

SUPPLEMENTARY MATERIAL:

Healthcare resource use and costs associated with organ damage in newly diagnosed adults with systemic lupus erythematosus in the UK

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Supplementary Table S1. CPRD READ codes and HES data ICD-10 codes for inclusion*

Description	Code
CPRD READ CODES	
Systemic lupus erythematosus	N000.00
Disseminated lupus erythematosus	N000000
Libman-Sacks disease	N000100
Systemic lupus erythematosus with organ or systemic involvement	N000300
Systemic lupus erythematosus with pericarditis	N000400
Cerebral lupus	N000600
Systemic lupus erythematosus NOS	N000z00
[X]Other forms of systemic lupus erythematosus	Nyu4300
Lupus nephritis	K01x411
Lupus erythematosus	M154.00
Lupus erythematosus NOS	M154z00
Polyneuropathy in disseminated lupus erythematosus	F371000
Lung disease with systemic lupus erythematosus	H57y400
Nephrotic syndrome in systemic lupus erythematosus	K01x400
HES ICD-10 CODES	
SLE with organ or system involvement	M32.1
Other forms of SLE	M32.8
SLE, unspecified	M32.9

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CPRD, Clinical Practice Research Datalink; HES, Hospital Episode Statistics; ICD-10, International Classification of Diseases Tenth Revision; NOS, not otherwise specified; SLE, systemic lupus erythematosus.

Supplementary Table S2. Classification of SLE organ damage*

Organ system	Condition
Cardiovascular	Angina or coronary artery bypass, myocardial infarction, cardiomyopathy, valvular disease, pericarditis or pericardiectomy
Endocrine (diabetes)	Diabetes regardless of treatment
Gastrointestinal	Infarction or resection of bowel (below duodenum), spleen, liver or gallbladder, chronic peritonitis, stricture or upper gastrointestinal tract surgery, pancreatic insufficiency, cholecystitis
Gonadal	Premature gonadal failure
Hepatic	Liver failure, transplantation, resection, compensation for liver failure, chronic liver disease
Malignancies	Any malignancy
Musculoskeletal	Muscle atrophy or weakness, deforming or erosive arthritis, osteoporosis with fracture or vertebral collapse, avascular necrosis
Neuropsychiatric	Cognitive impairment or major psychosis, seizures, cranial or peripheral neuropathy, cerebrovascular accident, chronic cerebrovascular disease, transverse myelitis
Ocular	Retinal change or optic atrophy, cataract
Peripheral vascular	Claudication, chronic peripheral vascular disease and tissue loss, venous thrombosis, peripheral vascular disease
Pulmonary	Pulmonary hypertension, pulmonary fibrosis, chronic pulmonary disease, pleural fibrosis, pulmonary infarction, pulmonary resection
Renal	End-stage renal disease, renal failure, glomerular filtration rate <50%, proteinuria, nephritis
Skin	Scarring chronic alopecia, panniculitis, skin ulceration (excluding thrombosis)

Supplementary Table S3. Cumulative incidences of organ damage by organ system following SLE diagnosis date (study cohort N=936)

Total n*	Years since SLE diagnosis, n (%)									
	1	2	3	4	5	6	7	8	9	10+
Overall (all organ damage) (n=533)	152 (28.5)	210 (39.4)	236 (44.3)	259 (48.6)	284 (53.3)	296 (55.5)	305 (57.2)	309 (58.0)	311 (58.3)	315 (59.1)
Cardiovascular (n=842)	60 (7.1)	79 (9.4)	92 (10.9)	108 (12.8)	125 (14.8)	133 (15.8)	138 (16.4)	142 (16.9)	145 (17.2)	149 (17.7)
Endocrine (n=875)	17 (1.9)	28 (3.2)	34 (3.9)	41 (4.7)	46 (5.3)	50 (5.7)	54 (6.2)	57 (6.5)	58 (6.6)	61 (7.0)
Gastrointestinal (n=910)	23 (2.5)	37 (4.1)	49 (5.4)	59 (6.5)	75 (8.2)	76 (8.4)	81 (8.9)	85 (9.3)	85 (9.3)	87 (9.6)
Gonadal (n=932)	4 (0.4)	7 (0.8)	9 (1.0)	13 (1.4)	14 (1.5)	14 (1.5)	14 (1.5)	15 (1.6)	16 (1.7)	17 (1.8)
Hepatic (n=875)	9 (1.0)	19 (2.1)	25 (2.7)	27 (2.9)	29 (3.1)	33 (3.6)	36 (3.9)	36 (3.9)	38 (4.1)	43 (4.6)
Malignancies (n=910)	26 (2.9)	36 (4.0)	51 (5.6)	63 (6.9)	71 (7.8)	78 (8.6)	82 (9.0)	85 (9.3)	90 (9.9)	95 (10.4)
Musculoskeletal (n=819)	56 (6.8)	80 (9.8)	99 (12.1)	116 (14.2)	128 (15.6)	135 (16.5)	140 (17.1)	142 (17.3)	145 (17.7)	146 (17.8)
Neuropsychiatric (n=882)	52 (5.9)	79 (9.0)	94 (10.7)	111 (12.6)	117 (13.3)	122 (13.8)	128 (14.5)	132 (15.0)	134 (15.2)	140 (15.9)
Ocular (n=918)	22 (2.4)	35 (3.8)	44 (4.8)	51 (5.6)	54 (5.9)	58 (6.3)	60 (6.5)	63 (6.9)	65 (7.1)	68 (7.4)
Peripheral vascular (n=875)	56 (6.4)	76 (8.7)	85 (9.7)	94 (10.7)	103 (11.8)	113 (12.9)	117 (13.4)	119 (13.6)	121 (13.8)	126 (14.4)
Pulmonary (n=862)	48 (5.6)	66 (7.7)	74 (8.6)	82 (9.5)	92 (10.7)	100 (11.6)	104 (12.1)	106 (12.3)	112 (13.0)	117 (13.6)
Renal (n=892)	47 (5.3)	62 (7.0)	77 (8.6)	90 (10.1)	98 (11.0)	104 (11.7)	109 (12.2)	110 (12.3)	111 (12.4)	116 (13.0)
Skin (n=856)	51 (6.0)	72 (8.4)	88 (10.3)	103 (12.0)	113 (13.2)	125 (14.6)	137 (16.0)	142 (16.6)	146 (17.1)	148 (17.3)

*n varies by organ damage category, as each category was examined separately and patients with that specific organ damage in the 12 months prior to SLE diagnosis date were excluded. SLE, systemic lupus erythematosus.

Supplementary Table S4. Unadjusted mean (SD) annualized all-cause costs per patient (2019 GBP) following SLE diagnosis (with and without organ damage*) by type of organ damage (post- and pre-organ damage index) in the HCRU/cost cohort**

	Post-organ damage index										Pre-organ damage index									
Mean (SD)	Inpatient stay		Outpatient visit		A&E visit		Primary care contact		Primary care prescriptions		Inpatient stay		Outpatient visit		A&E visit		Primary care contact		Primary care prescriptions	
	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD	OD	No-OD
Overall (all organ damage) (n=378)	£1099 (£2605)	£191 (£709)	£1063 (£1390)	£464 (£626)	£37 (£128)	£13 (£35)	£2727 (£3017)	£1319 (£1334)	£1777 (£5301)	£376 (£800)	£394 (£1178)	£285 (£977)	£700 (£1019)	£613 (£754)	£21 (£53)	£17 (£47)	£2053 (£1944)	£1499 (£1394)	£803 (£2229)	£340 (£744)
Cardiovascular (n=508)	£1957 (£3503)	£505 (£1561)	£1586 (£2129)	£717 (£1013)	£60 (£143)	£21 (£54)	£3833 (£7401)	£1908 (£2223)	£1607 (£2880)	£1076 (£3921)	£724 (£1714)	£743 (£2001)	£934 (£1107)	£930 (£1136)	£32 (£69)	£27 (£96)	£2787 (£2595)	£2049 (£2165)	£1314 (£3108)	£662 (£2193)
Endocrine (diabetes) (n=548)	£768 (£2061)	£660 (£1954)	£1390 (£2211)	£809 (£1195)	£39 (£117)	£24 (£66)	£4230 (£9706)	£2004 (£1859)	£1250 (£2360)	£1312 (£4309)	£1255 (£2339)	£913 (£2298)	£1420 (£1899)	£994 (£1243)	£59 (£133)	£29 (£99)	£3755 (£6100)	£2198 (£2208)	£1087 (£2135)	£742 (£1848)
Gastrointestinal (n=504)	£1977 (£3468)	£578 (£1717)	£1839 (£2248)	£768 (£1097)	£64 (£145)	£22 (£62)	£3736 (£4607)	£2046 (£2246)	£1614 (£2511)	£1299 (£4315)	£1546 (£2685)	£864 (£2289)	£1254 (£1378)	£1034 (£1335)	£54 (£105)	£29 (£97)	£3321 (£2836)	£2113 (£3487)	£1529 (£3236)	£763 (£2523)
Gonadal (n=466)	£341 (£1112)	£741 (£2055)	£694 (£840)	£913 (£1415)	£34 (£54)	£28 (£73)	£2028 (£1033)	£2277 (£2478)	£431 (£468)	£1431 (£4318)	£637 (£1506)	£846 (£2350)	£936 (£834)	£996 (£1396)	£43 (£68)	£29 (£89)	£2776 (£3167)	£1907 (£3298)	£481 (£757)	£842 (£2998)
Hepatic (n=444)	£1262 (£3068)	£693 (£1966)	£1165 (£1473)	£874 (£1363)	£46 (£106)	£25 (£75)	£3986 (£4100)	£2121 (£2306)	£1315 (£2458)	£1480 (£4644)	£1315 (£2496)	£794 (£2270)	£1185 (£1532)	£959 (£1449)	£46 (£82)	£29 (£78)	£3298 (£2890)	£1766 (£3406)	£1436 (£2606)	£807 (£3013)
Malignancies (n=458)	£2165 (£4261)	£575 (£1642)	£1970 (£2486)	£739 (£1000)	£63 (£156)	£25 (£70)	£3004 (£3992)	£2161 (£2476)	£2246 (£6333)	£1347 (£4591)	£1345 (£2661)	£716 (£2055)	£1281 (£1438)	£948 (£1322)	£64 (£204)	£25 (£64)	£3553 (£8086)	£1785 (£2162)	£1294 (£3126)	£751 (£2414)
Musculoskeletal (n=498)	£1466 (£3086)	£581 (£1777)	£1301 (£1602)	£801 (£1281)	£48 (£119)	£22 (£58)	£3150 (£2556)	£1930 (£2006)	£2592 (£7025)	£896 (£2339)	£1207 (£2657)	£829 (£2116)	£1002 (£1195)	£995 (£1227)	£30 (£73)	£29 (£101)	£2902 (£3190)	£2139 (£2278)	£1356 (£2809)	£658 (£1483)
Neuropsychiatric (n=535)	£1572 (£3197)	£565 (£1822)	£1523 (£2087)	£790 (£1208)	£52 (£126)	£21 (£60)	£3286 (£4377)	£2046 (£2361)	£2116 (£5662)	£1171 (£3689)	£1172 (£2456)	£792 (£1960)	£1154 (£1528)	£954 (£1104)	£48 (£114)	£27 (£87)	£3346 (£6021)	£2110 (£2229)	£1293 (£2914)	£706 (£1916)
Ocular (n=501)	£1673 (£3080)	£670 (£2005)	£1410 (£2134)	£859 (£1323)	£51 (£134)	£24 (£64)	£4542 (£8753)	£2094 (£2230)	£1751 (£4053)	£1290 (£3955)	£1131 (£2368)	£967 (£2452)	£1106 (£1097)	£1066 (£1355)	£37 (£94)	£32 (£101)	£3477 (£6484)	£2105 (£2299)	£1540 (£3444)	£772 (£2257)
Peripheral vascular (n=539)	£1454 (£3186)	£554 (£1711)	£1518 (£2143)	£768 (£1143)	£55 (£127)	£23 (£59)	£3490 (£3818)	£2056 (£2304)	£1614 (£3533)	£1163 (£3982)	£1307 (£2930)	£857 (£2121)	£1171 (£1359)	£994 (£1260)	£41 (£94)	£29 (£95)	£2698 (£2328)	£2250 (£3541)	£1699 (£5543)	£734 (£2312)
Pulmonary (n=516)	£1751 (£3092)	£544 (£1709)	£1493 (£1579)	£763 (£1234)	£72 (£222)	£20 (£56)	£3169 (£2281)	£1973 (£2286)	£2183 (£5842)	£1173 (£3803)	£1001 (£2220)	£774 (£2103)	£1072 (£1198)	£968 (£1257)	£42 (£91)	£25 (£63)	£2989 (£3018)	£2072 (£2216)	£1147 (£1900)	£641 (£1789)
Renal (n=541)	£1749 (£3571)	£538 (£1581)	£1468 (£1693)	£788 (£1236)	£44 (£101)	£25 (£70)	£3442 (£3156)	£2019 (£2378)	£2319 (£6441)	£1186 (£3855)	£1405 (£2948)	£828 (£2074)	£1160 (£1566)	£972 (£1205)	£40 (£95)	£29 (£98)	£3398 (£7939)	£2209 (£2303)	£1452 (£3583)	£770 (£2222)
Skin (n=396)	£1673 (£3246)	£489 (£1514)	£1453 (£1902)	£702 (£893)	£52 (£158)	£18 (£45)	£2830 (£3025)	£2088 (£2433)	£1859 (£4806)	£1261 (£3978)	£1261 (£2570)	£823 (£2171)	£1243 (£1719)	£998 (£1249)	£47 (£117)	£26 (£65)	£3350 (£7213)	£2107 (£2086)	£1221 (£3566)	£664 (£1655)

*n varies by organ damage category, as each category was examined separately and patients with that specific organ damage in the 12 months prior to SLE diagnosis date were excluded.

**Post-organ damage index date follow-up of ≥ 12 months

A&E, accident and emergency; GBP, British pound sterling; OD, organ damage; SD, standard deviation; SLE, systemic lupus erythematosus.

Supplementary Table S5. Overall adjusted mean (SE) annualized all-cause costs per patient (2019 GBP) following SLE diagnosis (with and without organ damage*) by type of organ damage (post- and pre-organ damage index) in the HCRU/cost cohort**

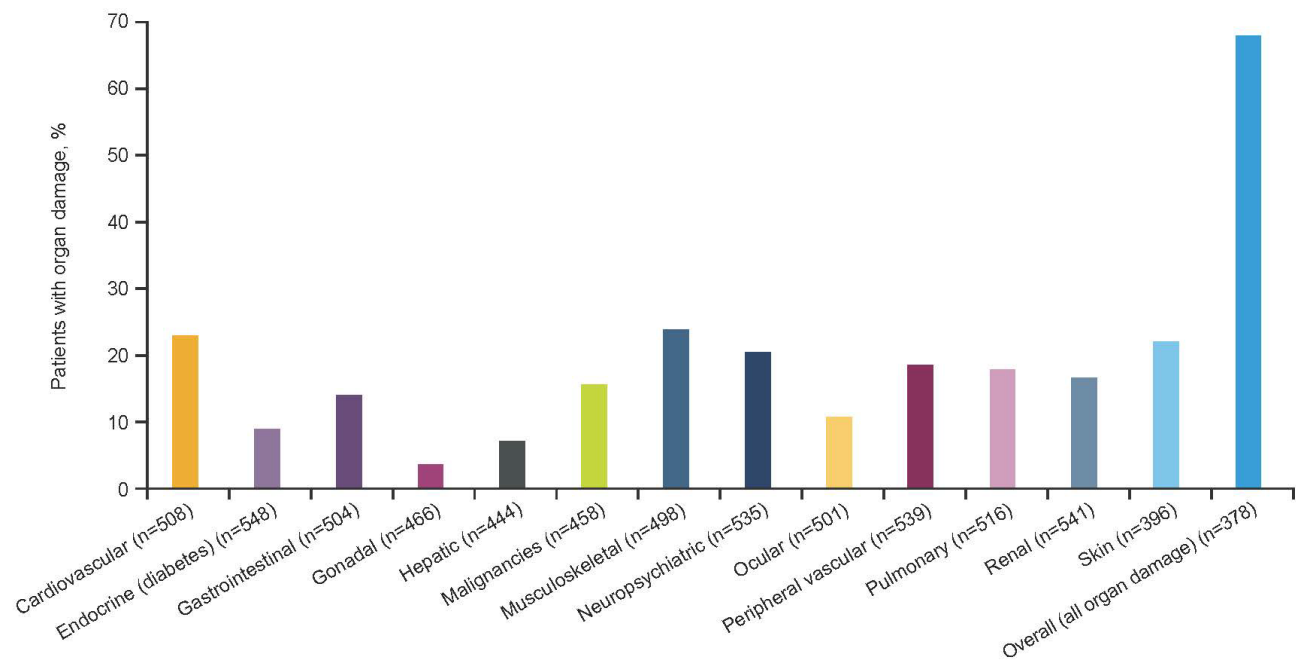
	Post-organ damage index			Pre-organ damage index		
	Adjusted mean difference in all-cause healthcare costs (organ damage versus no organ damage)			Adjusted mean difference in all-cause healthcare costs (organ damage versus no organ damage)		
	Estimate (SE)***	95% CI	P-value	Estimate (SE)*	95% CI	P-value
Overall (all organ damage) (n=378)	£4442 (£405)	£3648, £5237	<0.0001	£1423 (£222)	£987, £1859	<0.0001
Cardiovascular (n=508)	£5324 (£747)	£3860, £6787	<0.0001	£1634 (£436)	£780, £2488	0.0002
Endocrine (diabetes) (n=548)	£3590 (£1535)	£581, £6598	0.0194	£3057 (£808)	£1474, £4641	0.0002
Gastrointestinal (n=504)	£4457 (£847)	£2797, £6116	<0.0001	£2838 (£619)	£1625, £4052	<0.0001
Gonadal (n=466)	-£1268 (£567)	-£2379, -£158	0.0252	£1020 (£865)	-£675, £2715	0.2382
Hepatic (n=444)	£2709 (£1109)	£536, £4881	0.0146	£2865 (£842)	£1216, £4515	0.0007
Malignancies (n=458)	£7150 (£1370)	£4465, £9835	<0.0001	£3142 (£808)	£1559, £4726	0.0001
Musculoskeletal (n=498)	£3861 (£737)	£2416, £5305	<0.0001	£1758 (£415)	£945, £2572	<0.0001
Neuropsychiatric (n=535)	£4669 (£947)	£2813, £6524	<0.0001	£2329 (£551)	£1250, £3409	<0.0001
Ocular (n=501)	£4863 (£1497)	£1930, £7796	0.0012	£2097 (£812)	£506, £3687	0.0098
Peripheral vascular (n=539)	£4083 (£760)	£2594, £5573	<0.0001	£2105 (£628)	£874, £3335	0.0008
Pulmonary (n=516)	£4652 (£691)	£3296, £6007	<0.0001	£1717 (£443)	£848, £2585	0.0001
Renal (n=541)	£4552 (£883)	£2820, £6283	<0.0001	£2563 (£695)	£1201, £3924	0.0002
Skin (n=396)	£4001 (£740)	£2552, £5451	<0.0001	£2308 (£607)	£1119, £3498	0.0001

*n varies by organ damage category, as each category was examined separately and patients with that specific organ damage in the 12 months prior to SLE diagnosis date were excluded.

**Post-organ damage index date follow-up of ≥ 12 months.

***Calculated using generalized estimating equations accounting for correlated data to compare mean all-cause healthcare costs between patients with and without organ damage, adjusting for age, gender, and time since organ damage index. CI, confidence interval; GBP, British pound sterling; SE, standard error; SLE, systemic lupus erythematosus.

Supplementary Figure S1. Percentage of patients with organ damage* by system and overall in the HCRU/cost cohort**



*Organ damage identification: at least one diagnosis of organ damage at any time from SLE diagnosis date to end of follow-up (June 30, 2019). No organ damage diagnosis in the 12 months prior to the SLE diagnosis date.

**Post-organ damage index date follow-up of ≥ 12 months

SLE, systemic lupus erythematosus.