Contents

SUPPLEMENTARY METHODS.

US Optum® deidentified COVID-19 electronic health record dataset (2007–2020)

Given the urgent need to clinically understand the novel virus of COVID-19, Optum developed a low latency data pipeline that enables minimal data lag, while preserving as much clinical data as possible. The data are sourced from Optum's longitudinal electronic health record (EHR) repository, which is derived from dozens of healthcare provider organizations in the US, including more than 700 hospitals and 7,000 clinics. The data are certified as deidentified by an independent statistical expert following the Health Insurance Portability and Accountability Act of 1996

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(HIPAA) statistical deidentification rules and managed according to Optum® customer data use agreements. The COVID-19 dataset incorporates a wide swathe of raw clinical data, including new, unmapped COVID-19-specific clinical data points from both inpatient and ambulatory electronic medical records, practice management systems, and numerous other internal systems. Information is processed from across the continuum of care, including acute inpatient stays and outpatient visits. The COVID-19 data capture point-of-care diagnostics specific to the COVID-19 patient during initial presentation, acute illness, and convalescence, with over 500 mapped labs and bedside observations, including COVID-19-specific testing.

The Optum® COVID-19 EHR dataset elements included patient-level information: demographics, mortality (captured from Social Security Administration Death Master File, electronic medical records and Centers for Medicare and Medicaid Services), as well as clinical interventions, such as medications prescribed and administered. The data are comprised of multiple tables that can be linked by a common patient identifier (an anonymous, randomized string of characters).

The COVID-19 patient data included patients in the EHR database who had documented clinical care from January 2007 through to the most current monthly data release with a documented exposure to, or had been tested for, SARS-CoV-2 (positive or negative result), and/or had a diagnosis of COVID-19, or acute respiratory illness, after February 1, 2020. Thus, not all patients within the Optum® COVID-19 EHR dataset had received a diagnosis of COVID-19. Patients with COVID-19 were identified via a diagnosis code for SARS-CoV-2, a positive test for SARS-CoV-2 active infection (antigen and/or polymerase chain reaction), and/or a positive antibody test. The Optum® COVID-19 EHR dataset included medical records from 2007, allowing for the utilization of patients' medical history in the analysis.

Indicated cohort inclusion

The indicated cohorts included patients who had received a clinician diagnosis of rheumatoid arthritis, psoriatic arthritis, or ulcerative colitis (via International Classification of Diseases, 10th Revision, Clinical Modification diagnosis codes) within 2 years before index date and evidence of treatment with conventional synthetic disease-modifying antirheumatic drugs (including auranofin, aurothioglucose, azathioprine, chloroquine hydrochloride, chloroquine phosphate, cyclophosphamide, cyclosporine, gold sodium thiomalate, hydroxychloroquine sulphate, leflunomide, mercaptopurine, mesalamine, methotrexate, minocycline hydrochloride, n-acetylpenicillamine, penicillamine, primaquine, sulfasalazine, tacrolimus, and thalidomide), Janus kinase inhibitors (including tofacitinib, baricitinib, and upadacitinib), tumor necrosis factor inhibitors (TNFi; including adalimumab, certolizumab pegol, etanercept, golimumab, and infliximab), or non-TNFi biologics (including sarilumab, ustekinumab, secukinumab, abatacept, tocilizumab, ixekizumab, anakinra, and rituximab), prescribed within 2 years before index date.

International Classification of Diseases, 10th Revision, Clinical Modification diagnosis code list for study endpoints and variables

Pneumonia	
J12	Viral pneumonia, not classified elsewhere
J12.8	Other viral pneumonia
J12.81	Pneumonia due to SARS associated coronavirus
J12.89	Other viral pneumonia
J12.9	Viral pneumonia, unspecified
J18	Pneumonia, unspecified organism
J18.0	Bronchopneumonia, unspecified organism
J18.1	Lobar pneumonia, unspecified organism
J18.2	Hypostatic pneumonia, unspecified organism
J18.8	Other pneumonia, unspecified organism
J18.9	Pneumonia, unspecified organism
J95.851	Ventilator associated pneumonia
Kidney failure	
N00.0	Acute nephritic syndrome with minor glomerular abnormality
N00.1	Acute nephritic syndrome with focal and segmental glomerular lesions
N00.2	Acute nephritic syndrome with diffuse membranous glomerulonephritis

N00.3	Acute nephritic syndrome with diffuse mesangial proliferative glomerulonephritis
N00.4	Acute nephritic syndrome with diffuse endocapillary proliferative glomerulonephritis
N00.5	Acute nephritic syndrome with diffuse mesangiocapillary glomerulonephritis
N00.6	Acute nephritic syndrome with dense deposit disease
N00.7	Acute nephritic syndrome with diffuse crescentic glomerulonephritis
N01.0	Rapidly progressive nephritic syndrome with minor glomerular abnormality
N01.1	Rapidly progressive nephritic syndrome with focal and segmental glomerular lesions
N01.2	Rapidly progressive nephritic syndrome with diffuse membranous glomerulonephritis
N01.3	Rapidly progressive nephritic syndrome with diffuse mesangial proliferative glomerulonephritis
N01.4	Rapidly progressive nephritic syndrome with diffuse endocapillary proliferative glomerulonephritis
N01.5	Rapidly progressive nephritic syndrome with diffuse mesangiocapillary glomerulonephritis
N01.6	Rapidly progressive nephritic syndrome with dense deposit disease
N01.7	Rapidly progressive nephritic syndrome with diffuse crescentic glomerulonephritis
N01.8	Rapidly progressive nephritic syndrome with other morphologic changes
N01.9	Rapidly progressive nephritic syndrome with unspecified morphologic changes
N08	Glomerular disorders in diseases classified elsewhere
N00.8	Acute nephritic syndrome with other morphologic changes
N00.9	Acute nephritic syndrome with unspecified morphologic changes
N17	Acute kidney failure
N17.1	Acute kidney failure with acute cortical necrosis
N17.2	Acute kidney failure with medullary necrosis
N17.0	Acute kidney failure with tubular necrosis
N17.9	Acute kidney failure, unspecified
N17.8	Other acute kidney failure
N18.6	End stage renal disease
N19	Unspecified kidney failure
N26.1	Atrophy of kidney (terminal)
N26.9	Renal sclerosis, unspecified
Thrombotic events	
I80.x	Phlebitis and thrombophlebitis
I81.x	Portal vein thrombosis
I82.x	Other venous embolism and thrombosis
I26	Pulmonary embolism
D65	Disseminated intravascular coagulation-coagulopathy
I60.x	Subarachnoid hemorrhage
I61.x	Intracerebral hemorrhage
I63.x	Cerebral infarction

I64.x	Stroke, not specified as hemorrhage or infarction
H34.1	Central retina artery occlusion
G45.x	Transient cerebral ischemic attacks and related syndromes
Acute respiratory distress syndrome (ARDS)	
J80	Acute respiratory distress syndrome (ARDS)
J96	Respiratory failure, not elsewhere classified
J96.00	Acute respiratory failure
J96.00	…… unspecified whether with hypoxia or hypercapnia
J96.01	…… with hypoxia
J96.2	Acute and chronic respiratory failure
J96.20	…… unspecified whether with hypoxia or hypercapnia
J96.21	…… with hypoxia
J96.9	Respiratory failure, unspecified
J96.90	…… unspecified whether with hypoxia or hypercapnia
J96.91	…… with hypoxia
J8417	Other interstitial pulmonary diseases with fibrosis in diseases classified elsewhere
J8489	Other specified interstitial pulmonary diseases
J9600	Acute respiratory failure, unspecified whether with hypoxia or hypercapnia
J9601	Acute respiratory failure with hypoxia
J9690	Respiratory failure, unspecified, unspecified whether with hypoxia or hypercapnia
J9691	Respiratory failure, unspecified with hypoxia
J80	Acute respiratory distress syndrome (ARDS)
S27.309A	Acute lung injury
Heart failure	
I0981	Rheumatic heart failure
I130	Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease or unspecified chronic kidney disease
I132	Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease or end stage renal disease
I5020	Unspecified systolic (congestive) heart failure
I5021	Acute systolic (congestive) heart failure
I5022	Chronic systolic (congestive) heart failure
I5023	Acute on chronic systolic (congestive) heart failure
I5030	Unspecified diastolic (congestive) heart failure
I5031	Acute diastolic (congestive) heart failure
I5032	Chronic diastolic (congestive) heart failure
I5033	Acute or chronic diastolic (congestive) heart failure
I5040	Unspecified combined systolic (congestive) and diastolic (congestive) heart failure
I5041	Acute combined systolic (congestive) and diastolic (congestive) heart failure
I5042	Chronic combined systolic (congestive) and diastolic (congestive) heart failure

I5043	Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure
I509	Heart failure, unspecified
I501	Left ventricular failure
Sepsis or septic shock	
A41.89	Other specified sepsis
A41.9	Sepsis unspecified organism
R65.10	Systemic inflammatory response syndrome (SIRS) of non-infectious origin without acute organ dysfunction
R65.11	SIRS of non-infectious origin with acute organ dysfunction
R65.20	Severe sepsis without septic shock
R65.21	Severe sepsis with septic shock
Mechanical ventilation or ECMO	
1015098*	Ventilator Management
1014859*	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing
94003*	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; hospital inpatient/observation, each subsequent day
94002*	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; hospital inpatient/observation, initial day
E0454†	Pressure ventilator
94656*	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; first day
94657*	Ventilation assist and management, initiation of pressure or volume preset ventilators for assisted or controlled breathing; first day controlled breathing; subsequent days
E0450†	Volume control ventilator, without pressure support mode, may include pressure control mode, used with invasive interface (e.g. tracheostomy tube)
5A0945Z	Assistance with Respiratory Ventilation, 24-96 Consecutive Hours
5A09457	Assistance with Respiratory Ventilation, 24-96 Consecutive Hours, Continuous Positive Airway Pressure
5A09458	Assistance with Respiratory Ventilation, 24-96 Consecutive Hours, Intermittent Positive Airway Pressure
5A0955Z	Assistance with Respiratory Ventilation, Greater than 96 Consecutive Hours
5A09557	Assistance with Respiratory Ventilation, Greater than 96 Consecutive Hours, Continuous Positive Airway Pressure
5A09558	Assistance with Respiratory Ventilation, Greater than 96 Consecutive Hours, Intermittent Positive Airway Pressure
5A0935Z	Assistance with Respiratory Ventilation, Less than 24 Consecutive Hours
5A09357	Assistance with Respiratory Ventilation, Less than 24 Consecutive Hours, Continuous Positive Airway Pressure
5A09358	Assistance with Respiratory Ventilation, Less than 24 Consecutive Hours, Intermittent Positive Airway Pressure
5A1935Z	Respiratory Ventilation, Less than 24 Consecutive Hours
5A1945Z	Respiratory Ventilation, 24-96 Consecutive Hours
5A1955Z	Respiratory Ventilation, Greater than 96 Consecutive Hours
5A19054	Assistance with Respiratory Ventilation, 24-96 Consecutive Hours

0BH13EZ	Insertion of Endotracheal Airway into Trachea, Percutaneous Approach
0BH17EZ	Insertion of Endotracheal Airway into Trachea, Via Natural or Artificial Opening
0BH18EZ	Insertion of Endotracheal Airway into Trachea, Via Natural or Artificial Opening Endoscopic
5A1522F†	Extracorporeal Oxygenation, Membrane, Central
5A1522G†	Extracorporeal Oxygenation, Membrane, Peripheral Veno-arterial
5A1522H†	Extracorporeal Oxygenation, Membrane, Peripheral Veno-venous
3§	ECMO or Tracheostomy with Mechanical Ventilation > 96 Hours or Principal Diagnosis Except Face, Mouth and Neck with Major O.R.
207§	Respiratory System Diagnosis with Ventilator Support > 96 Hours or Peripheral Extracorporeal Membrane Oxygenation (ECMO)
291§	Heart Failure and Shock with MCC or Peripheral Extracorporeal Membrane Oxygenation (ECMO)
296§	Cardiac Arrest, Unexplained with MCC or Peripheral Extracorporeal Membrane Oxygenation (ECMO)
870§	Septicemia or Severe Sepsis with Mechanical Ventilation > 96 Hours or Peripheral Extracorporeal Membrane Oxygenation (ECMO)
Intravenous immunoglobulin‡	
Y59.3 or Y593	Adverse effects in the therapeutic use of immunoglobulin
Y59.300 or Y59300	Adverse effects in the therapeutic use of immunoglobulin
J1573†	Hepatitis B immune globulin
J1557, J1566, J1568, J1572, J1599, J1459†	Immune globulin
J2792†	Rho d immune globulin
G8809†	Rh-immunoglobulin (RhoGAM) ordered
G0332†	Services for intravenous infusion of immunoglobulin prior to administration
82784*	Gammaglobulin (immunoglobulin); IgA, IgD, IgG, IgM, each
82785*	Gammaglobulin (immunoglobulin); IgE
82787*	Gammaglobulin (immunoglobulin); immunoglobulin subclasses (e.g. IgG1, 2, 3 or 4), each

CPT: current procedural terminology; DRG: diagnosis-related group; HCPCS: Healthcare Common Procedure Coding System; NDC: National Drug Code.

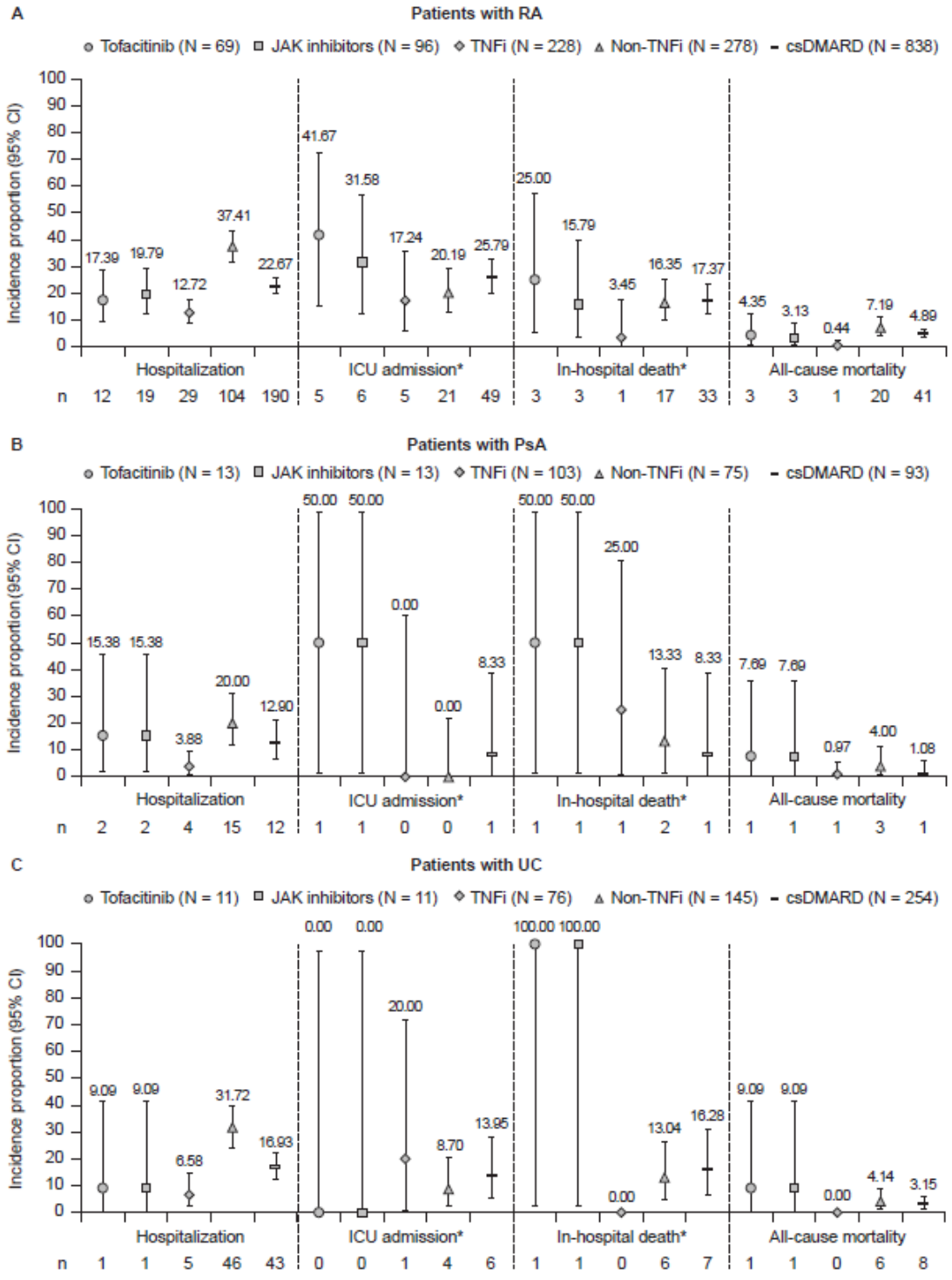
*CPT code.

†HCPCS code.

‡Patients with NDC for BabyBIG, Bivigam, Carimune, Cytogam, Cytomegalovirus Immune Globulin, Flebogamma, Gamimune N 10%, Gamimune N 5%, Gammagard S/D, Gammaplex, Gammar I.V., Gammar-P I.V., Gamunex, Iveegam, Octagam, Panglobulin, Panzyga, Polygam S/D, Privigen, Respigam, Sandoglobulin, Venoglobulin-S 10%, Venoglobulin-S 5%, or Zinplava.

§DRG code.

Supplementary Figure 2. Incidence of hospitalization, ICU admission, in-hospital death, and all-cause mortality in the (A) RA cohort, (B) PsA cohort, and (C) UC cohort, by baseline systemic therapy.



95% CIs are not calculated for incidence proportions of 0.00. CI: confidence interval; csDMARD: conventional synthetic disease-modifying antirheumatic drug; ICU: intensive care unit; JAK: Janus kinase; N: number of patients in

the cohort; n: number of patients in the specified category; PsA: psoriatic arthritis; RA: rheumatoid arthritis; TNFi: tumor necrosis factor inhibitor; UC: ulcerative colitis. *Denominator is the number of patients hospitalized.

Supplementary Table 1. Baseline[*] demographics and characteristics of patients in the indicated cohorts by systemic therapy.

	RA cohort				PsA cohort				UC cohort			
	Tofacitinib[†] (N = 69)	**TNFi[‡] (N = 228)**	**Non-TNFi biologic[§] (N = 278)**	**csDMARD[¶] (N = 838)**	**Tofacitinib[**] (N = 13)**	**TNFi[‡] (N = 103)**	**Non-TNFi biologic[§] (N = 75)**	**csDMARD[¶] (N = 93)**	**Tofacitinib[**] (N = 11)**	**TNFi[‡] (N = 76)**	**Non-TNFi biologic[§] (N = 145)**	**csDMARD[¶] (N = 254)**
Age, years, median (range)	60.00 (21–87)	53.5 (19–84)	63.0 (19–89)	61.0 (19–89)	57.0 (32–74)	51.0 (22–88)	55.0 (24–84)	56.0 (31–89)	50.0 (25–70)	38.5 (18–77)	54.0 (18–89)	51.5 (18–89)
Age, n (%)												
≥ 18–55	26 (37.7)	123 (54.0)	76 (27.3)	271 (32.3)	6 (46.2)	71 (68.9)	38 (50.7)	46 (49.5)	8 (72.7)	57 (75.0)	78 (53.8)	141 (55.5)
56–65	24 (34.8)	53 (23.3)	85 (30.6)	254 (30.3)	4 (30.8)	21 (20.4)	23 (30.7)	25 (26.9)	2 (18.2)	12 (15.8)	27 (18.6)	55 (21.7)
66–75	14 (20.3)	36 (15.8)	66 (23.7)	167 (19.9)	3 (23.1)	10 (9.7)	9 (12.0)	13 (14.0)	1 (9.1)	6 (7.9)	20 (13.8)	27 (10.6)
> 76	5 (7.3)	16 (7.0)	51 (18.4)	146 (17.4)	0 (0.0)	1 (1.0)	5 (6.7)	9 (9.7)	0 (0.0)	1 (1.3)	20 (13.8)	31 (12.2)
Sex (female), n (%)	58 (84.1)	188 (82.5)	214 (77.0)	652 (77.8)	9 (69.2)	57 (55.3)	31 (41.3)	59 (63.4)	8 (72.7)	41 (54.0)	75 (51.7)	135 (53.2)
Race, n (%)												

	RA cohort				PsA cohort				UC cohort			
	Tofacitinib[†] (N = 69)	**TNFi[‡] (N = 228)**	**Non-TNFi biologic[§] (N = 278)**	**csDMARD[¶] (N = 838)**	**Tofacitinib[**] (N = 13)**	**TNFi[‡] (N = 103)**	**Non-TNFi biologic[§] (N = 75)**	**csDMARD[¶] (N = 93)**	**Tofacitinib[**] (N = 11)**	**TNFi[‡] (N = 76)**	**Non-TNFi biologic[§] (N = 145)**	**csDMARD[¶] (N = 254)**
White	47 (68.1)	163 (71.5)	191 (68.7)	577 (68.9)	10 (76.9)	87 (84.5)	67 (89.3)	81 (87.1)	8 (72.7)	61 (80.3)	114 (78.6)	207 (81.5)
Black or African American	10 (14.5)	28 (12.3)	49 (17.6)	148 (17.7)	0 (0.0)	3 (2.9)	1 (1.3)	5 (5.4)	2 (18.2)	10 (13.2)	12 (8.3)	21 (8.3)
Asian	5 (7.3)	4 (1.8)	3 (1.1)	16 (1.9)	0 (0.0)	1 (1.0)	2 (2.7)	2 (2.2)	0 (0.0)	1 (1.3)	2 (1.4)	8 (3.2)
Other/Unknown	7 (10.1)	33 (14.5)	35 (12.6)	97 (11.6)	3 (23.1)	12 (11.7)	5 (6.7)	5 (5.4)	1 (9.1)	4 (5.3)	17 (11.7)	18 (7.1)
US region, n (%)												
Midwest	29 (42.0)	90 (39.5)	79 (28.4)	411 (49.1)	2 (15.4)	41 (39.8)	20 (26.7)	45 (48.4)	5 (45.5)	46 (60.5)	54 (37.2)	125 (49.2)
Northeast	32 (46.4)	95 (41.7)	129 (46.4)	249 (29.7)	8 (61.5)	54 (52.4)	50 (66.7)	34 (36.6)	6 (54.6)	22 (29.0)	73 (50.3)	79 (31.1)
South	7 (10.1)	22 (9.7)	20 (7.2)	112 (13.4)	3 (23.1)	4 (3.9)	3 (4.0)	9 (9.7)	0 (0.0)	4 (5.3)	1 (0.7)	30 (11.8)
West	0 (0.0)	16 (7.0)	43 (15.5)	50 (6.0)	0 (0.0)	3 (2.9)	1 (1.3)	2 (2.2)	0 (0.0)	3 (4.0)	14 (9.7)	13 (5.1)
Unknown	1 (1.5)	5 (2.2)	7 (2.5)	16 (1.9)	0 (0.0)	1 (1.0)	1 (1.3)	3 (3.2)	0 (0.0)	1 (1.3)	3 (2.1)	7 (2.8)
Insurance, n (%)[††]												

	RA cohort				PsA cohort				UC cohort			
	Tofacitinib[†] (N = 69)	**TNFi[‡] (N = 228)**	**Non-TNFi biologic[§] (N = 278)**	**csDMARD[¶] (N = 838)**	**Tofacitinib[**] (N = 13)**	**TNFi[‡] (N = 103)**	**Non-TNFi biologic[§] (N = 75)**	**csDMARD[¶] (N = 93)**	**Tofacitinib[**] (N = 11)**	**TNFi[‡] (N = 76)**	**Non-TNFi biologic[§] (N = 145)**	**csDMARD[¶] (N = 254)**
Commercial	51 (73.9)	175 (76.8)	186 (66.9)	601 (71.7)	10 (76.9)	75 (72.8)	52 (69.3)	70 (75.3)	9 (81.8)	61 (80.3)	112 (77.2)	189 (74.4)
Medicaid	9 (13.0)	43 (18.9)	45 (16.2)	141 (16.8)	1 (7.7)	9 (8.7)	13 (17.3)	8 (8.6)	2 (18.2)	12 (15.8)	27 (18.6)	34 (13.4)
Medicare	18 (26.1)	69 (30.3)	154 (55.4)	382 (45.6)	1 (7.7)	13 (12.6)	14 (18.7)	23 (24.7)	2 (18.2)	6 (7.9)	51 (35.2)	68 (26.8)
Other payor type	5 (7.3)	30 (13.2)	52 (18.7)	166 (19.8)	3 (23.1)	17 (16.5)	7 (9.3)	17 (18.3)	2 (18.2)	9 (11.8)	24 (16.6)	25 (9.8)
Uninsured	1 (1.5)	4 (1.8)	27 (9.7)	84 (10.0)	2 (15.4)	6 (5.8)	6 (8.0)	8 (8.6)	0 (0.0)	7 (9.2)	18 (12.4)	20 (7.9)
Unknown	56 (81.2)	171 (75.0)	218 (78.4)	578 (69.0)	10 (76.9)	76 (73.8)	57 (76.0)	66 (71.0)	6 (54.6)	60 (79.0)	124 (85.5)	172 (67.7)
Comorbidities/medical history, n (%)												
ILD	3 (4.4)	7 (3.1)	20 (7.2)	35 (4.2)	0 (0.0)	0 (0.0)	1 (1.3)	1 (1.1)	0 (0.0)	1 (1.3)	6 (4.1)	6 (2.4)
Asthma	10 (14.5)	21 (9.2)	45 (16.2)	113 (13.5)	2 (15.4)	8 (7.8)	8 (10.7)	9 (9.7)	1 (9.1)	5 (6.6)	17 (11.7)	16 (6.3)
COPD	6 (8.7)	21 (9.2)	63 (22.7)	100 (11.9)	0 (0.0)	1 (1.0)	4 (5.3)	6 (6.5)	0 (0.0)	1 (1.3)	10 (6.9)	15 (5.9)
VTE	0 (0.0)	3 (1.3)	23 (8.3)	33 (3.9)	0 (0.0)	0 (0.0)	4 (5.3)	2 (2.2)	0 (0.0)	0 (0.0)	6 (4.1)	8 (3.2)
Hypertension	23 (33.3)	82 (36.0)	159 (57.2)	425 (50.7)	6 (46.2)	25 (24.3)	29 (38.7)	40 (43.0)	1 (9.1)	13 (17.1)	54 (37.2)	84 (33.1)

	RA cohort				PsA cohort				UC cohort			
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Hyperlipidemia	20 (29.0)	60 (26.3)	130 (46.8)	313 (37.4)	4 (30.8)	21 (20.4)	25 (33.3)	31 (33.3)	1 (9.1)	12 (15.8)	38 (26.2)	67 (26.4)
Coronary artery disease	5 (7.3)	12 (5.3)	70 (25.2)	136 (16.2)	2 (15.4)	2 (1.9)	10 (13.3)	11 (11.8)	0 (0.0)	1 (1.3)	30 (20.7)	21 (8.3)
Serious infections (hospitalized)	3 (4.4)	6 (2.6)	69 (24.8)	78 (9.3)	0 (0.0)	1 (1.0)	7 (9.3)	3 (3.2)	1 (9.1)	3 (4.0)	38 (26.2)	24 (9.5)
Cancer	3 (4.4)	6 (2.6)	34 (12.2)	56 (6.7)	2 (15.4)	3 (2.9)	2 (2.7)	3 (3.2)	0 (0.0)	0 (0.0)	19 (13.1)	21 (8.3)
Other immune deficiencies	3 (4.4)	10 (4.4)	23 (8.3)	47 (5.6)	0 (0.0)	1 (1.0)	2 (2.7)	2 (2.2)	0 (0.0)	4 (5.3)	8 (5.5)	12 (4.7)
HIV/AIDS	0 (0.0)	0 (0.0)	1 (0.4)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.1)	0 (0.0)
Diabetes	10 (14.5)	38 (16.7)	67 (24.1)	177 (21.1)	3 (23.1)	16 (15.5)	15 (20.0)	20 (21.5)	2 (18.2)	5 (6.6)	26 (17.9)	34 (13.4)
CKD/dialysis	7 (10.1)	20 (8.8)	60 (21.6)	131 (15.6)	0 (0.0)	6 (5.8)	9 (12.0)	9 (9.7)	1 (9.1)	0 (0.0)	36 (24.8)	29 (11.4)

	RA cohort				PsA cohort				UC cohort			
	Tofacitinib[†] (N = 69)	**TNFi[‡] (N = 228)**	**Non-TNFi biologic[§] (N = 278)**	**csDMARD[¶] (N = 838)**	**Tofacitinib[**] (N = 13)**	**TNFi[‡] (N = 103)**	**Non-TNFi biologic[§] (N = 75)**	**csDMARD[¶] (N = 93)**	**Tofacitinib[**] (N = 11)**	**TNFi[‡] (N = 76)**	**Non-TNFi biologic[§] (N = 145)**	**csDMARD[¶] (N = 254)**
Liver disease	0 (0.0)	14 (6.1)	19 (6.8)	43 (5.1)	0 (0.0)	2 (1.9)	8 (10.7)	2 (2.2)	0 (0.0)	2 (2.6)	17 (11.7)	16 (6.3)
Corticosteroid use[‡‡]	28 (40.6)	88 (38.6)	143 (51.4)	296 (35.3)	2 (15.4)	21 (20.4)	19 (25.3)	15 (16.1)	1 (9.1)	33 (43.4)	65 (44.8)	59 (23.2)
History of hospitalization[§§]	4 (5.8)	23 (10.1)	119 (42.8)	154 (18.4)	0 (0.0)	3 (2.9)	14 (18.7)	12 (12.9)	2 (18.2)	8 (10.5)	63 (43.5)	47 (18.5)

AIDS: acquired immunodeficiency syndrome; CKD: chronic kidney disease; COPD: chronic obstructive pulmonary disease; csDMARD: conventional synthetic disease-modifying antirheumatic drug; HIV: human immunodeficiency virus; ILD: interstitial lung disease; N: number of patients in the cohort; n: number of patients in the specified category; PsA: psoriatic arthritis; RA: rheumatoid arthritis; TNFi: tumor necrosis factor inhibitor; UC: ulcerative colitis; VTE: venous thromboembolism.

[*]Baseline was defined as within 6 months before the COVID-19 diagnosis date.

[†]69/96 patients prescribed JAK inhibitors were prescribed tofacitinib.

[‡]TNFi included adalimumab, certolizumab pegol, etanercept, golimumab, and infliximab.

[§]Non-TNFi biologics included sarilumab, ustekinumab, secukinumab, abatacept, tocilizumab, ixekizumab, and rituximab.

[¶]csDMARDs included auranofin, aurothioglucose, azathioprine, chloroquine hydrochloride, chloroquine phosphate, cyclophosphamide, cyclosporine, gold sodium thiomalate,

hydroxychloroquine sulphate, leflunomide, mercaptopurine, mesalamine, methotrexate, minocycline hydrochloride, n-acetylpenicillamine, penicillamine, primaquine, sulfasalazine, tacrolimus, and thalidomide.

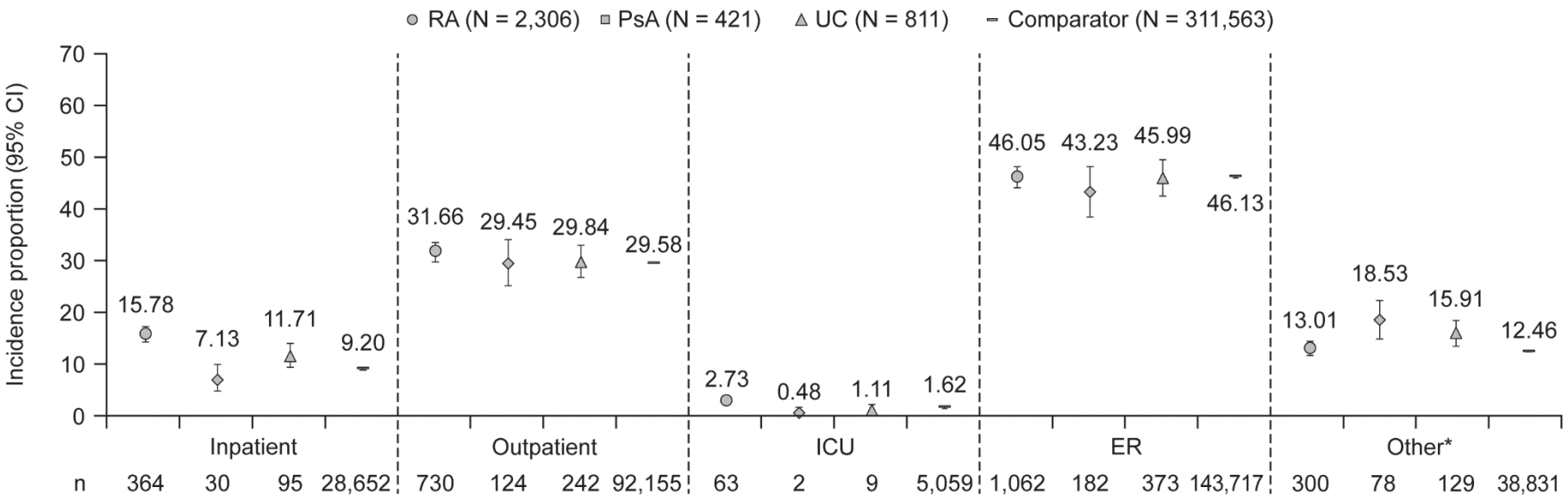
[**]All patients prescribed JAK inhibitors were prescribed tofacitinib.

[††]May not be mutually exclusive for each insurance type.

[‡‡]Within 90 days before COVID-19 diagnosis date.

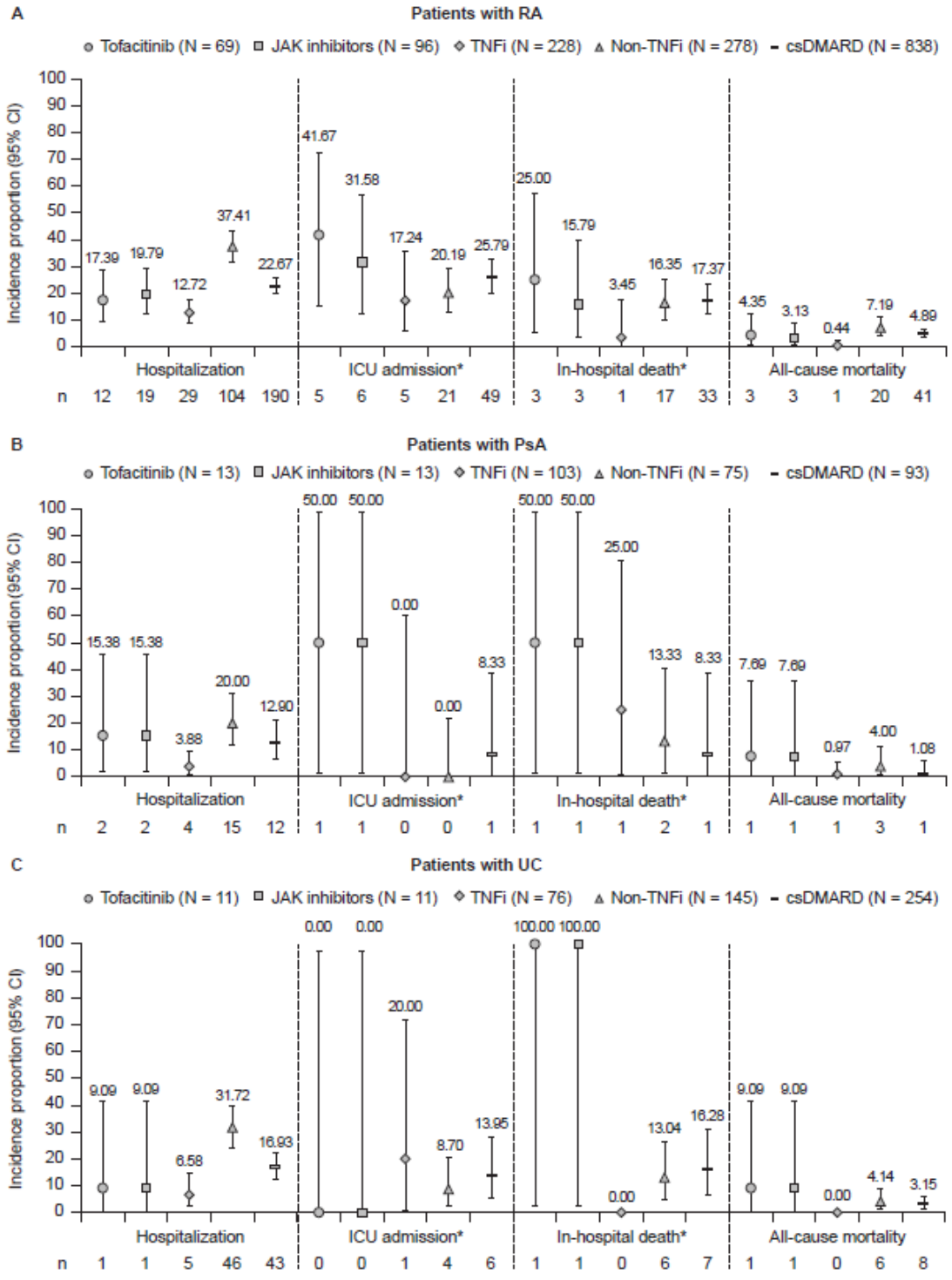
[§§]Any hospitalization during the baseline period.

Supplementary Figure S1. Distribution of COVID-19 diagnosis site in the indicated and comparator cohorts



CI: confidence interval; ER: emergency room; ICU: intensive care unit; N: number of patients in the cohort; n: number of patients in the specified category; PsA: psoriatic arthritis; RA: rheumatoid arthritis; UC, ulcerative colitis. *Only includes patients who do not have inpatient, outpatient, ICU, or ER records for COVID-19 diagnosis. Diagnosis sites are not mutually exclusive.

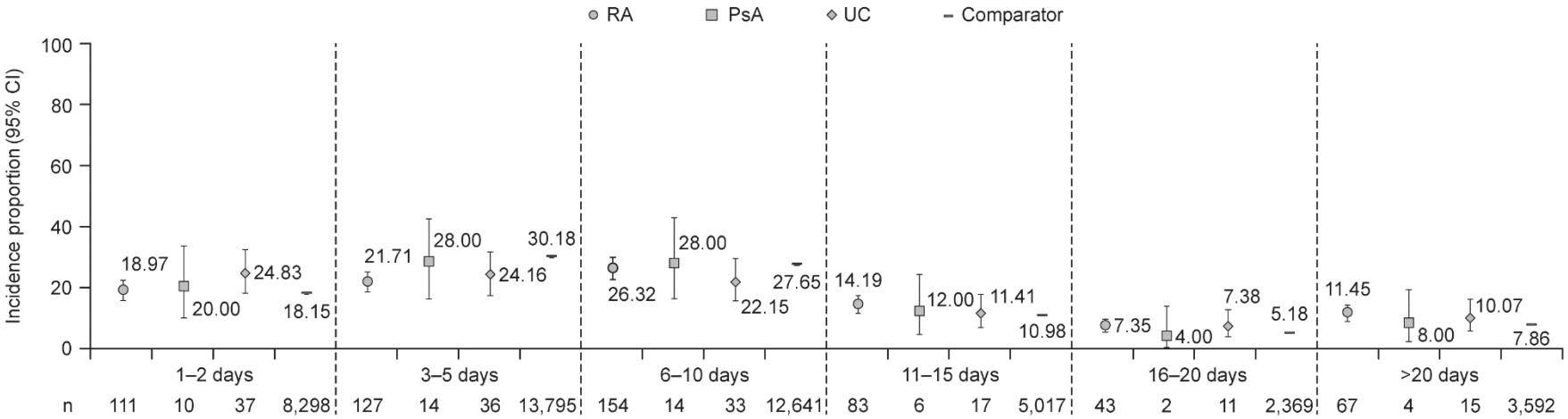
Supplementary Figure 2. Incidence of hospitalization, ICU admission, in-hospital death, and all-cause mortality in the (A) RA cohort, (B) PsA cohort, and (C) UC cohort, by baseline systemic therapy.



95% CIs are not calculated for incidence proportions of 0.00. CI: confidence interval; csDMARD: conventional synthetic disease-modifying antirheumatic drug; ICU: intensive care unit; JAK: Janus kinase; N: number of patients in

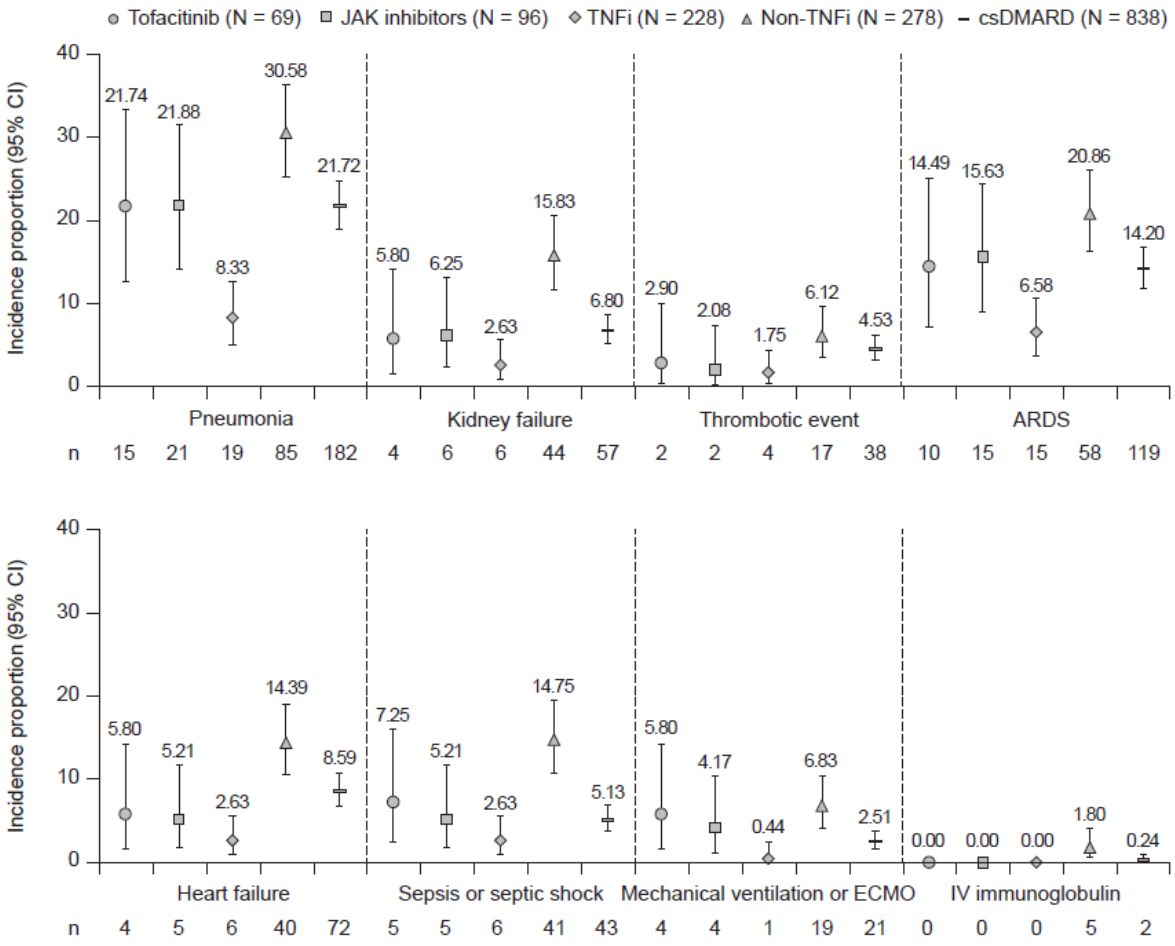
the cohort; n: number of patients in the specified category; PsA: psoriatic arthritis; RA: rheumatoid arthritis; TNFi: tumor necrosis factor inhibitor; UC: ulcerative colitis. *Denominator is the number of patients hospitalized.

Supplementary Figure 3. Length of hospital stay among hospitalized patients in the indicated and comparator cohorts.



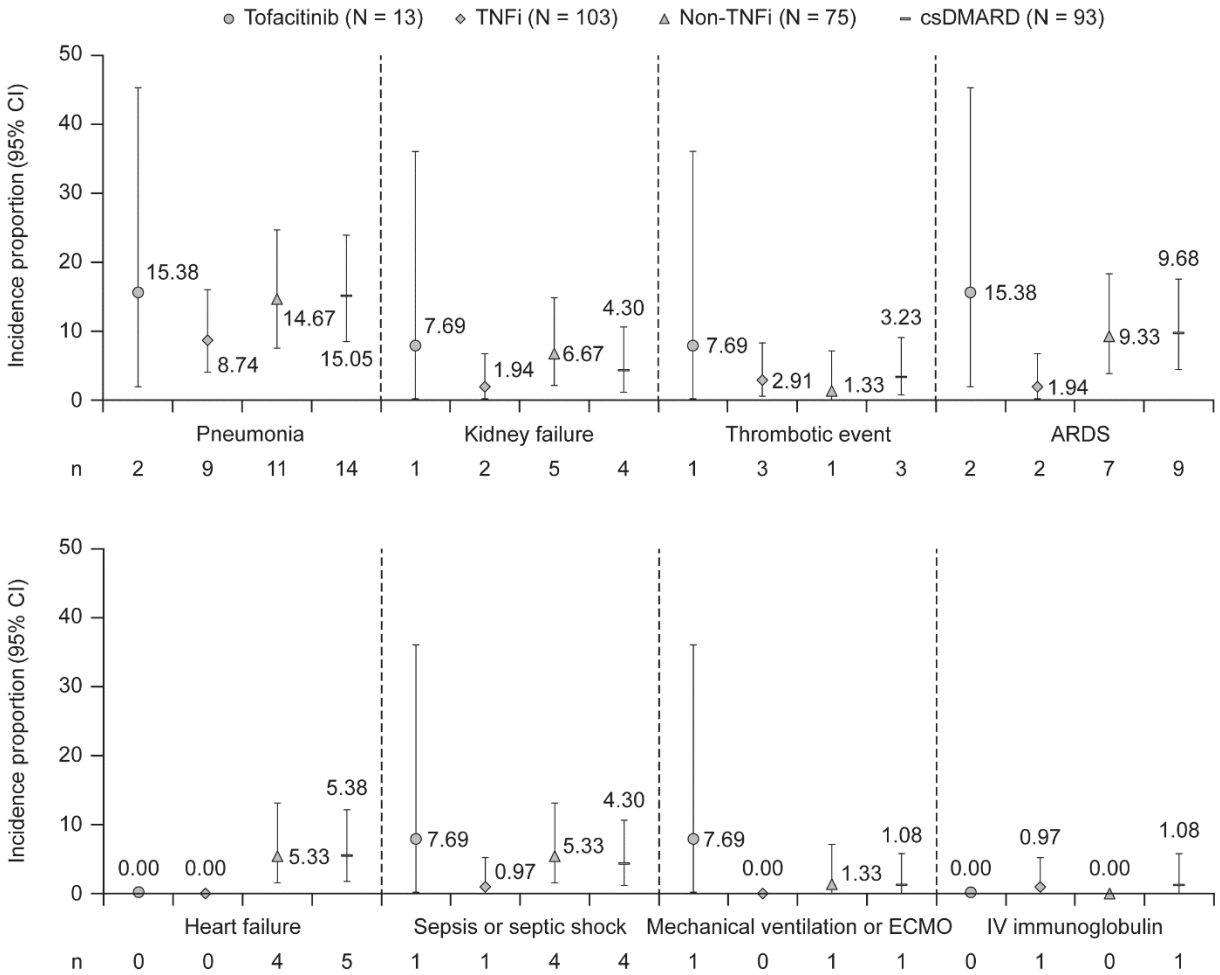
Denominator is the number of patients hospitalized. CI: confidence interval; n: number of patients in the specified category; PsA: psoriatic arthritis; RA: rheumatoid arthritis; UC: ulcerative colitis.

Supplementary Figure 4. COVID-19 clinical manifestations or outcomes of interest in patients with RA, by systemic therapy.



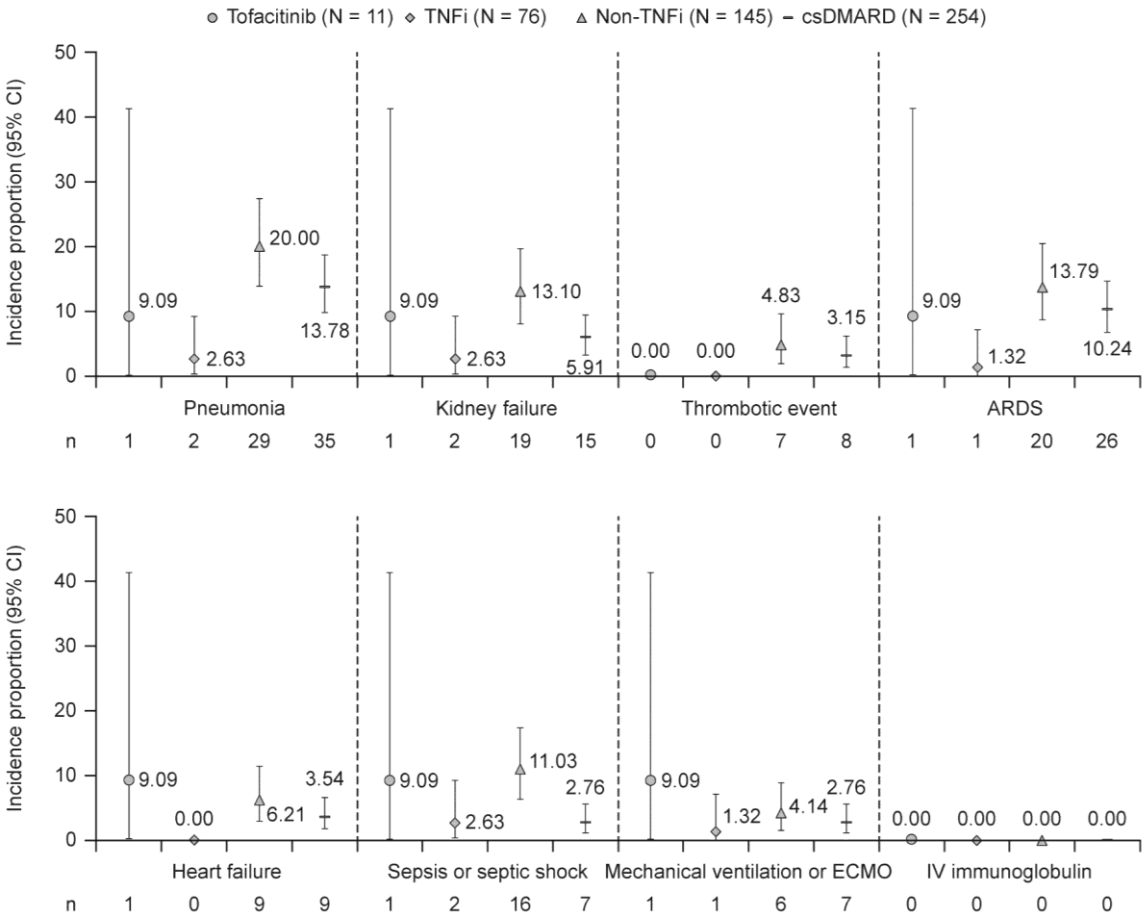
95% CIs are not calculated for incidence proportions of 0.00. IV immunoglobulin was used as an indicator of severe COVID-19. ARDS: acute respiratory distress syndrome; CI: confidence interval; csDMARD: conventional synthetic disease-modifying antirheumatic drug; ECMO: extracorporeal membrane oxygenation; IV: intravenous; JAK: Janus kinase; N: number of patients in the cohort; n: number of patients in the specified category; RA: rheumatoid arthritis; TNFi: tumor necrosis factor inhibitor.

Supplementary Figure 5. COVID-19 clinical manifestations or outcomes of interest in patients with PsA, by systemic therapy.



95% CIs are not calculated for incidence proportions of 0.00. IV immunoglobulin was used as an indicator of severe COVID-19. All patients in the PsA cohort who were receiving a JAK inhibitor were receiving tofacitinib. ARDS: acute respiratory distress syndrome; CI: confidence interval; csDMARD: conventional synthetic disease-modifying antirheumatic drug; ECMO: extracorporeal membrane oxygenation; IV: intravenous; JAK: Janus kinase; N: number of patients in the cohort; n: number of patients in the specified category; PsA: psoriatic arthritis; TNFi: tumor necrosis factor inhibitor.

Supplementary Figure 6. COVID-19 clinical manifestations/outcomes of interest in patients with UC, by systemic therapy.



95% CIs are not calculated for incidence proportions of 0.00. IV immunoglobulin was used as an indicator of severe COVID-19. All patients in the UC cohort who were receiving a JAK inhibitor were receiving tofacitinib. ARDS: acute respiratory distress syndrome; CI: confidence interval; csDMARD: conventional synthetic disease-modifying antirheumatic drug; ECMO: extracorporeal membrane oxygenation; IV: intravenous; JAK: Janus kinase; N: number of patients in the cohort; n: number of patients in the specified category; TNFi: tumor necrosis factor inhibitor; UC: ulcerative colitis.