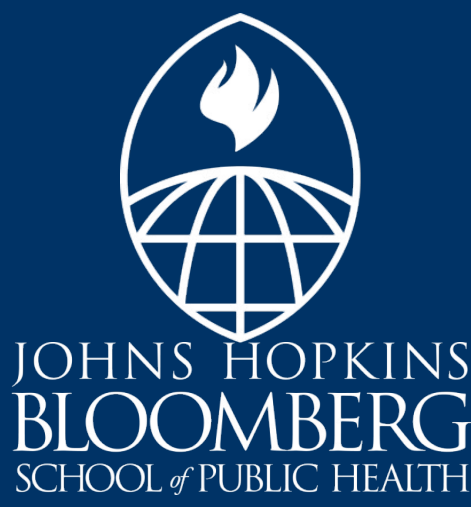




The Relationship Between Systematic Lupus Erythematosus Disease Activity Index (SLEDAI) and Healthcare Resource Utilization and Costs in Lupus Patients

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Problems

- Traditional sources of healthcare resource utilization (HCRU) and costs for systematic lupus erythematosus (SLE) patients lack granular clinical information and longitudinal follow-up.
- Due to the heterogeneous nature of SLE, in which disease activity fluctuates with time and acute flares and remissions are common. Little is known about the relationship between disease activity and HCRU/costs.

Objective

- Describe the relationship between current disease activity and HCRU over time in a cohort of SLE patients followed by the Johns Hopkins Lupus Cohort Study

Methods

- We combined data from the longstanding Johns Hopkins Lupus Cohort, where SLE Disease Activity Index (SLEDAI) was collected at minimum every six-months during standardized protocol visits, with health system resource use and cost data (Casemix). As well as claims data from a different cohort to estimate pharmacy spending.
- Patient HCRU (events and costs) and registry data were included each calendar half-year where at least 1-registry visit and 1-Casemix item was observed. We computed the annual HCRU and cost of care by type of utilization: outpatient, inpatient, emergency room and pharmaceutical.
- Described the impact of disease activity (based on the worst SLEDAI score observed in each period) on utilization and costs.
- SLEDAI score 0 (no activity), 1-5 (mild), 6-10 (moderate), 11+ (high) used as a predictor of outcomes, adjusted for patients fixed effects and disease characteristics, using mixed effect GLMs (Gamma/Poisson, log link)

Data Construction

Data Source	Use in Study
JHU Lupus Registry Cohort • 2000+ patients followed longitudinally since 1993	Clinical Severity/Characteristics SLEDAI Score over time # registry visits Days on medications
JHU Casemix • Matched to Registry patients, using medical record number • Contains all ‘in health system’ utilization/costs for cohort 2013-2019	All in health system IP/OP/ER utilization
External Privately Insured Claims Cohort • External claims data cohort with Lupus (N=21,311)	Per day cost of drug utilization among average Lupus Patients.

Table 1: Cohort Demographics

	N	SD/%	Min	Max
Total	1,162			
Demographics				
Female	1063	92%		
Age at Registry Entry	29	12.9	18	71
Age in 2013	43.9	14.2	19	90
Age at Study Entry	44.6	14.1	19	90
Race				
White	547	47%		
Black	488	42%		
Asian	66	6%		
Other	61	5%		
Insurance at Study Entry				
Private	930	80%		
Medicare	203	17%		
Medicaid	21	2%		
Other	8	1%		
Clinical History (at Registry Entry)				
Smoker	357	31%		
Diabetes	107	9%		
Renal Problems	229	17%		
Hypertension	621	53%		
Died (in Study)	55	5%		
Study Data Observed				
Patient Years Observed	5,144			
Patient Half Years Observed	9,531			
Patient Years Observed Per Person	4.4	2.2	1	7

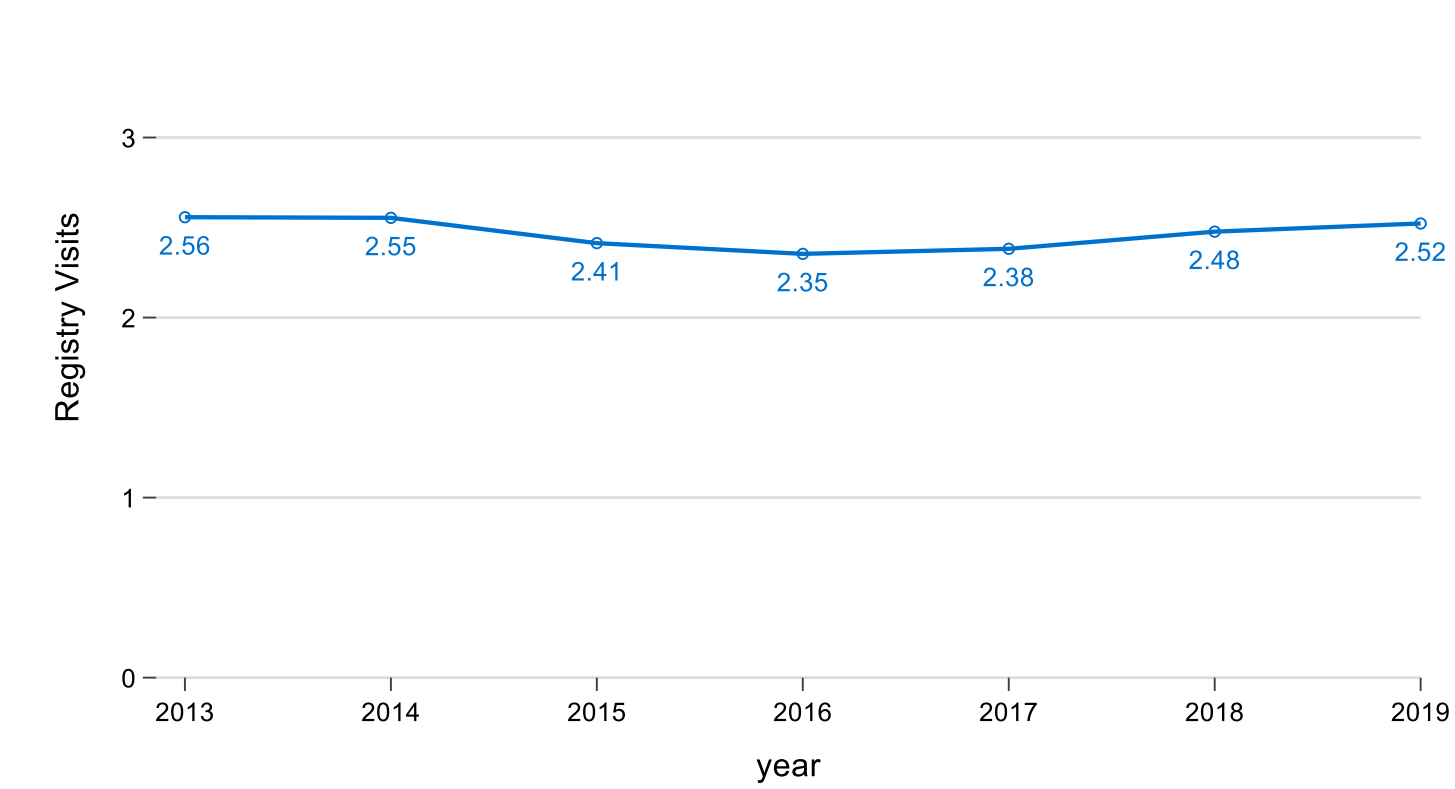
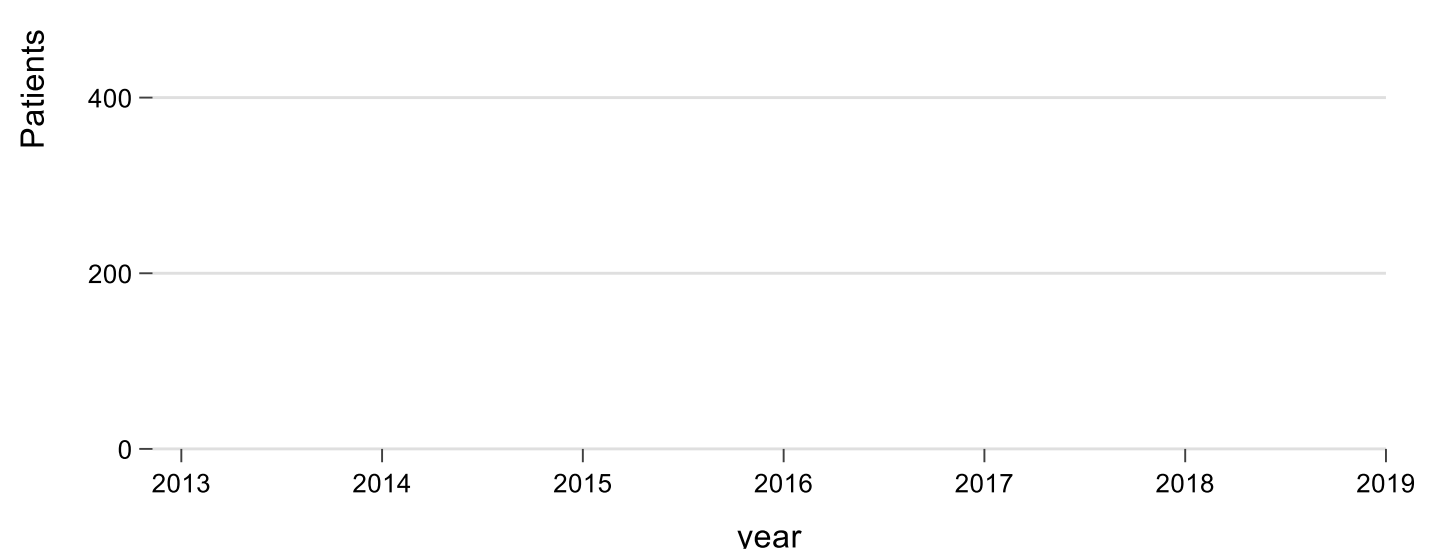


Table 2: Annual Health Care Resource Utilization

	Annual Visits Per Person Year			Annual Cost	
	Mean	Min	Max	Mean 2020 \$	SD
Registry Visits	2.6	1	10	NA ¹	
OP Days (Visits,Non-Registry)	3.3	1	110	\$5,542	\$13,247
ER Visits	0.1	0	8	\$238	\$1,139
ER Visits (if Any)	1.38	1	9	\$3,177	\$2,829
IP Visits	0.15	0	7	\$4,751	\$29,489
IP Visits (if Any)	1.59	1	13	\$51,004	\$83,592
Annual Unique Drugs	1.9	0	12	\$5,319	\$9,215
Total Cost				\$15,876	\$36,512

¹ Registry Cost are Included in OP Costs ² Total Cost=Outpatient(OP)+Emergency Room(ER)+Inpatient(IP)+Drug Costs

Figure 1: Annual Health Care Costs by SLEDAI Score in Year

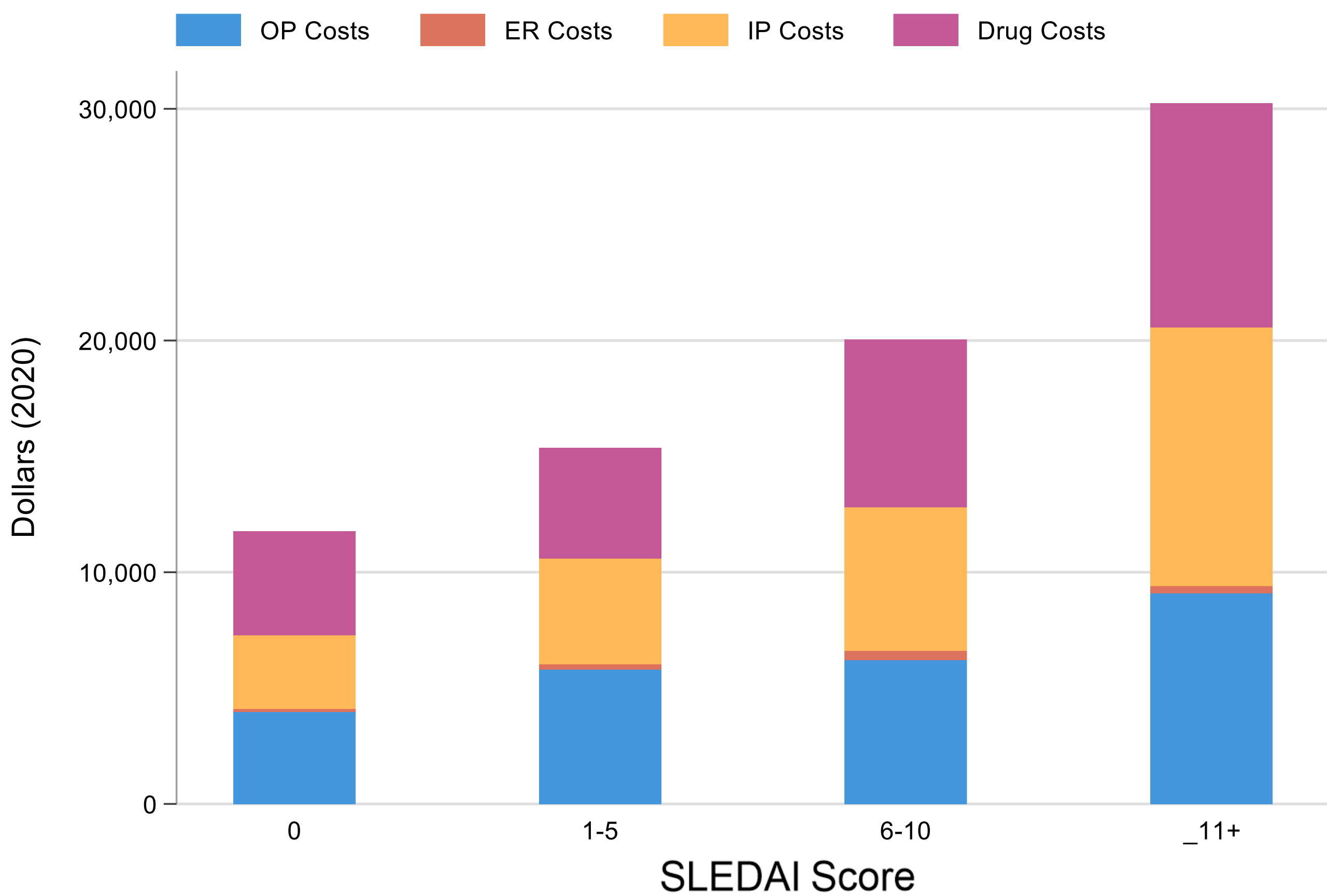


Table 3: GLM¹ of SLEDAI Score and Health Care Resource Utilization/Cost in Half-Year Period

	OP Costs	Rx Costs	Total Costs (IP+ER+OP+ Rx)	Any IP
SLEDAI Score				
0	(Ref)	(Ref)	(Ref)	(Ref)
1-5 (mild)	1.13***	1.17***	1.12***	1.14***
6-10 (moderate)	1.42***	1.26***	1.26***	1.38***
11+ (high)	1.97***	1.34**	1.57***	2.12***
Covariates (Race, Age, Sex, Clinical History, Distance)	X	X	X	X
Person-Fixed Effects	X	X	X	X
N (Person Half-Years)	9,531	9,531	9,531	9,531
N Patients	1,162	1,162	1,162	1,162

¹Gamma family for Costs, Poisson for Any IP, log link. ***p<0.001 **p<0.01 *p<0.05

Results

- Average Annual Spending on healthcare in this cohort was near \$16,000 dollars, with similar average costs from drugs, OP visits, and IP visits (Table 2)
- The average IP stay cost \$30,065 (SD=\$48,240) and the average ER visit cost \$1,933 (SD=\$1,314)
- There is a substantial gradient in HRCU by the worst SLEDAI score observed in period (Figure 1), the gradient is similar for OP, IP and Drug costs, it more than doubles for SLEDAI score 11+ compared to SLEDAI score 0, overall and by each type of HCRU.
- In adjusted models (Table 3), that control for a variety of patient and disease level factors, having a high SLEDAI score is associated with 57% higher total costs (97% higher OP costs, 34% higher drug costs), and 112% higher likelihood of admission during the half-year period.

Discussion

- Our Results describe the one-year healthcare resource utilization of SLE patients. Including average number of visits and costs by major buckets of care.
- After controlling for clinical and patient level characteristics, the impact of SLEDAI on HRCU remained substantial, suggesting that the acute event surrounding worsened disease activity have impact on HCRU. These results can be used in future modeling studies of the relationship between HCRU and disease activity.
- A limitation of our data is that HRCU is only observed within the JHU health system, and some patients in the registry may have received care outside of the system. Thus, cost estimates should be thought of as ‘cost floors’
- To mitigate this concern, we controlled for distance lived to Johns Hopkins Hospital, which had minimal impact on adjusted results.
- Another limitation is the window used to describe HCRU was 6-calendar months. This was chosen as this was the maximum planned window that a SLEDAI score should be observed in the registry, however a smaller window (1 month, 3 months, around a worsened SLEDAI score) would potentially be more informative. Future work will address this limitation.