Results StarShipTM was used to classify 250 PBMC (50 each of CD14 monocytes, CD19 B cells, CD4 helper T cells, CD8 T cells, and CD56 NK cells). Using dynamic spherical k-means, 6 clusters were generated that closely corresponded to the known cell types (figure 1). For comparison, hierarchical clustering and one-off spherical k-means with k set to 5 were carried out. Hierarchical clustering had an ARI of 0.45, one-off spherical k-means had an ARI of 0.89, and dynamic spherical k-means had an ARI of 0.86.

Conclusions This method can effectively partition unknown cells from scRNA-Seq data sets into biologically relevant clusters without prior knowledge of the number of cell types present. The similarity between the performance of the StarShipTM algorithm and one-off k-means, which does incorporate this prior knowledge, highlights the value of this dynamic technique. A full analysis of the AMP LN data is forthcoming.

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BD-09

PRELIMINARY REPORT: RULE-BASED ALGORITHMS USING SYSTEMIC LUPUS INTERNATIONAL COLLABORATING CLINICS (SLICC) CLASSIFICATION CRITERIA TO IDENTIFY PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS (SLE) FROM ELECTRONIC HEALTH RECORD (EHR) DATA

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Background SLE is difficult to diagnose given diverse manifestations that occur over time and across care sites. Electronic health records (EHR) are now used in a majority of health care settings throughout the country, and present a rich source of information about patients which can be mined for earlier diagnosis identification, to improve quality of care, or enable clinical studies. To identify SLE patients in EHR data, we developed a rules-based algorithm based on the SLICC classification criteria and compared against a gold standard SLE patient registry data set.

Methods We identified 513 patients in the Chicago Lupus Database (CLD) fulfilling 4 or more of the ACR classification criteria for SLE who also had records in the Northwestern Medicine Electronic Data Warehouse (NMEDW). ICD-9/10 codes were used to identify clinical SLICC SLE classification criteria items. Laboratory results were identified using lab test names in combination with threshold numeric values in order to determine whether patients met the SLICC lab test classification criteria requirements.

Results As shown in table 1, of 513 patients with SLE in the CLD, we detected the following SLICC classification criteria, in the NMEDW: clinical- chronic cutaneous 97%; acute cutaneous 98%; renal 65%; serositis 52%; arthritis 34%; neuro 29%; ulcers 16%; alopecia 1%; and labs- dsDNA 89%; hemolytic anemia 80%; complement 74%; leukopenia/lymphopenia 73%; APL 64%; ANA 52%; thrombocytopenia 22%; Coombs 17%; Sm 0%.

Of 513 patients with SLE in the CLD based on ACR criteria, 513 had at least 1 clinical criteria, 466 had at least 1 immunologic criteria, and 471 had 4 or more criteria. Using EHR data from the NMEDW, and rules for the SLICC

classification criteria that were based on ICD9/10 codes and labs and required identification of at least one clinical and one immunological criteria, we categorized 450/513 (88%) patients as having definite lupus.

Abstract BD-09 Table 1 SLICC Classification criteria identified in CLD and NMEDW

SLICC Criteria	Identified in CLD (N)	Identified in NMEDW (N)	Identified in CLD and NMEDW (%)
Clinical			
acute cutaneous	435	425	98%
Chronic cutaneous	146	141	97%
Renal	182	118	65%
Serositis	221	115	52%
Arthritis	472	161	34%
Neurological	205	59	29%
Oral ulcers	281	46	16%
Alopecia	96	1	1%
LABORATORY			
Anti-dsDNA Ab	348	310	89%
Hemolytic Anemia	5	4	80%
Complement	500	368	74%
Leukopenia/	508	369	73%
Lymphopenia			
Anti-phospholipid antibody	131	84	64%
Anti-nuclear antibody	433	226	52%
Thrombocytopenia	454	98	22%
Coombs	12	2	17%
Anti-Smith antibody	109	0	0%

Conclusions Query of patient EHR data with ICD-9/10 codes and lab tests for specific SLICC classification criteria items requires refinement to improve identification of some criteria. Using the SLICC classification rule for definite SLE, we were able to identify 88% of those with definite SLE by the ACR criteria, using ICD9/10 codes and labs. Text searching of notes (by simple string matching or natural language processing) may improve identification of individual SLICC criteria (e.g. renal biopsy) and may be critical for mining physicians' notes for criteria that are not well documented with diagnosis codes or lab results.

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BD-10

THE DISTRIBUTION OF INSURANCE IN A POPULATION-BASED COHORT OF SLE: GEORGIANS ORGANIZED AGAINST LUPUS COHORT

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Background Having health insurance coverage is important for people with chronic conditions. Those with systemic lupus erythematosus (SLE) are particularly vulnerable given the disproportionate impact on young minorities and women. This is the first description of health insurance changes over time overall and by sociodemographic groups on a population level.

Methods The Georgians Organized Against Lupus (GOAL) is a cohort of validated patients with SLE living in Atlanta, predominantly derived from the population-based and Centers for Disease Control and Prevention (CDC) funded Georgia Lupus Registry. Participants have been surveyed annually, including sociodemographics, health insurance, disease activity (Systemic Lupus Activity Questionnaire), and damage (Self-Administered Brief Index of Lupus Damage). Self-reported health insurance was categorized into no insurance, private, Medicare, Medicaid, and Medicare/Medicaid. Those reported being in a different category the year before were classified as having changed insurance.

Results An average of 642 individuals were surveyed annually from 2012 to 2016. At baseline, the average age was 46.4 ± 13.4 and disease duration was 13.6 ± 9.2 years. 93.6% were female and 78.5% black. 35.1% had a high school educational level or less, 45.8% were at or below the Federal poverty level, 34.6% were married or with a partner, and 35% were employed. Figure 1 shows the distribution of insurance categories from 2012 through 2016. Compared to the year before, 23.8% changed insurance in 2013, 22.2% in 2014, 24.1% in 2015, and 26.8% in 2016. Those who changed insurance tended to be black, lower in educational attainment, poorer, unemployed, and have greater disease activity and damage.

Conclusions In a population-based cohort in Georgia, the majority with SLE have private insurance and Medicare, which has grown over time while those uninsured have dropped. This is in line, but greater in magnitude, with the decrease in uninsured seen with the Affordable Care Act. Georgia is one of the states that has not expanded Medicaid resulting in flat enrollment. There also appears to be an increase in those who switch insurance categories. In this era of fluctuating health care policy, it is important to learn how types of and changes in coverage affect health care utilization, disease treatment and outcomes, self-reported health, and mortality in SLE, particularly given the disproportionate impact on vulnerable groups. Studies utilizing administrative data should also be aware of medical coverage distributions and regional variations in policy that impact these distributions.

Abstract BD-10 Figure 1 Longitudinal distribution of self-reported medical coverage

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BD-11 LACK OF HETEROGENEITY ACROSS RACE/ETHNIC GROUPS IN THE RISK OF COMMON COMORBIDITIES AMONG PATIENTS WITH SLE COMPARED TO THE GENERAL POPULATION IN A LARGE HEALTHCARE SYSTEM IN CALIFORNIA

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Background Systemic lupus erythematosus (SLE) disproportionately affects racial/ethnic minorities and is an independent risk factor for pneumonia, infections, renal disease and cardiovascular diseases (CVD). There are also racial/ethnic differences in these common comorbidities. There is limited understanding of how much inequality or heterogeneity SLE confers independently of the underlying disease pathways of comorbidities between race/ethnic groups. We examined the patterns, strength and direction of the risk of comorbidities in race/ethnic groups with SLE compared to controls. We hypothesized that those with SLE will have increased risk of comorbidities and that these associations will be strongest for racial minorities and weakest for non-Hispanic whites (NHW).

Methods We defined a cohort using electronic health records data (2005–2016) from a large healthcare organization in California serving patients of diverse racial/ethnic backgrounds. The eligible population included SLE patients and age-sex-race/ethnicity matched non-SLE patients (≥ 18 years of age). SLE diagnosis was the primary exposure defined using ICD9: 710.0 and ICD10: M32.1, M32.8, and M32.9. The following outcomes were identified: pneumonia, infections, renal disease and CVD. For each racial/ethnic group, we calculated the proportion of incident comorbidities among SLE cases and controls, and then built adjusted logistic regression models for each outcome with SLE as the exposure.

Results We identified 1,290 SLE cases and 12 900 controls. The median age at baseline was 43 years and 92% of the cohort was female. Among SLE cases, 38% were NHW, 13% were Hispanic, 4% were Black, and 25% were Asian/Pacific Islander. Compared to controls, SLE cases had higher incidence of pneumonia (32% vs 18%), infections (46% vs 26%), renal disease (16% vs 3%) and CVD (45% vs 22%). The association persisted with odds ratio (OR) of 1.5 to 3, after adjusting for confounders ($p < 0.01$). In subgroups analysis, ORs were similar across all racial/ethnic groups. We found no evidence for heterogeneity in the patterning of increased odds of the comorbidities between race/ethnic groups. For example, NHW, Blacks, Hispanics and Asians with SLE had between 2–3 times increased odds of CVD compared to controls.

Conclusions Our findings suggest that SLE similarly increases the risk of pneumonia, infections, renal disease and cardiovascular diseases (CVD) across racial/ethnic groups. Understanding the reasons for the lack of heterogeneity is important for targeting preventative interventions among patients with SLE.

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