH.

## Patient characteristics pre- and post-stratification

Supplementary Table 1: Baseline patient characteristics for Alpha-1 blocker (T) and 5ARI/PDE5 (C) prevalent-use in the SIDIAP, VA, CUIMC, OpenClaims, Optum DOD, and Optum EHR data sources. We report the proportion of use satisfying selected based-line characteristics and the standardized difference of population proportions (SDf) before and after stratification. Less extreme SDf through stratification suggest improved balance between patient cohorts through propensity score adjustment.

Characteristic	SIDIAP						VA						CUIMC					
	Before stratification N = 11,793 (T)			After stratification and 1,318 (C)			Before stratification N = 360,802 (T)			After stratification and 54,723 (C)			Before stratification N = 2,414 (T)			After stratification and 582 (C)		
	T (%)		Sdf	T (%)		C (%)	T (%)		C (%)	T (%)		Sdf	T (%)		C (%)	T (%)		C (%)
	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf
Age group																		
<25																		
25-29	0.0	<0.4		0.0	<0.3	-0.06	0.0	0.0		0.0	0.0		<0.2	0.0		<0.2	0.0	
30-34	0.0	<0.4	-0.05	0.0	<0.3	-0.04	0.1	0.0	0.02	0.0	0.0	0.01	0.2	<0.9	0.01	0.2	<0.9	0.04
35-39	0.0	<0.4	-0.04	0.0	<0.3	-0.04	0.1	0.0	0.04	0.1	0.0	0.03	0.5	<0.9	0.02	0.5	<0.9	0.04
40-44	0.3	0.0		0.3	0.0		0.3	0.1	0.05	0.3	0.1	0.03	0.5	<0.9	0.02	0.5	<0.9	0.04
45-49	1.1	0.5	0.06	1.1	0.7	0.04	0.8	0.3	0.07	0.7	0.6	0.02	1.1	<0.9	0.07	1.2	<0.9	0.12
50-54	3.2	3.0	0.17	3.0	1.7	0.08	2.1	0.7	0.11	1.9	1.7	0.01	3.0	2.1	0.06	3.0	1.9	0.08
55-59	7.5	3.0	0.21	7.1	7.4	-0.01	4.5	2.0	0.14	4.1	4.1	0.00	6.3	3.4	0.13	5.9	5.7	0.01
60-64	12.2	6.0	0.22	11.5	13.3	-0.05	8.5	4.7	0.16	8.0	8.2	0.00	12.3	3.6	0.32	10.5	11.8	-0.04
65-69	16.3	13.4	0.08	16.0	15.5	0.01	14.4	10.0	0.13	13.7	14.0	-0.01	16.2	12.2	0.12	15.5	14.3	0.03
70-74	19.2	16.8	0.06	19.0	19.4	-0.01	31.9	28.1	0.08	31.3	31.8	-0.01	18.6	19.6	-0.02	18.6	20.0	-0.04
75-79	17.7	19.2	-0.04	17.8	17.7	0.00	15.8	17.1	-0.04	16.0	15.7	0.01	16.1	18.9	-0.07	16.4	15.4	0.03
80-84	11.7	17.8	-0.17	12.6	11.7	0.03	9.1	12.9	-0.12	9.6	9.4	0.01	13.6	18.0	-0.12	14.5	15.2	-0.02
85-89	7.6	13.9	-0.20	8.3	7.6	0.03	7.8	13.8	-0.19	8.6	8.4	0.01	7.0	12.5	-0.18	8.1	9.1	-0.04
90-94	2.6	6.9	-0.20	3.0	3.5	-0.03	3.6	7.5	-0.17	4.1	4.3	-0.01	3.9	7.5	-0.16	4.3	5.0	-0.03
95+	0.4	1.1	-0.08	0.4	0.9	-0.06	1.1	2.5	-0.11	1.3	1.4	-0.02	0.9	1.0	-0.01	1.0	<0.9	0.02
Gender: female																		
Medical history: General																		
Acute respiratory disease	8.7	9.6	-0.03	8.8	8.7	0.00	6.6	5.3	0.06	6.4	6.3	0.00	7.2	3.9	0.14	6.6	6.3	0.01
Attention deficit hyperactivity disorder	0.1	<0.4	-0.03	0.1	0.5	-0.08	0.4	0.2	0.03	0.4	0.4	0.00	<0.2	<0.9	0.00	<0.2	<0.9	-0.02
Chronic liver disease	1.5	0.9	0.06	1.5	0.8	0.06	2.6	1.5	0.08	2.5	2.3	0.01	2.2	<0.9	0.13	1.9	2.0	0.00
Chronic obstructive lung disease	12.6	15.8	-0.09	12.9	13.8	-0.02	15.7	14.3	0.04	15.6	15.6	0.00	7.6	3.1	0.20	6.8	5.8	0.04
Crohn's disease	0.2	0.5	-0.06	0.2	0.6	-0.06	0.2	0.2	0.01	0.2	0.2	0.00	0.2	<0.9	0.02	0.2	<0.9	0.04
Dementia	2.8	5.1	-0.12	2.9	3.3	-0.02	3.9	6.0	-0.10	4.1	4.3	-0.01	4.7	3.3	0.07	4.5	5.3	-0.03
Depressive disorder	9.3	9.8	-0.02	9.4	9.4	0.00	18.8	14.2	0.13	18.2	18.0	0.01	8.4	4.3	0.17	7.7	5.3	0.10
Diabetes mellitus	24.1	23.8	0.01	24.3	23.9	0.01	32.8	31.0	0.04	32.5	32.8	0.00	24.6	15.1	0.24	22.4	22.8	-0.01
Gastroesophageal reflux disease	10.3	11.7	-0.04	10.4	12.2	-0.06	18.9	17.7	0.03	18.7	18.7	0.00	11.6	8.4	0.10	10.5	11.4	-0.03
Gastrointestinal hemorrhage	0.9	0.5	0.06	0.9	0.4	0.07	1.3	1.0	0.03	1.2	1.2	0.00	2.2	2.1	0.02	2.2	2.9	-0.04
Human immunodeficiency virus infection	0.3	0.4	-0.01	0.3	0.6	-0.04	0.5	0.4	0.01	0.5	0.5	0.00	2.7	1.4	0.09	2.5	4.1	-0.09
Hyperlipidemia	24.7	26.6	-0.04	24.8	25.2	-0.01	48.7	48.3	0.01	48.6	48.3	0.01	41.6	33.8	0.16	39.9	44.7	-0.10
Hypertensive disorder	55.0	58.8	-0.08	55.6	53.0	0.05	58.6	57.0	0.03	58.4	58.1	0.01	50.7	36.4	0.29	47.5	51.1	-0.07
Lesion of liver	1.1	0.8	0.04	1.1	1.0	0.01	2.1	1.3	0.06	2.0	1.8	0.01	2.9	<0.9	0.17	2.5	2.4	0.01
Obesity	28.6	27.2	0.03	28.5	28.1	0.01	12.3	8.8	0.11	11.8	11.7	0.00	7.3	4.3	0.13	6.7	6.2	0.02
Osteoarthritis	29.1	33.9	-0.10	29.6	29.0	0.01	18.3	16.5	0.05	18.1	18.1	0.00	16.2	11.7	0.13	14.8	13.8	0.03
Pneumonia	1.0	1.1	0.00	1.0	1.1	-0.01	2.2	2.0	0.01	2.1	2.1	0.00	6.0	2.7	0.16	5.3	3.9	0.07
Psoriasis	4.4	3.4	0.05	4.3	2.9	0.08	1.1	1.1	0.00	1.1	1.3	-0.01	1.1	0.9	0.03	1.0	1.2	-0.02
Renal impairment	14.4	18.7	-0.11	14.9	13.4	0.04	14.2	14.5	-0.01	14.2	14.2	0.00	22.4	13.9	0.22	20.4	21.1	-0.02
Rheumatoid arthritis	0.2	0.5	-0.05	0.2	0.5	-0.04	1.0	1.0	0.00	0.9	1.0	0.00	0.4	<0.9	0.01	0.4	<0.9	0.03
Schizophrenia	0.4	0.5	-0.03	0.4	0.6	-0.04	1.0	0.8	0.02	1.0	1.1	-0.01	0.4	<0.9	0.04	0.4	1.5	-0.12
Ulcerative colitis	0.6	0.8	-0.03	0.5	0.9	-0.04	0.4	0.4	0.00	0.4	0.4	-0.01	0.2	<0.9	0.02	<0.2	1.5	-0.15
Urinary tract infectious disease	5.7	5.9	-0.01	5.8	6.0	-0.01	3.0	3.1	0.00	3.0	3.1	0.00	8.8	7.2	0.06	8.3	9.7	-0.05
Viral hepatitis C	0.9	0.6	0.04	0.9	0.6	0.04	1.6	0.8	0.07	1.5	1.3	0.02	1.0	<0.9	0.03	0.9	2.0	-0.10
Visual system disorder	40.9	45.2	-0.09	41.5	40.9	0.01	34.1	33.8	0.00	34.0	34.4	-0.01	15.2	15.1	0.00	14.7	17.1	-0.07

(Continued)

Characteristic	SIDIAP						VA						CUIMC					
	Before stratification N = 11,793 (T) and 1,318 (C)			After stratification N = 360,802 (T) and 54,723 (C)			Before stratification N = 360,802 (T) and 54,723 (C)			After stratification N = 2,414 (T) and 582 (C)			Before stratification N = 2,414 (T) and 582 (C)			After stratification N = 2,414 (T) and 582 (C)		
	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF
Medical history: Cardiovascular disease																		
Atrial fibrillation	9.0	14.3	-0.17	9.5	9.7	0.00	11.4	14.4	-0.09	11.8	11.9	0.00	14.2	17.5	-0.09	14.8	16.7	-0.05
Cerebrovascular disease	3.0	3.9	-0.05	3.1	3.1	0.00	4.0	4.2	-0.01	4.0	3.9	0.00	8.4	6.7	0.06	7.8	9.9	-0.07
Coronary arteriosclerosis	0.0	<0.4	-0.02	0.0	<0.3	-0.01	17.8	20.1	-0.06	18.1	18.1	0.00	23.4	21.6	0.04	22.7	26.0	-0.08
Heart disease	34.4	42.9	-0.17	35.4	34.8	0.01	33.5	37.6	-0.08	34.1	34.0	0.00	43.4	39.5	0.08	42.5	44.6	-0.04
Heart failure	4.2	8.3	-0.17	4.5	5.0	-0.02	7.7	8.6	-0.03	7.8	7.9	0.00	13.3	10.8	0.07	12.6	14.4	-0.05
Ischemic heart disease	10.6	12.8	-0.07	10.9	10.7	0.00	6.4	6.6	-0.01	6.5	6.4	0.00	9.2	7.2	0.07	8.4	11.8	-0.11
Peripheral vascular disease	5.4	6.2	-0.03	5.5	5.5	0.00	5.4	5.6	-0.01	5.5	5.4	0.00	5.9	5.3	0.03	5.5	8.9	-0.13
Pulmonary embolism	0.7	1.6	-0.08	0.8	1.7	-0.09	0.7	0.7	0.00	0.7	0.7	0.00	1.2	1.2	0.00	1.0	1.7	-0.05
Venous thrombosis	1.3	1.2	0.01	1.3	1.4	-0.01	1.3	1.4	0.00	1.3	1.4	-0.01	2.6	<0.9	0.17	2.4	<0.9	0.15
Medical history: Neoplasms																		
Hematologic neoplasm	0.8	0.8	0.00	0.8	0.6	0.03	1.6	1.7	-0.01	1.6	1.6	0.00	3.5	2.2	0.07	3.3	3.1	0.01
Malignant lymphoma	0.7	0.5	0.03	0.7	0.3	0.05	0.9	1.0	-0.01	1.0	0.9	0.00	2.4	2.6	-0.01	2.3	3.6	-0.08
Malignant neoplasm of anorectum	0.6	0.5	0.02	0.6	0.5	0.01	0.2	0.1	0.01	0.2	0.1	0.01	0.3	0.0	0.00	0.3	0.0	0.00
Malignant neoplasm of breast	18.4	19.4	-0.03	18.5	17.5	0.03	12.9	11.5	0.04	12.7	12.3	0.01	20.9	15.6	0.14	20.0	19.8	0.01
Malignant tumor of breast	0.1	<0.4	-0.01	0.1	<0.3	0.01	0.0	0.0	0.00	0.0	0.0	0.00	<0.2	<0.9	-0.03	<0.2	<0.9	-0.08
Malignant tumor of colon	2.2	2.2	0.00	2.2	1.9	0.02	0.4	0.4	0.00	0.4	0.4	0.00	0.9	<0.9	0.03	0.8	1.0	-0.01
Malignant tumor of lung	0.2	<0.4	-0.01	0.2	<0.3	-0.01	0.8	0.7	0.01	0.8	0.7	0.00	1.4	0.0	0.00	1.3	0.0	0.00
Malignant tumor of urinary bladder	2.8	3.8	-0.05	2.9	2.3	0.04	0.9	1.0	0.00	0.9	1.0	0.00	2.2	2.9	-0.04	2.4	3.6	-0.07
Primary malignant neoplasm of prostate	4.1	1.7	0.15	3.9	2.7	0.07	5.2	3.2	0.10	4.9	4.6	0.01	7.2	4.8	0.10	7.0	5.0	0.09
Medication use																		
Antibacterials for systemic use	28.5	27.8	0.01	28.5	28.1	0.01	24.9	22.2	0.06	24.5	24.4	0.00	42.9	34.8	0.16	41.4	45.5	-0.08
Antidepressants	15.4	18.3	-0.08	15.6	15.2	0.01	37.1	29.9	0.15	36.1	35.9	0.00	19.1	15.6	0.09	18.3	19.1	-0.02
Antiepileptics	10.0	9.1	0.03	10.1	9.6	0.02	29.1	24.1	0.11	28.5	28.1	0.01	20.2	12.5	0.21	18.8	18.6	0.00
Antiinflammatory and antirheumatic products	22.0	17.6	0.11	21.5	21.5	0.00	43.6	37.2	0.13	42.7	42.8	0.00	20.0	15.1	0.13	18.8	20.3	-0.04
Antineoplastic agents	1.2	1.1	0.01	1.2	0.9	0.03	4.8	4.5	0.01	4.8	4.7	0.00	5.0	3.3	0.09	4.5	6.1	-0.07
Antipsoriaties	2.1	1.9	0.02	2.1	1.6	0.04	1.4	1.4	0.00	1.4	1.4	0.00	1.9	0.9	0.09	1.7	<0.9	0.11
Antithrombotic agents	37.7	45.2	-0.15	38.7	37.2	0.03	39.6	40.1	-0.01	39.7	39.7	0.00	42.1	29.3	0.27	39.2	41.1	-0.04
Drugs for acid related disorders	47.7	48.9	-0.03	47.9	45.0	0.06	48.3	44.9	0.07	47.8	47.8	0.00	35.4	27.4	0.17	33.3	36.8	-0.07
Drugs for obstructive airway diseases	23.0	26.3	-0.08	23.3	23.9	-0.01	41.6	37.3	0.09	41.1	40.8	0.00	21.2	17.2	0.10	20.2	20.7	-0.01
Drugs used in diabetes	23.8	23.4	0.01	24.0	23.3	0.02	32.3	29.7	0.06	31.9	32.1	0.00	21.9	14.6	0.19	20.2	20.8	-0.01
Immunosuppressants	2.0	1.5	0.04	2.0	1.7	0.02	3.5	3.0	0.03	3.4	3.3	0.00	9.1	3.8	0.22	8.1	5.4	0.11
Lipid modifying agents	43.8	46.7	-0.06	44.1	43.1	0.02	68.3	68.0	0.01	68.3	68.1	0.00	49.6	41.7	0.16	47.9	54.6	-0.14
Opoids	11.9	12.4	-0.01	11.9	12.7	-0.02	15.2	11.6	0.11	14.7	14.6	0.00	22.7	14.2	0.22	20.4	20.9	-0.01
Psycholeptics	28.8	30.4	-0.04	29.0	29.5	-0.01	24.0	18.7	0.13	23.2	23.0	0.00	24.2	17.7	0.16	22.5	23.6	-0.03
Psychostimulants, ADHD agents and nootropics	3.3	3.9	-0.03	3.4	3.4	0.00	1.2	0.8	0.04	1.1	1.1	0.00	2.4	1.5	0.06	2.3	1.7	0.05
Race																		
American Indian or Alaska Native							0.6	0.6	0.01	0.6	0.6	0.00	<0.2	0.0		<0.2	0.0	
Asian							0.6	0.7	-0.01	0.6	0.6	0.00	2.2	1.5	-0.03	2.1	1.3	-0.01
Black or African American							16.1	12.2	0.11	15.5	15.4	0.00	8.3	5.1	0.13	7.6	9.3	-0.06
Native Hawaiian or Other Pacific Islander							0.7	0.7	0.00	0.7	0.7	0.00	1.1	<0.9	0.09	1.0	<0.9	0.08
White							76.1	79.7	-0.09	76.6	76.7	0.00	40.0	37.2	0.06	39.8	40.9	-0.02
Other or unknown							5.9	6.2	-0.01	6.0	6.0	0.00	2.0	2.7	-0.05	2.0	1.5	0.04
Ethnicity																		
Hispanic or Latino							5.2	5.4	-0.01	5.2	5.3	0.00	15.9	9.9	0.18	14.5	13.3	0.04
Not Hispanic nor Latino							92.3	91.9	0.01	92.2	92.2	0.00	38.9	36.5	0.05	38.6	37.8	0.02

Characteristic	OpenClaims						Optum DOD						Optum EHR					
	Before stratification N = 1,995,594 (T) and 366,734 (C)			After stratification N = 241,842 (T) and 39,032 (C)			Before stratification N = 241,842 (T) and 39,032 (C)			After stratification N = 15,275 (T) and 2,136 (C)			Before stratification N = 15,275 (T) and 2,136 (C)			After stratification N = 15,275 (T) and 2,136 (C)		
	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf	T (%)	C (%)	Sdf
Age group																		
<25	0.1	0.1	0.00	0.1	0.1	0.00	0.0	0.0	0.00	0.0	0.0	0.00	0.0	0.0	0.00	0.0	0.0	0.0
25-29	0.1	0.1	0.00	0.1	0.1	0.00	0.0	0.0	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
30-34	0.1	0.1	-0.01	0.1	0.1	-0.01	0.0	0.0	0.00	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0
35-39	0.2	0.2	-0.01	0.2	0.2	0.00	0.1	0.1	0.01	0.1	0.1	0.01	0.1	0.1	0.00	0.1	<0.2	0.00
40-44	0.4	0.4	0.01	0.4	0.4	0.01	0.3	0.2	0.03	0.3	0.2	0.03	0.6	0.4	0.02	0.5	0.3	0.04
45-49	1.2	0.8	0.04	1.2	1.0	0.01	0.8	0.5	0.04	0.8	0.6	0.02	1.6	0.7	0.08	1.5	0.7	0.07
50-54	3.1	1.8	0.08	2.9	2.7	0.01	2.0	1.1	0.08	1.9	1.7	0.01	4.0	2.2	0.10	3.9	2.6	0.07
55-59	7.0	4.1	0.13	6.6	6.2	0.02	4.9	2.6	0.12	4.5	4.4	0.01	9.0	5.3	0.14	8.6	8.0	0.02
60-64	12.2	8.1	0.14	11.6	11.3	0.01	8.5	5.3	0.12	8.0	8.0	0.00	15.3	10.2	0.16	14.6	14.8	-0.01
65-69	17.4	13.9	0.10	16.8	16.9	0.00	16.6	12.6	0.11	16.0	16.3	-0.01	17.8	14.3	0.10	17.4	17.7	-0.01
70-74	19.2	19.2	0.00	19.2	19.1	0.00	21.9	20.6	0.03	21.7	21.9	0.00	17.5	17.5	0.01	17.5	20.3	-0.07
75-79	16.7	19.2	-0.07	17.1	17.4	-0.01	19.7	21.9	-0.05	20.0	19.9	0.00	14.8	16.8	-0.05	15.1	15.1	0.00
80-84	17.1	24.1	-0.18	18.1	18.7	-0.02	13.3	17.2	-0.11	13.9	13.9	0.00	9.9	15.1	-0.16	10.7	10.3	0.01
85-89	5.3	7.8	-0.10	5.7	5.8	0.00	9.6	14.5	-0.15	10.3	10.4	0.00	9.0	17.4	-0.25	10.1	10.0	0.00
90-94							2.3	3.5	-0.07	2.4	2.5	-0.01						
95+																		
Gender: female																		
Medical history: General																		
Acute respiratory disease	7.1	5.8	0.05	6.9	6.9	0.00	13.2	11.3	0.06	12.9	13.1	-0.01	18.4	15.1	0.09	17.9	18.4	-0.01
Attention deficit hyperactivity disorder	0.3	0.2	0.02	0.3	0.3	0.00	0.5	0.3	0.04	0.5	0.4	0.01	0.7	0.7	0.01	0.7	0.9	-0.02
Chronic liver disease	0.7	0.4	0.05	0.7	0.6	0.01	1.3	0.8	0.05	1.3	1.2	0.00	2.9	1.6	0.09	2.8	2.6	0.01
Chronic obstructive lung disease	7.0	5.4	0.07	6.8	6.7	0.00	13.8	11.0	0.08	13.4	13.6	-0.01	17.7	13.9	0.10	17.2	17.3	0.00
Crohn's disease	0.2	0.2	0.01	0.2	0.2	0.00	0.3	0.3	0.01	0.3	0.3	0.00	0.5	0.4	0.02	0.5	0.5	0.00
Dementia	1.8	2.3	-0.03	1.9	1.9	0.00	5.2	6.3	-0.04	5.4	5.5	0.00	3.7	4.4	-0.03	3.8	3.3	0.03
Depressive disorder	4.6	3.4	0.06	4.5	4.3	0.01	11.6	9.0	0.09	11.3	11.2	0.00	15.2	11.1	0.12	14.6	15.3	-0.02
Diabetes mellitus	19.3	16.0	0.09	18.8	18.6	0.00	32.4	28.7	0.08	31.9	32.1	0.00	31.9	24.9	0.16	31.0	33.6	-0.06
Gastroesophageal reflux disease	6.7	5.6	0.05	6.6	6.4	0.01	17.2	15.2	0.06	16.9	17.1	-0.01	25.6	21.7	0.09	25.0	27.0	-0.04
Gastrointestinal hemorrhage	1.1	1.0	0.02	1.1	1.1	0.00	2.2	2.0	0.02	2.2	2.3	-0.01	3.3	2.6	0.04	3.3	3.1	0.01
Human immunodeficiency virus infection	0.3	0.3	0.01	0.3	0.3	0.00	0.4	0.4	0.01	0.4	0.5	-0.02	0.7	0.7	0.00	0.6	0.9	-0.03
Hyperlipidemia	29.8	28.9	0.02	29.7	29.6	0.00	60.8	61.2	-0.01	60.8	61.1	0.00	62.0	61.5	0.01	61.8	62.8	-0.02
Hypertensive disorder	38.2	34.8	0.07	37.7	37.6	0.00	66.9	64.5	0.05	66.6	66.8	0.00	66.2	63.5	0.06	65.8	67.1	-0.03
Lesion of liver	0.8	0.5	0.04	0.7	0.7	0.01	1.4	0.9	0.04	1.3	1.2	0.00	2.6	1.3	0.09	2.5	1.9	0.04
Obesity	3.9	2.7	0.07	3.7	3.5	0.01	11.9	8.7	0.10	11.5	11.4	0.00	19.4	12.6	0.19	18.5	20.7	-0.05
Osteoarthritis	13.5	11.3	0.07	13.2	12.9	0.01	27.0	23.7	0.08	26.6	26.7	0.00	26.9	22.2	0.11	26.3	27.8	-0.03
Pneumonia	2.0	1.7	0.02	2.0	1.9	0.00	3.9	3.3	0.03	3.8	4.0	-0.01	6.3	5.6	0.03	6.1	6.2	0.00
Psoriasis	0.6	0.5	0.01	0.6	0.6	0.00	1.2	1.0	0.01	1.2	1.2	0.00	1.4	1.2	0.01	1.3	1.4	0.00
Renal impairment	11.2	9.7	0.05	11.1	10.8	0.01	22.4	21.2	0.03	22.3	22.3	0.00	23.7	21.6	0.05	23.5	24.2	-0.02
Rheumatoid arthritis	0.5	0.4	0.01	0.5	0.5	0.00	1.1	0.9	0.02	1.1	1.1	0.00	1.4	1.0	0.04	1.4	1.4	0.00
Schizophrenia	0.3	0.1	0.03	0.2	0.2	0.01	0.5	0.3	0.04	0.4	0.4	0.01	0.5	<0.2	0.07	0.5	0.3	0.03
Ulcerative colitis	0.2	0.2	0.00	0.2	0.2	-0.01	0.4	0.4	-0.01	0.4	0.5	-0.01	0.6	0.5	0.01	0.6	0.6	-0.01
Urinary tract infectious disease	4.3	3.6	0.04	4.2	4.1	0.00	8.1	7.1	0.04	8.0	7.9	0.00	6.7	5.0	0.07	6.5	5.3	0.05
Viral hepatitis C	0.4	0.2	0.05	0.4	0.3	0.02	0.7	0.3	0.06	0.7	0.6	0.02	1.3	0.6	0.07	1.2	0.8	0.04
Visual system disorder	15.2	16.7	-0.04	15.4	15.8	-0.01	34.5	38.1	-0.07	35.0	34.9	0.00	16.0	15.7	0.01	15.9	17.0	-0.03

(Continued)

Characteristic	OpenClaims						Optum DOD						Optum EHR					
	Before stratification N = 1,995,594 (T) and 366,734 (C)			After stratification			Before stratification N = 241,842 (T) and 39,032 (C)			After stratification			Before stratification N = 15,275 (T) and 2,136 (C)			After stratification		
	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF	T (%)	C (%)	SDF
Medical history: Cardiovascular disease																		
Atrial fibrillation	7.5	8.6	-0.04	7.7	7.8	0.00	14.0	16.0	-0.05	14.3	14.4	0.00	16.4	20.7	-0.11	16.9	16.8	0.00
Cerebrovascular disease	3.3	3.2	0.00	3.3	3.3	0.00	7.4	7.3	0.00	7.4	7.4	0.00	7.6	7.4	0.01	7.6	8.2	-0.02
Coronary arteriosclerosis	11.5	11.3	0.01	11.5	11.7	-0.01	23.6	23.4	0.00	23.5	23.7	0.00	27.9	26.1	0.04	27.8	27.8	0.00
Heart failure	23.5	23.7	0.00	23.5	23.8	-0.01	41.8	42.5	-0.01	41.9	42.1	0.00	47.8	47.9	0.00	47.8	48.3	-0.01
Heart disease	5.7	5.3	0.01	5.6	5.6	0.00	11.4	10.8	0.02	11.4	11.5	0.00	14.0	13.0	0.03	13.9	14.2	-0.01
Ischemic heart disease	4.0	3.6	0.03	4.0	4.0	0.00	10.0	9.2	0.02	9.9	9.9	0.00	14.5	12.7	0.05	14.3	15.4	-0.03
Peripheral vascular disease	4.0	3.5	0.03	3.9	3.9	0.00	11.4	10.2	0.04	11.2	11.3	0.00	10.6	9.8	0.03	10.4	12.7	-0.07
Pulmonary embolism	0.5	0.5	0.00	0.5	0.5	0.00	0.9	1.0	-0.01	0.9	1.0	-0.01	1.5	1.1	0.04	1.5	1.3	0.01
Venous thrombosis	0.9	0.9	0.00	0.9	0.9	0.00	1.8	1.9	-0.01	1.9	1.9	0.00	2.3	2.5	-0.01	2.3	3.2	-0.06
Medical history: Neoplasms																		
Hematologic neoplasm	1.2	1.2	0.00	1.2	1.2	0.00	2.0	2.0	0.00	2.0	1.9	0.00	3.3	3.1	0.01	3.2	3.3	0.00
Malignant lymphoma	0.7	0.8	-0.01	0.8	0.8	0.00	1.1	1.2	-0.01	1.1	1.1	0.00	1.5	1.7	-0.01	1.6	1.6	0.00
Malignant neoplasm of anorectum	0.2	0.1	0.02	0.2	0.2	0.01	0.3	0.2	0.02	0.3	0.2	0.01	0.5	0.2	0.04	0.5	0.3	0.03
Malignant neoplastic disease	11.1	9.7	0.04	10.9	10.7	0.01	17.8	16.9	0.03	17.7	17.3	0.01	19.7	18.4	0.03	19.5	19.9	-0.01
Malignant tumor of breast	0.0	0.0	0.00	0.0	0.0	0.00	0.1	0.0	0.01	0.1	0.0	0.01	0.1	<0.2	0.00	0.1	<0.2	0.01
Malignant tumor of colon	0.4	0.3	0.01	0.4	0.4	0.00	0.7	0.6	0.02	0.7	0.6	0.01	0.8	0.7	0.01	0.8	0.5	0.04
Malignant tumor of lung	0.5	0.4	0.01	0.5	0.5	0.00	0.8	0.6	0.02	0.8	0.7	0.01	1.4	0.9	0.04	1.3	1.2	0.01
Malignant tumor of urinary bladder	0.9	0.9	0.00	0.9	0.9	0.00	1.3	1.7	-0.03	1.4	1.5	-0.01	2.0	2.6	-0.04	2.1	2.8	-0.05
Primary malignant neoplasm of prostate	4.8	2.9	0.10	4.6	4.2	0.02	7.3	4.8	0.11	7.0	6.7	0.01	5.8	3.0	0.14	5.5	4.7	0.04
Medication use																		
Antibacterials for systemic use	43.9	40.5	0.07	43.4	43.3	0.00	42.1	38.4	0.08	41.6	41.6	0.00	49.4	42.3	0.14	48.5	48.8	-0.01
Antidepressants	24.0	19.6	0.11	23.3	23.4	0.00	24.3	20.4	0.09	23.8	24.1	-0.01	32.1	26.4	0.13	31.3	33.1	-0.04
Antiepileptics	18.9	14.3	0.12	18.2	18.0	0.01	19.8	15.3	0.12	19.2	19.4	-0.01	26.8	19.3	0.18	25.7	28.2	-0.06
Antiinflammatory and antirheumatic products	26.0	19.6	0.15	25.0	24.6	0.01	20.7	16.2	0.11	20.1	19.7	0.01	33.0	25.1	0.17	31.8	34.3	-0.05
Antineoplastic agents	5.5	5.4	0.00	5.5	5.6	0.00	4.0	3.9	0.01	4.0	4.0	0.00	5.2	5.3	-0.01	5.1	5.3	-0.01
Antipsoriatics	1.0	0.9	0.01	1.0	1.0	0.00	1.0	0.8	0.02	1.0	0.9	0.00	1.6	1.0	0.06	1.6	1.2	0.03
Antithrombotic agents	25.5	24.8	0.01	25.4	25.5	0.00	24.7	25.1	-0.01	24.8	25.1	-0.01	61.2	59.7	0.03	60.9	62.6	-0.04
Drugs for acid related disorders	32.0	27.6	0.10	31.3	31.4	0.00	31.2	28.2	0.06	30.8	31.0	0.00	52.2	46.1	0.12	51.4	53.6	-0.04
Drugs for obstructive airway diseases	31.7	27.7	0.09	31.1	31.0	0.00	23.6	19.6	0.10	23.0	23.3	-0.01	44.7	36.6	0.17	43.6	44.0	-0.01
Drugs used in diabetes	26.1	21.5	0.11	25.5	25.4	0.00	28.0	24.2	0.09	27.5	27.8	-0.01	32.5	24.7	0.17	31.5	34.3	-0.06
Immunosuppressants	2.8	2.3	0.03	2.8	2.7	0.00	2.8	2.3	0.03	2.7	2.7	0.00	4.8	3.5	0.07	4.7	4.1	0.03
Lipid modifying agents	61.5	61.9	-0.01	61.6	62.2	-0.01	65.3	66.7	-0.03	65.5	65.8	-0.01	67.0	66.7	0.00	66.9	69.1	-0.05
Opioids	18.8	13.6	0.14	18.0	17.4	0.02	19.0	14.0	0.13	18.3	18.0	0.01	32.6	24.8	0.17	31.3	34.1	-0.06
Psycholeptics	19.2	16.2	0.08	18.8	18.7	0.00	20.2	16.9	0.08	19.7	19.7	0.00	38.4	30.2	0.17	37.2	38.6	-0.03
Psychostimulants, ADHD agents and nootropics	1.8	1.4	0.03	1.7	1.8	0.00	1.3	0.8	0.05	1.2	1.2	0.00	3.0	2.2	0.06	2.9	3.3	-0.02
Race																		
American Indian or Alaska Native																		
Asian							1.3	1.6	-0.02	1.3	1.3	0.00	1.3	1.6	-0.02	1.3	1.5	-0.02
Black or African American							8.5	5.5	0.12	8.2	8.2	0.00	8.5	5.5	0.12	8.2	7.1	0.04
Native Hawaiian or Other Pacific Islander																		
White							83.8	88.0	-0.12	84.3	85.1	-0.02						
Other or unknown																		
Ethnicity																		
Hispanic or Latino							3.9	3.2	0.04	3.8	3.8	0.00						
Not Hispanic nor Latino							86.5	87.9	-0.04	86.6	86.3	0.01						

## Cohort and exposure definitions in OMOP Common Data Model

### Exposures

#### 1. Alpha-blockers

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
924566	tamsulosin	Drug	RxNorm	NO	YES	NO
930021	alfuzosin	Drug	RxNorm	NO	YES	NO
1341238	terazosin	Drug	RxNorm	NO	YES	NO
1350489	prazosin	Drug	RxNorm	NO	YES	NO
1363053	doxazosin	Drug	RxNorm	NO	YES	NO
19012925	silodosin	Drug	RxNorm	NO	YES	NO

#### 2. 5-alpha reductase inhibitors / phosphodiesterase type 5 inhibitor (indicated for BPH)

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
989482	dutasteride	Drug	RxNorm	NO	YES	NO
996416	finasteride	Drug	RxNorm	NO	YES	NO
1336926	tadalafil	Drug	RxNorm	NO	YES	NO

#### 3. BPH

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
198803	Benign prostatic hyperplasia	Condition	SNOMED	NO	YES	NO

### Outcome Cohort

This section documents the outcome cohort definitions. We consider

- COVID-19 diagnosis or SARS-CoV-2 positive test with no required prior observation
- Hospitalization with a COVID-19 diagnosis record or SARS-CoV-2 positive test with no required prior observation

- Hospitalization and requiring intensive services with a SARS-CoV-2 positive test with no required prior observation

Below are their complete specifications.

[COVID ID133 V1] Persons with a COVID-19 diagnosis or a SARS-CoV-2 positive test with no required prior observation

#### Initial Event Cohort

People having any of the following:

- a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>2</sup>
  - occurrence start is after 2019-12-01
- a measurement of SARS-CoV-2 test measurement<sup>3</sup>
  - occurrence start is after 2019-12-01
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- an observation of SARS-CoV-2 test measurement<sup>3</sup>
  - occurrence start is after 2019-12-01
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- a condition occurrence of COVID-19 conditions<sup>1</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**

#### End Date Strategy

#### Date Offset Exit Criteria

This cohort definition end date will be the index event's start date plus 1 days

#### Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

#### 1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO
4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO
37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

#### 2. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

### 3. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO
37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO

[COVID ID135 V1] Persons hospitalized with a COVID-19 diagnosis record or a SARS-CoV-2 positive test with no required prior observation

#### Initial Event Cohort

People having any of the following:

- a visit occurrence of Inpatient Visit<sup>2</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **all events per person.**

For people matching the Primary Events, include:

Having any of the following criteria:

- at least 1 occurrences of a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>3</sup>
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of a measurement of SARS-CoV-2 test measurement<sup>4</sup>
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of an observation of SARS-CoV-2 test measurement<sup>4</sup>
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of a condition occurrence of COVID-19 conditions<sup>1</sup>
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date

Limit cohort of initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**



## End Date Strategy

### Date Offset Exit Criteria

This cohort definition end date will be the index event's end date plus 0 days

### Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

#### 1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO
4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO
37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

#### 2. Inpatient Visit

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
262	Emergency Room and Inpatient Visit	Visit	Visit	NO	YES	NO
9201	Inpatient Visit	Visit	Visit	NO	YES	NO

#### 3. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

#### 4. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO
37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO

[COVID ID137 V1] Persons hospitalized and requiring intensive services with a COVID-19 diagnosis record or a SARS-CoV-2 positive test with no required prior observation

#### Initial Event Cohort

People having any of the following:

- a procedure of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- a condition occurrence of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- an observation of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- a procedure of tracheostomy<sup>7</sup>
  - occurrence start is after 2019-12-01
- a procedure of Extracorporeal membrane oxygenation (ECMO) procedure<sup>2</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **all events per person.**

For people matching the Primary Events, include:

Having all of the following criteria:

- at least 1 occurrences of a visit occurrence of Inpatient Visit<sup>3</sup>
  - Having any of the following criteria:
    - at least 1 occurrences of a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>5</sup>
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of a measurement of SARS-CoV-2 test measurement<sup>6</sup>
      - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of an observation of SARS-CoV-2 test measurement<sup>6</sup>
      - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of a condition occurrence of COVID-19 conditions<sup>1</sup>
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- where event starts between all days Before and 0 days After index start date and event ends between 0 days Before and all days After index start date

Limit cohort of initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**

#### End Date Strategy

### Date Offset Exit Criteria

This cohort definition end date will be the index event's end date plus 0 days

### Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

#### 1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO
4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO
37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

#### 2. Extracorporeal membrane oxygenation (ECMO) procedure

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
1531630	Extracorporeal Oxygenation, Membrane, Peripheral Venovenous	Procedure	ICD10PCS	NO	NO	NO
1531631	Extracorporeal Oxygenation, Membrane, Peripheral Venovenous	Procedure	ICD10PCS	NO	NO	NO
1531632	Extracorporeal Oxygenation, Membrane, Central	Procedure	ICD10PCS	NO	NO	NO
2002247	Extracorporeal membrane oxygenation [ECMO]	Procedure	ICD9Proc	NO	YES	NO
2787820	Extracorporeal Supersaturated Oxygenation, Intermittent	Procedure	ICD10PCS	NO	NO	NO
2787821	Extracorporeal Hyperbaric Oxygenation, Continuous	Procedure	ICD10PCS	NO	NO	NO

4052536	Extracorporeal membrane oxygenation	Procedure	SNOMED	NO	YES	NO
4338595	Cardiac support using extracorporeal membrane oxygenation circuitry	Procedure	SNOMED	NO	NO	NO
44515635	Extracorporeal membrane oxygenation	Procedure	OPCS4	NO	YES	NO
44811012	Fluoroscopy guided percutaneous insertion of cannula for extracorporeal membrane oxygenation	Procedure	SNOMED	NO	NO	NO

### 3. Inpatient Visit

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
262	Emergency Room and Inpatient Visit	Visit	Visit	NO	YES	NO
9201	Inpatient Visit	Visit	Visit	NO	YES	NO

### 4. Mechanical ventilation

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
765576	Orotracheal intubation using bougie device	Procedure	SNOMED	NO	YES	NO
2108641	Glossectomy; complete or total, with or without tracheostomy, without radical neck dissection	Procedure	CPT4	YES	YES	NO
2108642	Glossectomy; complete or total, with or without tracheostomy, with unilateral radical neck dissection	Procedure	CPT4	YES	YES	NO
2108681	Patient receiving care in the intensive care unit (ICU) and receiving mechanical ventilation, 24 hours or less (CRIT)	Observation	CPT4	NO	YES	NO
2788036	Respiratory Ventilation, Less than 24 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO

2788037	Respiratory Ventilation, 24-96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788038	Respiratory Ventilation, Greater than 96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
4006318	Respiratory assist, manual	Procedure	SNOMED	YES	YES	NO
4021786	Fear of disconnection from ventilator	Condition	SNOMED	YES	YES	NO
4031379	Artificial ventilation finding	Condition	SNOMED	YES	YES	NO
4072633	Weaning from mechanically assisted ventilation	Procedure	SNOMED	NO	YES	NO
4074663	Diaphragmatic augmentation	Procedure	SNOMED	YES	YES	NO
4080957	Endotracheal respiratory assistance	Procedure	SNOMED	NO	YES	NO
4107247	Inhalation anesthesia, machine system, semi-closed, no rebreathing of primary agent	Procedure	SNOMED	YES	YES	NO
4168966	Endotracheal tube present	Observation	SNOMED	NO	YES	NO
4219858	Problem with patient ventilator	Observation	SNOMED	NO	YES	NO
4230167	Artificial respiration	Procedure	SNOMED	NO	YES	NO
4232550	Home visit for mechanical ventilation care	Observation	SNOMED	NO	YES	NO
4232891	Mechanical ventilation response	Observation	SNOMED	YES	YES	NO
4235361	Hyperventilation therapy for traumatic brain injury	Procedure	SNOMED	NO	YES	NO
4237618	Ventilator care	Observation	SNOMED	NO	YES	NO
4251737	Ventilator care management	Procedure	SNOMED	NO	YES	NO
4254108	Resuscitation with artificial respiration	Procedure	SNOMED	YES	YES	NO

4254905	Ventilator care education	Procedure	SNOMED	YES	YES	NO
4259233	Ventilator care assessment	Procedure	SNOMED	YES	YES	NO
4332501	Management of noninvasive mechanical ventilation	Procedure	SNOMED	NO	YES	NO
4348300	Expired air ventilation	Procedure	SNOMED	YES	YES	NO
4353715	Ventilator finding	Observation	SNOMED	YES	YES	NO
37116689	Insertion of endotracheal ventilation catheter	Procedure	SNOMED	NO	YES	NO
37206832	Mechanical insufflation exsufflation	Procedure	SNOMED	NO	YES	NO
40481547	Dependence on ventilator	Condition	SNOMED	NO	YES	NO
40487536	Intubation of respiratory tract	Procedure	SNOMED	NO	YES	NO
42738852	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; first day	Procedure	CPT4	NO	YES	NO
42738853	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; subsequent days	Procedure	CPT4	NO	YES	NO
44509482	Other specified ventilation support	Procedure	OPCS4	NO	YES	NO
44791135	Ventilatory support	Procedure	SNOMED	NO	YES	NO
44808555	Provision of mechanical ventilator	Procedure	SNOMED	YES	YES	NO
45887795	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing	Procedure	CPT4	NO	YES	NO

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
765576	Orotracheal intubation using bougie device	Procedure	SNOMED	NO	YES	NO
2108641	Glossectomy; complete or total, with or without tracheostomy, without radical neck dissection	Procedure	CPT4	YES	YES	NO
2108642	Glossectomy; complete or total, with or without tracheostomy, with unilateral radical neck dissection	Procedure	CPT4	YES	YES	NO
2108681	Patient receiving care in the intensive care unit (ICU) and receiving mechanical ventilation, 24 hours or less (CRIT)	Observation	CPT4	NO	YES	NO
2788036	Respiratory Ventilation, Less than 24 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788037	Respiratory Ventilation, 24-96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788038	Respiratory Ventilation, Greater than 96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
4006318	Respiratory assist, manual	Procedure	SNOMED	YES	YES	NO
4021786	Fear of disconnection from ventilator	Condition	SNOMED	YES	YES	NO
4031379	Artificial ventilation finding	Condition	SNOMED	YES	YES	NO

#### 5. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

#### 6. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO
37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO

## 7. tracheostomy

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
45887989	Transoral approach to skull base, brain stem or upper spinal cord for biopsy, decompression or excision of lesion	Procedure	CPT4	NO	YES	NO
4337047	Insertion of tracheostomy tube	Procedure	SNOMED	NO	YES	NO
4311023	Revision of stoma of trachea	Procedure	SNOMED	NO	YES	NO
4208093	Tracheostomy, emergency procedure by transtracheal approach	Procedure	SNOMED	NO	YES	NO
4199580	Mediastinal tracheostomy	Procedure	SNOMED	NO	YES	NO
4195473	Temporary tracheostomy	Procedure	SNOMED	NO	YES	NO
4168864	Lateral tracheostomy	Procedure	SNOMED	NO	YES	NO
4166281	Anterior tracheostomy	Procedure	SNOMED	NO	YES	NO
4115488	Emergency tracheostomy	Procedure	SNOMED	NO	YES	NO
4065590	Permanent tracheostomy	Procedure	SNOMED	NO	YES	NO
2870619	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Percutaneous @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO



2862930	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Open @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2836115	Medical and Surgical @ Respiratory System @ Bypass @ Trachea @ Percutaneous @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2831237	Medical and Surgical @ Respiratory System @ Bypass @ Trachea @ Open @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2829386	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Via Natural or Artificial Opening @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2829384	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Percutaneous Endoscopic @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2794811	Medical and Surgical @ Respiratory System @ Change @ Trachea @ External @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2743216	Removal of Tracheostomy Device from Trachea, Via Natural or Artificial Opening	Procedure	ICD10PCS	NO	YES	NO

2110486	Transoral approach to skull base, brain stem or upper spinal cord for biopsy, decompression or excision of lesion; requiring splitting of tongue and/or mandible (including tracheostomy)	Procedure	CPT4	YES	YES	NO
2106569	Tracheal puncture, percutaneous with transtracheal aspiration and/or injection	Procedure	CPT4	NO	YES	NO
2106568	Construction of tracheoesophageal fistula and subsequent insertion of an alaryngeal speech prosthesis (eg, voice button, Blom-Singer prosthesis)	Procedure	CPT4	NO	YES	NO
2106567	Tracheostomy, fenestration procedure with skin flaps	Procedure	CPT4	NO	YES	NO
2106565	Tracheostomy, emergency procedure; cricothyroid membrane	Procedure	CPT4	NO	YES	NO
2106563	Tracheostomy, planned (separate procedure); younger than 2 years	Procedure	CPT4	NO	YES	NO
2106562	Tracheostomy, planned (separate procedure)	Procedure	CPT4	NO	YES	NO

## Cohort and exposure definitions in OMOP Common Data Model

### Exposures

#### 1. Alpha-blockers

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
924566	tamsulosin	Drug	RxNorm	NO	YES	NO
930021	alfuzosin	Drug	RxNorm	NO	YES	NO
1341238	terazosin	Drug	RxNorm	NO	YES	NO
1350489	prazosin	Drug	RxNorm	NO	YES	NO
1363053	doxazosin	Drug	RxNorm	NO	YES	NO
19012925	silodosin	Drug	RxNorm	NO	YES	NO

## 2. 5-alpha reductase inhibitors / phosphodiesterase type 5 inhibitor (indicated for BPH)

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
989482	dutasteride	Drug	RxNorm	NO	YES	NO
996416	finasteride	Drug	RxNorm	NO	YES	NO
1336926	tadalafil	Drug	RxNorm	NO	YES	NO

## 3. BPH

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
198803	Benign prostatic hyperplasia	Condition	SNOMED	NO	YES	NO

## Outcome Cohort

This section documents the outcome cohort definitions. We consider

- COVID-19 diagnosis or SARS-CoV-2 positive test with no required prior observation
- Hospitalization with a COVID-19 diagnosis record or SARS-CoV-2 positive test with no required prior observation
- Hospitalization and requiring intensive services with a SARS-CoV-2 positive test with no required prior observation

Below are their complete specifications.

[COVID ID133 V1] Persons with a COVID-19 diagnosis or a SARS-CoV-2 positive test with no required prior observation

### Initial Event Cohort

People having any of the following:

- a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>2</sup>
  - occurrence start is after 2019-12-01
- a measurement of SARS-CoV-2 test measurement<sup>3</sup>

- occurrence start is after 2019-12-01
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- an observation of SARS-CoV-2 test measurement<sup>3</sup>
  - occurrence start is after 2019-12-01
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- a condition occurrence of COVID-19 conditions<sup>1</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**

End Date Strategy

Date Offset Exit Criteria

This cohort definition end date will be the index event's start date plus 1 days

Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

### 1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO
4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO
37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

### 2. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

### 3. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO

37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO
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[COVID ID135 V1] Persons hospitalized with a COVID-19 diagnosis record or a SARS-CoV-2 positive test with no required prior observation

#### Initial Event Cohort

People having any of the following:

- a visit occurrence of Inpatient Visit<sup>2</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **all events per person.**

For people matching the Primary Events, include:

Having any of the following criteria:

- at least 1 occurrences of a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>3</sup>
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of a measurement of SARS-CoV-2 test measurement<sup>4</sup>
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of an observation of SARS-CoV-2 test measurement<sup>4</sup>
  - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- or at least 1 occurrences of a condition occurrence of COVID-19 conditions<sup>1</sup>
- where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date

Limit cohort of initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**

#### End Date Strategy

##### Date Offset Exit Criteria

This cohort definition end date will be the index event's end date plus 0 days

##### Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

#### 1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO

4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO
37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

## 2. Inpatient Visit

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
262	Emergency Room and Inpatient Visit	Visit	Visit	NO	YES	NO
9201	Inpatient Visit	Visit	Visit	NO	YES	NO

## 3. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

## 4. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO
37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO

[COVID ID137 V1] Persons hospitalized and requiring intensive services with a COVID-19 diagnosis record or a SARS-CoV-2 positive test with no required prior observation

### Initial Event Cohort

People having any of the following:

- a procedure of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- a condition occurrence of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- an observation of Mechanical ventilation<sup>4</sup>
  - occurrence start is after 2019-12-01
- a procedure of tracheostomy<sup>7</sup>

- occurrence start is after 2019-12-01
- a procedure of Extracorporeal membrane oxygenation (ECMO) procedure<sup>2</sup>
  - occurrence start is after 2019-12-01

with continuous observation of at least 0 days prior and 0 days after event index date, and limit initial events to: **all events per person.**

For people matching the Primary Events, include:

Having all of the following criteria:

- at least 1 occurrences of a visit occurrence of Inpatient Visit<sup>3</sup>
  - Having any of the following criteria:
    - at least 1 occurrences of a measurement of SARS-CoV-2 positive test measurement pre-coordinated<sup>5</sup>
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of a measurement of SARS-CoV-2 test measurement<sup>6</sup>
      - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of an observation of SARS-CoV-2 test measurement<sup>6</sup>
      - value as concept is any of: Detected, Detected, Positive, Positive, Present, Present
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
    - or at least 1 occurrences of a condition occurrence of COVID-19 conditions<sup>1</sup>
    - where event starts between 21 days Before and all days After index start date and event starts between all days Before and 0 days After index end date
- where event starts between all days Before and 0 days After index start date and event ends between 0 days Before and all days After index start date

Limit cohort of initial events to: **earliest event per person.**

Limit qualifying cohort to: **earliest event per person.**

End Date Strategy

Date Offset Exit Criteria

This cohort definition end date will be the index event's end date plus 0 days

Cohort Collapse Strategy:

Collapse cohort by era with a gap size of 90 days.

1. COVID-19 conditions

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
439676	Coronavirus infection	Condition	SNOMED	NO	YES	NO
4100065	Disease due to Coronaviridae	Condition	SNOMED	NO	YES	NO

37311060	Suspected disease caused by 2019-nCoV	Observation	SNOMED	NO	YES	NO
37311061	Disease caused by 2019-nCoV	Condition	SNOMED	NO	YES	NO

## 2. Extracorporeal membrane oxygenation (ECMO) procedure

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
1531630	Extracorporeal Oxygenation, Membrane, Peripheral Venovenous	Procedure	ICD10PCS	NO	NO	NO
1531631	Extracorporeal Oxygenation, Membrane, Peripheral Venovenous-arterial	Procedure	ICD10PCS	NO	NO	NO
1531632	Extracorporeal Oxygenation, Membrane, Central	Procedure	ICD10PCS	NO	NO	NO
2002247	Extracorporeal membrane oxygenation [ECMO]	Procedure	ICD9Proc	NO	YES	NO
2787820	Extracorporeal Supersaturated Oxygenation, Intermittent	Procedure	ICD10PCS	NO	NO	NO
2787821	Extracorporeal Hyperbaric Oxygenation, Continuous	Procedure	ICD10PCS	NO	NO	NO
4052536	Extracorporeal membrane oxygenation	Procedure	SNOMED	NO	YES	NO
4338595	Cardiac support using extracorporeal membrane oxygenation circuitry	Procedure	SNOMED	NO	NO	NO
44515635	Extracorporeal membrane oxygenation	Procedure	OPCS4	NO	YES	NO
44811012	Fluoroscopy guided percutaneous insertion of cannula for extracorporeal membrane oxygenation	Procedure	SNOMED	NO	NO	NO



### 3. Inpatient Visit

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
262	Emergency Room and Inpatient Visit	Visit	Visit	NO	YES	NO
9201	Inpatient Visit	Visit	Visit	NO	YES	NO

### 4. Mechanical ventilation

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
765576	Orotracheal intubation using bougie device	Procedure	SNOMED	NO	YES	NO
2108641	Glossectomy; complete or total, with or without tracheostomy, without radical neck dissection	Procedure	CPT4	YES	YES	NO
2108642	Glossectomy; complete or total, with or without tracheostomy, with unilateral radical neck dissection	Procedure	CPT4	YES	YES	NO
2108681	Patient receiving care in the intensive care unit (ICU) and receiving mechanical ventilation, 24 hours or less (CRIT)	Observation	CPT4	NO	YES	NO
2788036	Respiratory Ventilation, Less than 24 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788037	Respiratory Ventilation, 24-96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788038	Respiratory Ventilation, Greater than 96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
4006318	Respiratory assist, manual	Procedure	SNOMED	YES	YES	NO
4021786	Fear of disconnection from ventilator	Condition	SNOMED	YES	YES	NO
4031379	Artificial ventilation	Condition	SNOMED	YES	YES	NO

	finding					
4072633	Weaning from mechanically assisted ventilation	Procedure	SNOMED	NO	YES	NO
4074663	Diaphragmatic augmentation	Procedure	SNOMED	YES	YES	NO
4080957	Endotracheal respiratory assistance	Procedure	SNOMED	NO	YES	NO
4107247	Inhalation anesthesia, machine system, semi-closed, no rebreathing of primary agent	Procedure	SNOMED	YES	YES	NO
4168966	Endotracheal tube present	Observation	SNOMED	NO	YES	NO
4219858	Problem with patient ventilator	Observation	SNOMED	NO	YES	NO
4230167	Artificial respiration	Procedure	SNOMED	NO	YES	NO
4232550	Home visit for mechanical ventilation care	Observation	SNOMED	NO	YES	NO
4232891	Mechanical ventilation response	Observation	SNOMED	YES	YES	NO
4235361	Hyperventilation therapy for traumatic brain injury	Procedure	SNOMED	NO	YES	NO
4237618	Ventilator care	Observation	SNOMED	NO	YES	NO
4251737	Ventilator care management	Procedure	SNOMED	NO	YES	NO
4254108	Resuscitation with artificial respiration	Procedure	SNOMED	YES	YES	NO
4254905	Ventilator care education	Procedure	SNOMED	YES	YES	NO
4259233	Ventilator care assessment	Procedure	SNOMED	YES	YES	NO
4332501	Management of noninvasive mechanical ventilation	Procedure	SNOMED	NO	YES	NO
4348300	Expired air ventilation	Procedure	SNOMED	YES	YES	NO
4353715	Ventilator finding	Observation	SNOMED	YES	YES	NO
37116689	Insertion of endotracheal	Procedure	SNOMED	NO	YES	NO

	ventilation catheter					
37206832	Mechanical insufflation exsufflation	Procedure	SNOMED	NO	YES	NO
40481547	Dependence on ventilator	Condition	SNOMED	NO	YES	NO
40487536	Intubation of respiratory tract	Procedure	SNOMED	NO	YES	NO
42738852	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; first day	Procedure	CPT4	NO	YES	NO
42738853	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; subsequent days	Procedure	CPT4	NO	YES	NO
44509482	Other specified ventilation support	Procedure	OPCS4	NO	YES	NO
44791135	Ventilatory support	Procedure	SNOMED	NO	YES	NO
44808555	Provision of mechanical ventilator	Procedure	SNOMED	YES	YES	NO
45887795	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing	Procedure	CPT4	NO	YES	NO

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
765576	Orotracheal intubation using bougie device	Procedure	SNOMED	NO	YES	NO
2108641	Glossectomy; complete or total, with or without tracheostomy, without radical neck dissection	Procedure	CPT4	YES	YES	NO

2108642	Glossectomy; complete or total, with or without tracheostomy, with unilateral radical neck dissection	Procedure	CPT4	YES	YES	NO
2108681	Patient receiving care in the intensive care unit (ICU) and receiving mechanical ventilation, 24 hours or less (CRIT)	Observation	CPT4	NO	YES	NO
2788036	Respiratory Ventilation, Less than 24 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788037	Respiratory Ventilation, 24-96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
2788038	Respiratory Ventilation, Greater than 96 Consecutive Hours	Procedure	ICD10PCS	NO	YES	NO
4006318	Respiratory assist, manual	Procedure	SNOMED	YES	YES	NO
4021786	Fear of disconnection from ventilator	Condition	SNOMED	YES	YES	NO
4031379	Artificial ventilation finding	Condition	SNOMED	YES	YES	NO

#### 5. SARS-CoV-2 positive test measurement pre-coordinated

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
37310282	2019 novel coronavirus detected	Measurement	SNOMED	NO	YES	NO

#### 6. SARS-CoV-2 test measurement

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
756055	Measurement of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)	Measurement	OMOP Extension	NO	YES	NO
37310281	2019 novel coronavirus not detected	Measurement	SNOMED	YES	YES	NO

## 7. tracheostomy

Concept Id	Concept Name	Domain	Vocabulary	Excluded	Descendants	Mapped
45887989	Transoral approach to skull base, brain stem or upper spinal cord for biopsy, decompression or excision of lesion	Procedure	CPT4	NO	YES	NO
4337047	Insertion of tracheostomy tube	Procedure	SNOMED	NO	YES	NO
4311023	Revision of stoma of trachea	Procedure	SNOMED	NO	YES	NO
4208093	Tracheostomy, emergency procedure by transtracheal approach	Procedure	SNOMED	NO	YES	NO
4199580	Mediastinal tracheostomy	Procedure	SNOMED	NO	YES	NO
4195473	Temporary tracheostomy	Procedure	SNOMED	NO	YES	NO
4168864	Lateral tracheostomy	Procedure	SNOMED	NO	YES	NO
4166281	Anterior tracheostomy	Procedure	SNOMED	NO	YES	NO
4115488	Emergency tracheostomy	Procedure	SNOMED	NO	YES	NO
4065590	Permanent tracheostomy	Procedure	SNOMED	NO	YES	NO
2870619	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Percutaneous @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2862930	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Open @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2836115	Medical and Surgical @ Respiratory System @ Bypass @ Trachea @	Procedure	ICD10PCS	NO	YES	NO

	Percutaneous @ Tracheostomy Device					
2831237	Medical and Surgical @ Respiratory System @ Bypass @ Trachea @ Open @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2829386	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Via Natural or Artificial Opening @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2829384	Medical and Surgical @ Respiratory System @ Revision @ Trachea @ Percutaneous Endoscopic @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2794811	Medical and Surgical @ Respiratory System @ Change @ Trachea @ External @ Tracheostomy Device	Procedure	ICD10PCS	NO	YES	NO
2743216	Removal of Tracheostomy Device from Trachea, Via Natural or Artificial Opening	Procedure	ICD10PCS	NO	YES	NO
2110486	Transoral approach to skull base, brain stem or upper spinal cord for biopsy, decompression or excision of lesion; requiring splitting of tongue and/or mandible (including tracheostomy)	Procedure	CPT4	YES	YES	NO
2106569	Tracheal puncture, percutaneous with transtracheal aspiration and/or injection	Procedure	CPT4	NO	YES	NO

2106568	Construction of tracheoesophageal fistula and subsequent insertion of an alaryngeal speech prosthesis (eg, voice button, Blom-Singer prosthesis)	Procedure	CPT4	NO	YES	NO
2106567	Tracheostomy, fenestration procedure with skin flaps	Procedure	CPT4	NO	YES	NO
2106565	Tracheostomy, emergency procedure; cricothyroid membrane	Procedure	CPT4	NO	YES	NO
2106563	Tracheostomy, planned (separate procedure); younger than 2 years	Procedure	CPT4	NO	YES	NO
2106562	Tracheostomy, planned (separate procedure)	Procedure	CPT4	NO	YES	NO