

Supplementary Online Content

Supplementary Table 1. ICD-9 and ICD-10 codes for autoimmune rheumatic disease and transplant patients

Supplementary Table 2. Risk of severe COVID-19 outcomes among patients with autoimmune rheumatic disease

Supplementary Table 3. Risk of severe COVID-19 outcomes among transplant recipients

Supplementary Table 4. Sensitivity analysis for risk of 60-day mortality for patients with autoimmune rheumatic disease and transplant

Supplementary Table 1. ICD-9 and ICD-10 codes for autoimmune rheumatic disease and transplant patients

Disease	ICD-9/CCP	ICD-10
Autoimmune rheumatic disease		
Rheumatoid arthritis	714.X	M05.X-M06.X
Psoriasis/Psoriatic arthritis	696.X	L40.X
Ankylosing spondylitis	720.X	M45.X
Systemic lupus erythematosus	710.0	M32.1, M32.8, M32.9
Sjogren's syndrome	710.2	M35.0
Systemic sclerosis	710.1	M34.X
Myositis	710.3, 710.4	M33.0, M33.1, M33.2, M33.9
Adult systemic vasculitides	446.0, 446.4, 446.5, 446.7	M30.0, M31.3, M31.4, M31.5
Transplants		
Lobe lung	455	1GR85
Lung	455	1GT85
Heart and lung	Not available	1HY85
Heart	495	1HZ85
Liver	6241, 6249	1OA85
Pancreas	Not available	1OJ85
Pancreas and duodenum	6481-6484	1OK85
Kidney	6751, 6759	1PC85
Bone marrow	530	1WY19

Abbreviations: ICD, International Classification of Diseases

Supplementary Table 2. Risk of severe COVID-19 outcomes among patients with autoimmune rheumatic disease

	Hospitalizations		ICU admissions		Invasive ventilation		COVID-19-specific mortality	
	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)
All ARDs (n=6,279)	780 (12.4)	1.30 (1.19, 1.43)	225 (3.6)	1.30 (1.11, 1.51)	100 (1.6)	1.60 (1.27, 2.01)	229 (3.7)	1.24 (1.05, 1.47)
ARD matched comparators (n=31,130)	2,843 (9.1)	1.00 (ref)	807 (2.6)	1.00 (ref)	284 (0.9)	1.00 (ref)	847 (2.7)	1.00 (ref)
<i>RA (n=2,067)</i>	321 (15.5)	1.34 (1.15, 1.54)	95 (4.6)	1.30 (1.03, 1.65)	46 (2.2)	1.56 (1.11, 2.21)	103 (5.0)	1.18 (0.92, 1.52)
<i>RA matched comparators (n=10,197)</i>	1,151 (11.3)	1.00 (ref)	336 (3.3)	1.00 (ref)	130 (1.3)	1.00 (ref)	400 (3.9)	1.00 (ref)
<i>PsO/PsA (n=2,695)</i>	263 (9.8)	1.17 (1.01, 1.37)	65 (2.4)	0.90 (0.68, 1.19)	26 (1.0)	1.01 (0.66, 1.56)	68 (2.5)	0.93 (0.68, 1.26)
<i>PsO/PsA matched comparators (n=13,411)</i>	1,052 (7.8)	1.00 (ref)	332 (2.5)	1.00 (ref)	118 (0.9)	1.00 (ref)	309 (2.3)	1.00 (ref)
<i>AS (n=529)</i>	51 (9.6)	1.36 (0.95, 1.94)	20 (3.8)	2.03 (1.18, 3.50)	9 (1.7)	2.63 (1.14, 6.06)	13 (2.5)	2.15 (1.02, 4.55)
<i>AS matched comparators (n=2,631)</i>	180 (6.8)	1.00 (ref)	48 (1.8)	1.00 (ref)	17 (0.6)	1.00 (ref)	32 (1.2)	1.00 (ref)
SARDs (n=1,118)	168 (15.0)	1.62 (1.32, 2.00)	52 (4.7)	1.74 (1.24, 2.44)	23 (2.1)	2.57 (1.51, 4.36)	49 (4.4)	1.44 (1.00, 2.10)
SARDs matched comparators (n=5,532)	490 (8.9)	1.00 (ref)	135 (2.4)	1.00 (ref)	40 (0.7)	1.00 (ref)	157 (2.8)	1.00 (ref)
<i>SLE (n=239)</i>	37 (15.5)	1.88 (1.18, 3.00)	11 (4.6)	1.67 (0.75, 3.74)	≤5 (*)	1.87 (0.46, 7.64)	≤5 (*)	0.85 (0.17, 4.29)
<i>SLE matched comparators (n=1,187)</i>	77 (6.5)	1.00 (ref)	26 (2.2)	1.00 (ref)	11 (0.9)	1.00 (ref)	13 (1.1)	1.00 (ref)
<i>SjS (n=96)</i>	15 (15.6)	2.07 (0.94, 4.58)	≤5 (*)	*	≤5 (*)	*	≤5 (*)	*
<i>SjS matched comparators (n=477)</i>	35 (7.4)	1.00 (ref)	14 (2.9)	1.00 (ref)	≤5 (*)	1.00 (ref)	15 (3.2)	1.00 (ref)
<i>Systemic sclerosis (n=35)</i>	≤5 (*)	*	≤5 (*)	*	≤5 (*)	*	≤5 (*)	*

<i>Systemic sclerosis matched comparators (n=173)</i>	16 (9.3)	1.00 (ref)	≤5 (*)	1.00 (ref)	≤5 (*)	1.00 (ref)	≤5 (*)	1.00 (ref)
<i>Myositis (n=30)</i>	5 (16.7)	3.18 (0.69, 14.55)	≤5 (*)	*	≤5 (*)	*	≤5 (*)	*
<i>Myositis matched comparators (n=150)</i>	12 (8.0)	1.00 (ref)	≤5 (*)	1.00 (ref)	≤5 (*)	1.00 (ref)	7 (4.7)	1.00 (ref)
<i>Adult systemic vasculitides (n=82)</i>	25 (30.5)	2.18 (1.17, 4.05)	8 (9.8)	1.70 (0.70, 4.16)	≤5 (*)	1.53 (0.34, 6.85)	≤5 (*)	*
<i>Adult systemic vasculitides matched comparators (n=404)</i>	64 (15.8)	1.00 (ref)	21 (5.2)	1.00 (ref)	8 (2.0)	1.00 (ref)	16 (4.0)	1.00 (ref)

Abbreviations: ARD, autoimmune rheumatic disease; AS, ankylosing spondylitis; CI, confidence interval; ICD, International Classification of Diseases; ICU, intensive care unit; OR, odds ratio; PsA, psoriatic arthritis; PsO, psoriasis; RA, rheumatoid arthritis; SARD, systemic autoimmune rheumatic disease; SjS, Sjogren's syndrome; SLE, systemic lupus erythematosus

*Unable to be calculated due to small sample size

Supplementary Table 3. Risk of severe COVID-19 outcomes among transplant recipients

	Hospitalizations		ICU admissions		Invasive ventilation		COVID-19-specific mortality	
	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)	n (%)	aOR (95% CI)
Transplants (n=222)	115 (51.8)	10.56 (6.88, 16.22)	49 (22.1)	8.13 (4.76, 13.91)	19 (8.6)	8.64 (3.81, 19.61)	27 (12.2)	5.48 (2.82, 10.63)
Transplant matched comparators (n=1,106)	110 (10.0)	1.00 (ref)	41 (3.7)	1.00 (ref)	14 (1.3)	1.00 (ref)	24 (2.2)	1.00 (ref)

Abbreviations: ICD, International Classification of Diseases; ICU, intensive care unit; OR, odds ratio

Supplementary Table 4. Sensitivity analysis for risk of 60-day mortality for patients with autoimmune rheumatic disease and transplant

	60-day mortality	
	n (%)	aOR (95% CI)
All ARDs (n=6,279)	260 (4.1)	1.20 (1.02, 1.41)
ARD matched comparators (n=31,130)	973 (3.1)	1.00 (ref)
<i>RA (n=2,067)</i>	121 (5.9)	1.25 (0.99, 1.59)
<i>RA matched comparators (n=10,197)</i>	451 (4.4)	1.00 (ref)
<i>PsO/PsA (n=2,695)</i>	78 (2.9)	0.95 (0.71, 1.27)
<i>PsO/PsA matched comparators (n=13,406)</i>	344 (2.6)	1.00 (ref)
<i>AS (n=529)</i>	12 (2.3)	2.25 (1.01, 5.03)
<i>AS matched comparators (n=2,631)</i>	30 (1.1)	1.00 (ref)
<i>SARDs (n=1,118)</i>	52 (4.7)	1.25 (0.86, 1.80)
<i>SARDs matched comparators (n=5,532)</i>	180 (3.3)	1.00 (ref)
<i>SLE (n=239)</i>	6 (2.5)	1.19 (0.33, 4.32)
<i>SLE matched comparators (n=1,187)</i>	13 (1.1)	1.00 (ref)
<i>SjS (n=96)</i>	≤5 (*)	*
<i>SjS matched comparators (n=477)</i>	17 (3.6)	1.00 (ref)
<i>Systemic sclerosis (n=35)</i>	≤5 (*)	*
<i>Systemic sclerosis matched comparators (n=173)</i>	≤5 (*)	1.00 (ref)
<i>Myositis (n=30)</i>	≤5 (*)	*
<i>Myositis matched comparators (n=150)</i>	9 (6.0)	1.00 (ref)
<i>Adult systemic vasculitides (n=82)</i>	≤5 (*)	1.17 (0.36, 3.76)
<i>Adult systemic vasculitides matched comparators (n=404)</i>	18 (4.5)	1.00 (ref)
All transplant (n=222)	23 (10.4)	4.59 (2.29, 9.21)
Transplant matched comparators (n=1,106)	24 (2.2)	1.00 (ref)

Abbreviations: ARD, autoimmune rheumatic diseases; AS, ankylosing spondylitis; ICU, intensive care unit; OR, odds ratio; PsA, psoriatic arthritis; PsO, psoriasis; RA, rheumatoid arthritis; SARD, systemic autoimmune rheumatic disease; SD, standard deviation; SLE, systemic lupus erythematosus; SjS, Sjogren's syndrome

*Unable to be calculated due to small sample size