**Lupus Algorithm using SLICC criteria**

**Version 5.4:**

This version includes the addition of natural language processing (NLP) for 2 SLICC criteria sub-phenotypes: arthritis, and renal, and also re-computes overall if lupus is present. The NLP takes as input: 1) the output of the previous algorithm (v. 4.x) that uses structured data, and 2) text from specific note types and note sources.

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**Introduction:**

Systemic Lupus Erythematosus (SLE) is a chronic, systemic autoimmune disease that can affect many parts of the body including skin, lungs, brain, heart, kidneys, joints, and blood vessels. SLE presentation can vary significantly between patients. Because of this, it can be challenging to identify a patient as having SLE. Between 300,000 and 2,000,000 people in the US are estimated to have SLE. Determination of an exact number of people affected is challenging as the disease is difficult to identify given the diverse presentations and the length of time it may take for symptoms to appear. Electronic Health Records (EHR) are widely used in healthcare setting and are a rich source of information about the patients that can be mined for classification of SLE and earlier identification.

**Cases and Controls:**

We are using the SLICC (Systemic Lupus International Collaborating Clinics) Criteria to determine if patients have SLE. A group of rheumatologists came up with SLICC criteria in 2012 to improve clinical relevance, and to incorporate the new knowledge of SLE immunology.1

**SLICC Criteria:**

|  |  |
| --- | --- |
| **Clinical Criteria** | **Immunologic Criteria** |
| Oral Ulcer | Antinuclear Antibodies |
| Alopecia | Anti-dsDNA Antibodies |
| Neurological condition | Anti-Sm Antibodies |
| Arthritis | Antiphospholipid Antibodies |
| Serositis | Low Complement |
| Acute Cutaneous Lupus | Direct Coombs Test (positive) |
| Chronic Cutaneous Lupus |  |
| Renal condition |  |
| Thrombocytopenia |  |
| Leukopenia |  |
| Hemolytic Anemia |  |

In order to have SLE according to SLICC, a patient must:

1) have at least four criteria, with at least one clinical criterion AND one immunologic criterion1

OR

2) have biopsy proven lupus nephritis as the sole clinical criterion in the presence of ANA or anti-dsDNA antibodies1

For our algorithm, we are not going to differentiate between cases and controls at first; thus, we will just gather all of the specified data for all eMERGE subjects. Specifically, we want to know if each subject has each SLICC criteria, how many days a subject has an SLE diagnosis code (710.0 ICD-9 or M32.10 ICD-10), how many (in-person outpatient or in patients) visits in or after 2016, and how many primary care (General Medicine, Internal Medicine, OB/GYN) encounters (outpatient) a subject has. We also want to know the age (days) at the first SLE diagnosis code (710.0 ICD-9 AND M32.10 ICD-10) and age (days) at the last primary care encounter (such as General, Internal, Family, Geriatric, or Pediatric Medicine; General OB/GYN; or however else primary care departments are specified at your site).

**To have a given SLICC criteria, patients need\*\***:

(

* at least 1 diagnosis code, or code(s) on 2 separate days (depends on the criteria), as noted in Appendix A for each criteria, anywhere in the EHR (including but not limited to problem lists)

OR

* a lab test with an abnormal value from the inclusion criteria detailed in Appendix A for each SLICC criteria

OR

* a positive mention of the criteria found using NLP (natural language processing), also described in the Appendix under each criteria that uses NLP

)

AND

* NO diagnosis codes from any exclusion criteria listed for each SLICC criteria, if any listed in Appendix A (not all SLICC criteria have exclusions).

**\*\*The one exception is Hemolytic Anemia:** to have the hemolytic anemia SLICC criteria, patients need to have abnormal lab results for more than 1 lab, as defined in Appendix A:

* (low hemoglobin AND high LDH)

OR

* (high Reticulocytes AND high LDH)

**NLP portion of this algorithm**

The NLP portion of this algorithm first uses regular expressions to capture keywords mentioned in clinical text/notes in the EHR. The SLICC criteria for which we used NLP in this algorithm include: renal, arthritis and oral/nasal ulcer criteria.

Then the results of the NLP are combined with the results from structured data portion of this algorithm to re-calculate if patients have renal and/or arthritis criteria & then to compute if they have SLE using SLICC criteria.

Then, for those patients that have SLE, further NLP code is used to further refine the renal criteria/sub-phenotype (of SLE cases determined using the diagnosis codes, labs, combined with regular expression NLP for arthritis, and renal criteria) using MetaMap to extract pertinent concepts from clinical text/notes, and then re-calculating if patients have renal sub-phenotype using the results from MetaMap.

The text needed from the EHR for the NLP is the text :

of progress/encounter/consult notes & discharge summaries/instructions

from inpatient and outpatient encounter/visits

from the following note sources (specify note\_source A or B for each note)

A = rheumatology department

B = nephrology, (kidney/nephrology) transplant, or pathology department

Please refer to the **README.doc** in the zip file with the NLP code for technical details for how to use the provided Python & R code (in Jupyter notebooks) to implement the NLP and combine the results of the NLP with the results from structured data.

Detailed expected input and output format of files for this code is specified in NU\_SLE\_NLP\_data\_dictionaries.xlsx, including :

* Input:
  + Note text
  + Data from the structured data portion of this algorithm, which matches the data dictionary on PheKB for v. 4.x of this algorithm.
* Output:
  + Output for arthritis criteria, which includes text snippets where criteria found, so can validate if needed
  + Intermediate output for renal criteria, which includes text snippets where criteria found, so can validate if needed
  + Final output for renal criteria
  + Final SLE status for each subject

**Appendix A**

*For each criteria/condition, the description of how to use the codes &/or labs listed is described before each inclusion and exclusion table listing the diagnosis and/or procedure codes and/or labs.*

*We are using* [*standard SQL wildcards*](https://www.geeksforgeeks.org/sql-wildcard-operators/) *(‘%’, ’\_’) when wildcards are needed: for more information on what those wildcards mean, click the link above. In short:*

* *‘%’ (percent) wildcard means 0 or more alphanumeric characters (any characters) can be in that position in the string. Thus for ‘250%’ : ‘250’, ‘250.1’, and ‘250.01’ are all valid matches.*
* *‘\_” (underscore) wildcard means that exactly 1 alphanumeric character (any character) must be in that position in the string. Thus, if there are 2 underscores next to each other as in some of the code strings below, then 2 alphanumeric characters must be there. For example, for the ICD10 procedure code string ‘*0B\_\_0\_\_*’, valid strings could be ‘*0B120CD*’ or ‘*0BCD0EF’, etc.

**Oral Ulcer Inclusion Criteria**

To be considered as having the oral ulcer criteria, patients need to have any of the following inclusion codes (doesn’t need to be the same code) **on at least 2 separate days**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Oral Ulcer Inclusion | ICD9 Diagnosis | 478.19 | Nasal Ulcer |
| Oral Ulcer Inclusion | ICD9 Diagnosis | 528.2 | Oral Ulcer |
| Oral Ulcer Inclusion | ICD9 Diagnosis | 528.9 | Palate Ulcer |
| Oral Ulcer Inclusion | ICD9 Diagnosis | 529.9 | Tongue Ulcer |
| Oral Ulcer Inclusion | ICD9 Diagnosis | 529.9 | Tongue Ulcer |
| Oral Ulcer Inclusion | ICD10 Diagnosis | J34.1 | Nasal Ulcer |
| Oral Ulcer Inclusion | ICD10 Diagnosis | J34.89 | Nasal Ulcer |
| Oral Ulcer Inclusion | ICD10 Diagnosis | K12 | Oral Ulcer |
| Oral Ulcer Inclusion | ICD10 Diagnosis | K13.79 | Tongue/Palate Ulcer |
| Oral Ulcer Inclusion | ICD10 Diagnosis | K14.8 | Tongue Ulcer |

**Oral Ulcer Exclusion Criteria**

And patients also need to NOT have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 054.9 | Infection (Herpes) |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 099.3 | Reactive Arthritis |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 136.1 | Behcets |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 447.6 | Vasculitis |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 536.8 | Acidic Foods |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 555.9 | Inflammatory Bowel Disease |
| Oral Ulcer Exclusion | ICD9 Diagnosis | 560.89 | Inflammatory Bowel Disease |
| Oral Ulcer Exclusion | ICD10 Diagnosis | B00.9 | Infection (Herpes) |
| Oral Ulcer Exclusion | ICD10 Diagnosis | K30 | Acidic Foods |
| Oral Ulcer Exclusion | ICD10 Diagnosis | K50.90 | Inflammatory Bowel Disease |
| Oral Ulcer Exclusion | ICD10 Diagnosis | K56.69 | Inflammatory Bowel Disease |
| Oral Ulcer Exclusion | ICD10 Diagnosis | L95 | Vasculitis |
| Oral Ulcer Exclusion | ICD10 Diagnosis | M02.30 | Reactive Arthritis |
| Oral Ulcer Exclusion | ICD10 Diagnosis | M35.2 | Behcets |

**Alopecia Inclusion Criteria**

Any of the following codes

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Alopecia Inclusion | ICD9 Diagnosis | 704.00 | Alopecia |
| Alopecia Inclusion | ICD9 Diagnosis | 704.01 | Alopecia |
| Alopecia Inclusion | ICD10 Diagnosis | L66.0 | Alopecia |
| Alopecia Inclusion | ICD10 Diagnosis | L66.2 | Alopecia |
| Alopecia Inclusion | ICD10 Diagnosis | L66.8 | Alopecia |
| Alopecia Inclusion | ICD10 Diagnosis | L95.9 | Alopecia |

**Alopecia Exclusion Criteria**

And patients also need to NOT have any of the following codes

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Alopecia Exclusion | ICD9 Diagnosis | 280.8 | Iron Deficiency |
| Alopecia Exclusion | ICD9 Diagnosis | 280.9 | Iron Deficiency |
| Alopecia Exclusion | ICD10 Diagnosis | D50.8 | Iron Deficiency |
| Alopecia Exclusion | ICD10 Diagnosis | D50.9 | Iron Deficiency |

**Neurological Inclusion Criteria**

Patients need to have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Neurological Inclusion | ICD9 Diagnosis | 053.13 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 293.0 | Acute Confusional State |
| Neurological Inclusion | ICD9 Diagnosis | 293.9 | Acute Confusional State |
| Neurological Inclusion | ICD9 Diagnosis | 294.9 | Acute Confusional State |
| Neurological Inclusion | ICD9 Diagnosis | 298.9 | Psychosis |
| Neurological Inclusion | ICD9 Diagnosis | 300.11 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 323.81 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 323.82 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 323.9 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 345.10 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.40 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.50 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.80 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.81 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.90 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 345.91 | Seizure |
| Neurological Inclusion | ICD9 Diagnosis | 349.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 354.2 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 354.5 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD9 Diagnosis | 354.8 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD9 Diagnosis | 355.8 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 355.9 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD9 Diagnosis | 356.4 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 356.8 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 356.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 357.1 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 357.6 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 357.7 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 357.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD9 Diagnosis | 730.07 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 730.18 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 730.20 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 730.25 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 730.70 | Myelitis |
| Neurological Inclusion | ICD9 Diagnosis | 780.39 | Seizure |
| Neurological Inclusion | ICD10 Diagnosis | B02.23 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | F05 | Acute Confusional State |
| Neurological Inclusion | ICD10 Diagnosis | F06.8 | Acute Confusional State |
| Neurological Inclusion | ICD10 Diagnosis | F29 | Psychosis |
| Neurological Inclusion | ICD10 Diagnosis | F44.5 | Seizure |
| Neurological Inclusion | ICD10 Diagnosis | G04.81 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | G04.89 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | G04.90 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | G04.91 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | G40.% | Seizure |
| Neurological Inclusion | ICD10 Diagnosis | G56.80 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD10 Diagnosis | G56.90 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G57.90 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD10 Diagnosis | G57.91 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G58.0 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G58.7 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD10 Diagnosis | G58.9 | Mononeuritis Multiplex |
| Neurological Inclusion | ICD10 Diagnosis | G60.3 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G60.8 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G60.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G62.0 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G62.2 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G62.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G63 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G90.09 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | G96.9 | Peripheral or Cranial Neuropathy |
| Neurological Inclusion | ICD10 Diagnosis | M86.072 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | M86.179 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | M86.279 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | M86.8X8 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | M86.9 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | M89.60 | Myelitis |
| Neurological Inclusion | ICD10 Diagnosis | R56.9 | Seizure |

**Neurological Exclusion Criteria**

And patients also need to NOT have any of the following codes at any time, **except for those marked with an asterisk (\*), where you only exclude the patient if the exclusion code is found within 7 days of a neurological inclusion code**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Neurological Exclusion | ICD9 Diagnosis | 042 | Infection |
| Neurological Exclusion | ICD9 Diagnosis | 136.9 | Infection |
| Neurological Exclusion | ICD9 Diagnosis | 250.60 | Diabetes Mellitus |
| Neurological Exclusion | ICD9 Diagnosis | 250.62 | Diabetes Mellitus |
| Neurological Exclusion | ICD9 Diagnosis | 357.2 | Diabetes Mellitus |
| Neurological Exclusion | ICD9 Diagnosis | 709.1 | Primary Vasculitis |
| Neurological Exclusion | ICD9 Diagnosis | 457.1 | Lymphedema |
| Neurological Exclusion | ICD9 Diagnosis | 959.% | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | B20 | Infection |
| Neurological Exclusion | ICD10 Diagnosis | B89 | Infection |
| Neurological Exclusion | ICD10 Diagnosis | B99.9 | Infection |
| Neurological Exclusion | ICD10 Diagnosis | E08.42 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | E09.42 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | E10.42 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | E11.40 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | E11.42 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | E13.42 | Diabetes Mellitus |
| Neurological Exclusion | ICD10 Diagnosis | I89.0 | Lymphedema |
| Neurological Exclusion | ICD10 Diagnosis | L95.9 | Primary Vasculitis |
| Neurological Exclusion | ICD10 Diagnosis | S09.8XXA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S09.90XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S09.93XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S19.9XXA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S29.8XXA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S39.81XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S39.840A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S39.848A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S39.82XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S49.80XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S49.90XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S59.809A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S59.819A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S59.909A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S59.919A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S69.80XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S69.90XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S79.819A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S79.829A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S79.919A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S79.929A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S89.80XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S89.90XA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S99.819A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | S99.919A | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | T07.XXXA | Injury\* |
| Neurological Exclusion | ICD10 Diagnosis | T14.90XA | Injury\* |

**Arthritis Inclusion Criteria**

To be considered as having the arthritis criteria, patients need to have any of the following inclusion codes (doesn’t need to be the same code) **on at least 2 separate days**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Arthritis Inclusion | ICD9 Diagnosis | 716.40 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.48 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.5% | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.80 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.88 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.89 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 716.9% | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.00 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.08 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.49 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.6% | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.80 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.88 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.89 | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | 719.9% | Arthritis |
| Arthritis Inclusion | ICD9 Diagnosis | V13.4 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M12.80 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M12.88 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M12.89 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M13.0 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M25.40 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M25.48 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M25.50 | Arthritis |
| Arthritis Inclusion | ICD10 Diagnosis | M25.9 | Arthritis |

**OR NLP** regex matches any of the following patterns:

'synovitis' ,'arthritis,\s\*joint swelling:\s\*\+', 'arthritis, joint swelling:location:\s\*\+', 'polyarthritis'.

**Arthritis Exclusion**

And patients also need to NOT have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| Arthritis Exclusion | ICD9 Diagnosis | 715.% | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.0 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.9 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.1 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.2 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.91 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.019 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.029 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.039 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.049 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M16.10 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M17.10 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.079 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.93 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.219 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.229 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.239 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.249 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M16.7 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M17.5 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.279 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.93 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M19.90 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M18.9 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M16.9 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M17.9 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.8 | Osteoarthritis |
| Arthritis Exclusion | ICD10 Diagnosis | M15.3 | Osteoarthritis |

**Serositis Inclusion Criteria**

To be considered as having the serositis criteria, patients need to have any of the following inclusion codes (doesn’t need to be the same code) **on at least 2 separate days**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Serositis Inclusion | ICD9 Diagnosis | 420.0 | Pericarditis |
| Serositis Inclusion | ICD9 Diagnosis | 420.9 | Pericarditis |
| Serositis Inclusion | ICD9 Diagnosis | 420.91 | Pericarditis |
| Serositis Inclusion | ICD9 Diagnosis | 423.2 | Pericarditis |
| Serositis Inclusion | ICD9 Diagnosis | 423.9 | Pleural Effusion |
| Serositis Inclusion | ICD9 Diagnosis | 511.0 | Pleuritis |
| Serositis Inclusion | ICD9 Diagnosis | 511.89 | Pleural Effusion |
| Serositis Inclusion | ICD9 Diagnosis | 511.9 | Pleural Effusion |
| Serositis Inclusion | ICD9 Diagnosis | 785.3 | Pericardial Rub |
| Serositis Inclusion | ICD9 Diagnosis | 786.51 | Pericardial Pain |
| Serositis Inclusion | ICD9 Diagnosis | 786.52 | Pleural Pain |
| Serositis Inclusion | ICD9 Diagnosis | 786.7 | Pleural Rub |
| Serositis Inclusion | ICD10 Diagnosis | I30.0 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | I30.8 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | I30.9 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | I31.1 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | I31.3 | Pericardial Effusion |
| Serositis Inclusion | ICD10 Diagnosis | I31.9 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | I32 | Pericarditis |
| Serositis Inclusion | ICD10 Diagnosis | J90 | Pleural Effusion |
| Serositis Inclusion | ICD10 Diagnosis | J91.8 | Pleural Effusion |
| Serositis Inclusion | ICD10 Diagnosis | J94.1 | Pleuritis |
| Serositis Inclusion | ICD10 Diagnosis | J94.2 | Pleural Effusion |
| Serositis Inclusion | ICD10 Diagnosis | J94.8 | Pleuritis |
| Serositis Inclusion | ICD10 Diagnosis | J94.9 | Pleuritis |
| Serositis Inclusion | ICD10 Diagnosis | R07.1 | Pleural Pain |
| Serositis Inclusion | ICD10 Diagnosis | R07.2 | Pericardial Pain |
| Serositis Inclusion | ICD10 Diagnosis | R07.81 | Pleural Pain |
| Serositis Inclusion | ICD10 Diagnosis | R09.1 | Pleuritis |
| Serositis Inclusion | ICD10 Diagnosis | R09.89 | Pericardial Pain |

**Serositis Exclusion Criteria**

And patients also need to NOT have any of the following codes at any time, **except for those marked with an asterisk (\*) (a few diagnosis codes & all the procedure codes are marked with an asterisk), where you only exclude the patient if the exclusion code is found within 7 days of a serositis inclusion code**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Serositis Exclusion | ICD9 Diagnosis | 041.9 | Infection |
| Serositis Exclusion | ICD9 Diagnosis | 486 | Pneumonia\* |
| Serositis Exclusion | ICD9 Diagnosis | 788.99 | Uremia |
| Serositis Exclusion | ICD10 Diagnosis | B96.89 | Infection |
| Serositis Exclusion | ICD10 Diagnosis | J18.9 | Pneumonia\* |
| Serositis Exclusion | ICD10 Diagnosis | R30.1 | Uremia |
| Serositis Exclusion | ICD10 Diagnosis | R39.2 | Uremia |
| Serositis Exclusion | ICD10 Diagnosis | R39.82 | Uremia |
| Serositis Exclusion | ICD10 Diagnosis | R39.89 | Uremia |
| Serositis Exclusion | ICD9 Diagnosis | 415.1% | Pulmonary Embolism\* |
| Serositis Exclusion | ICD9 Diagnosis | 416.2% | Pulmonary Embolism\* |
| Serositis Exclusion | ICD9 Diagnosis | V12.55 | Pulmonary Embolism\* |
| Serositis Exclusion | ICD10 Diagnosis | I26.% | Pulmonary Embolism\* |
| Serositis Exclusion | ICD10 Diagnosis | I27.82 | Chronic Pulmonary Embolism\* |
| Serositis Exclusion | ICD9 Diagnosis | 786.50 | Painful Rib\* |
| Serositis Exclusion | ICD10 Diagnosis | S09.8XXA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S09.90XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S09.93XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S19.9XXA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S29.8XXA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S39.81XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S39.840A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S39.848A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S39.82XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S49.80XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S49.90XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S59.809A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S59.819A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S59.909A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S59.919A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S69.80XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S69.90XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S79.819A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S79.829A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S79.919A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S79.929A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S89.80XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S89.90XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S99.819A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | S99.919A | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | T07.XXXA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | T14.90XA | Injury\* |
| Serositis Exclusion | ICD10 Diagnosis | Z48.89 | Post-Op care\* |
| Serositis Exclusion | ICD9 Diagnosis | 410.% | Acute myocardial infarction\* |
| Serositis Exclusion | ICD9 Diagnosis | 412.% | Old myocardial infarction\* |
| Serositis Exclusion | ICD10 Diagnosis | I21.% | Acute myocardial infarction\* |
| Serositis Exclusion | ICD10 Diagnosis | I22.% | Subsequent ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction\* |
| Serositis Exclusion | ICD10 Diagnosis | I23.% | Certain current complications following ST elevation (STEMI) and non-ST elevation (NSTEMI) myocardial infarction (within the 28 day period)\* |
| Serositis Exclusion | ICD10 Diagnosis | I25.2 | Old myocardial infarction\* |
| Serositis Exclusion | CPT | 33510-33516 | Coronary artery bypass, vein only\* |
| Serositis Exclusion | CPT | 33517-33523 | Coronary artery bypass, using venous graft(s) and arterial graft(s)\* |
| Serositis Exclusion | CPT | 33530 | Combined Arterial-Venous Grafting for Coronary Bypass\* |
| Serositis Exclusion | CPT | 33533-33536 | Coronary artery bypass, using arterial graft(s)\* |
| Serositis Exclusion | CPT | 33542 | Arterial Grafting for Coronary Artery Bypass\* |
| Serositis Exclusion | CPT | 33545 | Arterial Grafting for Coronary Artery Bypass\* |
| Serositis Exclusion | CPT | 33548 | Arterial Grafting for Coronary Artery Bypass\* |
| Serositis Exclusion | CPT | 33390-33391 | Valvuloplasty, Aortic Valve, Open, with Cardiopulmonary Bypass\* |
| Serositis Exclusion | CPT | 33474 | Valvotomy, pulmonary valve, open heart\* |
| Serositis Exclusion | CPT | 33927-33930 | Heart/Lung Transplantation Procedures\* |
| Serositis Exclusion | CPT | 33933 | Heart/Lung Transplantation Procedures\* |
| Serositis Exclusion | CPT | 33935 | Heart/Lung Transplantation Procedures\* |
| Serositis Exclusion | CPT | 33940 | Heart/Lung Transplantation Procedures\* |
| Serositis Exclusion | CPT | 33944-33945 | Heart/Lung Transplantation Procedures\* |
| Serositis Exclusion | CPT | 32035-32036 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32096-32098 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32100 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32110 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32120 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32124 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32140-32141 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32150-32151 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32160 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32505-32507 | Thoracotomy Surgery\* |
| Serositis Exclusion | CPT | 32440 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32442 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32445 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32480 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32482 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32484 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32486 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32488 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32491 | Removal of lung, inc. pneumonectomy\* |
| Serositis Exclusion | CPT | 32503-32504 | Resection of apical lung tumor (eg, Pancoast tumor), including chest wall resection, rib(s) resection(s)\* |
| Serositis Exclusion | CPT | 32850-32854 | Lung Transplant\* |
| Serositis Exclusion | CPT | 32905-32906 | Thoracoplasty, Schede type or extrapleural (all stages)\* |
| Serositis Exclusion | ICD9 Procedure | 35.1% | Open Heart Valvuloplasty Without Replacement\* |
| Serositis Exclusion | ICD9 Procedure | 35.51 | Repair of atrial or ventricular septal defect …, open technique\* |
| Serositis Exclusion | ICD9 Procedure | 35.53 | Repair of atrial or ventricular septal defect …, open technique\* |
| Serositis Exclusion | ICD9 Procedure | 36.03 | Open chest coronary artery angioplasty\* |
| Serositis Exclusion | ICD9 Procedure | 36.1% | Bypass Anastomosis For Heart Revascularization\* |
| Serositis Exclusion | ICD9 Procedure | 36.2 | Heart revascularization by arterial implant\* |
| Serositis Exclusion | ICD9 Procedure | 37.33 | Excision Or Destruction Of Other Lesion Or Tissue Of Heart, Open Approach\* |
| Serositis Exclusion | ICD9 Procedure | 37.5% | Heart Replacement Procedures [whole heart transplant, etc.]\* |
| Serositis Exclusion | ICD9 Procedure | 37.91 | Open Chest Cardiac Massage\* |
| Serositis Exclusion | ICD9 Procedure | 39.61 | Extracorporeal circulation auxiliary to open heart surgery\* |
| Serositis Exclusion | ICD9 Procedure | 39.62 | Hypothermia (systemic) incidental to open heart surgery\* |
| Serositis Exclusion | ICD9 Procedure | 07.12 | Open biopsy of adrenal gland\* |
| Serositis Exclusion | ICD9 Procedure | 41.33 | open biopsy of spleen\* |
| Serositis Exclusion | ICD9 Procedure | 43.89 | open and other partial gastrectomy\* |
| Serositis Exclusion | ICD9 Procedure | 44.15 | open biopsy of stomach\* |
| Serositis Exclusion | ICD9 Procedure | 45.15 | open biopsy of small intestine\* |
| Serositis Exclusion | ICD9 Procedure | 45.26 | open biopsy of large intestine\* |
| Serositis Exclusion | ICD9 Procedure | 45.7% | Open And Other Partial Excision Of Large Intestine\* |
| Serositis Exclusion | ICD9 Procedure | 48.25 | Open biopsy of rectum​​\* |
| Serositis Exclusion | ICD9 Procedure | 48.43 | Open pull-through resection of rectum\* |
| Serositis Exclusion | ICD9 Procedure | 48.52 | Open abdominoperineal resection of the rectum\* |
| Serositis Exclusion | ICD9 Procedure | 50.12 | open biopsy of liver\* |
| Serositis Exclusion | ICD9 Procedure | 50.23 | Open ablation of liver lesion or tissue\* |
| Serositis Exclusion | ICD9 Procedure | 51.13 | open biopsy of gallbladder or bile ducts\* |
| Serositis Exclusion | ICD9 Procedure | 52.12 | open biopsy of pancreas\* |
| Serositis Exclusion | ICD9 Procedure | 53.01 | Other and open repair of direct inguinal hernia\* |
| Serositis Exclusion | ICD9 Procedure | 53.02 | Other and open repair of indirect inguinal hernia\* |
| Serositis Exclusion | ICD9 Procedure | 53.03 | Other and open repair of direct inguinal hernia with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.04 | Other and open repair of indirect inguinal hernia with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.11 | Other and open bilateral repair of direct inguinal hernia​\* |
| Serositis Exclusion | ICD9 Procedure | 53.12 | Other and open bilateral repair of indirect inguinal hernia\* |
| Serositis Exclusion | ICD9 Procedure | 53.13 | Other and open bilateral repair of inguinal hernia, one direct and one indirect​\* |
| Serositis Exclusion | ICD9 Procedure | 53.14 | Other and open bilateral repair of direct inguinal hernia with graft or prosthesis​\* |
| Serositis Exclusion | ICD9 Procedure | 53.15 | Other and open bilateral repair of indirect inguinal hernia with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.16 | Other and open bilateral repair of inguinal hernia, one direct and one indirect, with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.41 | Other and open repair of umbilical hernia with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.49 | Other open umbilical herniorrhaphy​\* |
| Serositis Exclusion | ICD9 Procedure | 53.61 | Other open incisional hernia repair with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.69 | Other and open repair of other hernia of anterior abdominal wall with graft or prosthesis\* |
| Serositis Exclusion | ICD9 Procedure | 53.72 | Other and open repair of diaphragmatic hernia, abdominal approach\* |
| Serositis Exclusion | ICD9 Procedure | 53.84 | Other and open repair of diaphragmatic hernia, with thoracic approach\* |
| Serositis Exclusion | ICD9 Procedure | 54.12 | Reopening of recent laparotomy site\* |
| Serositis Exclusion | ICD9 Procedure | 55.24 | open biopsy of kidney\* |
| Serositis Exclusion | ICD9 Procedure | 55.32 | open ablation of renal lesion or tissue\* |
| Serositis Exclusion | ICD9 Procedure | 56.34 | open biopsy of ureter\* |
| Serositis Exclusion | ICD9 Procedure | 57.34 | open biopsy of bladder\* |
| Serositis Exclusion | ICD9 Procedure | 57.59 | Open excision or destruction of other lesion or tissue of bladder\* |
| Serositis Exclusion | ICD9 Procedure | 32.23 | Open ablation of lung lesion or tissue\* |
| Serositis Exclusion | ICD10 Procedure | 02\_\_0\_\_ | Medical and Surgical, Heart and Great Vessels, [various surgeries] , Open\* |
| Serositis Exclusion | ICD10 Procedure | 0B\_\_0\_\_ | Medical and Surgical, Respiratory System (Trachea, Carina, Bronchus, Lungs, Pleura, and Diaphragm), [various surgeries], Open\* |
| Serositis Exclusion | ICD10 Procedure | 02YA% | Medical and Surgical, Transplantation, Heart\* |
| Serositis Exclusion | ICD10 Procedure | 3E080GC | Introduction of Other Therapeutic Substance into Heart, Open Approach\* |
| Serositis Exclusion | ICD10 Procedure | 0D\_\_0\_\_ | Open Gastrointestinal System Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0F\_\_0\_\_ | Open Hepatobiliary System and Pancreas Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0Y\_\_0\_\_ | Open Anatomical Regions, Lower Extremities Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0B\_\_0\_\_ | Open Respiratory System Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0W\_\_0\_\_ | Open Anatomical Regions, General Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 07\_\_0\_\_ | Open Lymphatic and Hemic Systems Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0G\_\_0\_\_ | Open Endocrine System Surgeries\* |
| Serositis Exclusion | ICD10 Procedure | 0T\_\_0\_\_ | Open Urinary System Surgeries\* |

**Acute Cutaneous Lupus Inclusion Criteria**

To be considered as having the acute cutaneous lupus criteria, patients need to have any of the following inclusion codes (doesn’t need to be the same code) **on at least 2 separate days**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Acute Cutaneous Lupus Inclusion | ICD9 Diagnosis | 694.5 | Bullous Lupus |
| Acute Cutaneous Lupus Inclusion | ICD9 Diagnosis | 695.15 | Toxic Epidermal Necrolysis Variant of SLE |
| Acute Cutaneous Lupus Inclusion | ICD9 Diagnosis | 695.4 | Subacute Cutaneous Lupus |
| Acute Cutaneous Lupus Inclusion | ICD9 Diagnosis | 696.2 | Maculopapular Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L12.0 | Bullous Lupus |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L12.8 | Bullous Lupus |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L41.0 | Maculopapular Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L41.1 | Maculopapular Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L41.8 | Maculopapular Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L51.2 | Toxic Epidermal Necrolysis Variant of SLE |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L56.0 | Photosensitive Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L56.2 | Photosensitive Rash |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L93.0 | Subacute Cutaneous Lupus |
| Acute Cutaneous Lupus Inclusion | ICD10 Diagnosis | L93.2 | Subacute Cutaneous Lupus |

**Acute Cutaneous Lupus Exclusion Criteria**

And patients also need to NOT have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Acute Cutaneous Lupus Exclusion | ICD9 Diagnosis | 710.3 | Dermatomyositis |
| Acute Cutaneous Lupus Exclusion | ICD10 Diagnosis | M33.90 | Dermatomyositis |

**Chronic Cutaneous Lupus Inclusion Criteria**

To be considered as having the chronic cutaneous lupus criteria, patients need to have any of the following inclusion codes (doesn’t need to be the same code) **on at least 2 separate days**:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Chronic Cutaneous Lupus Inclusion | ICD9 Diagnosis | 373.34 | Discoid Rash |
| Chronic Cutaneous Lupus Inclusion | ICD9 Diagnosis | 729.30 | Lupus Panniculitis |
| Chronic Cutaneous Lupus Inclusion | ICD9 Diagnosis | 991.5 | Chillblains Lupus |
| Chronic Cutaneous Lupus Inclusion | ICD10 Diagnosis | H01.129 | Discoid Rash |
| Chronic Cutaneous Lupus Inclusion | ICD10 Diagnosis | M79.3 | Lupus Panniculitis |
| Chronic Cutaneous Lupus Inclusion | ICD10 Diagnosis | T69.1XXA | Chillblains Lupus |

**Renal Inclusion Criteria**

Any of the following codes **or abnormal lab results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Renal Inclusion | ICD9 Diagnosis | 593.6 | Renal |
| Renal Inclusion | ICD9 Diagnosis | 593.81 | Renal |
| Renal Inclusion | ICD9 Diagnosis | 593.9 | Renal |
| Renal Inclusion | ICD9 Diagnosis | 791.7 | Renal |
| Renal Inclusion | ICD10 Diagnosis | N28.0 | Renal |
| Renal Inclusion | ICD10 Diagnosis | N28.9 | Renal |
| Renal Inclusion | ICD10 Diagnosis | R80 | Renal |
| Renal Inclusion | ICD10 Diagnosis | R80.9 | Renal |
| Renal Inclusion | ICD10 Diagnosis | R82.99 | Renal |
| Renal Inclusion | Lab Test | 24 hour urine protein: >500 mg | 24 hour Urine Protein |
| Renal Inclusion | Lab Test | Cellular Cast in Urine Red Cells: >0/hpf | Cellular Cast in Urine Red Cells |

**OR NLP** regular expression matches any of the patterns in the table below. Notice for the last renal category – proteinuria, extracted number associated with proteinuria has to be greater than 0.5, and can not be a date (e.g. year 2017) in order to be counted as proteinuria positive.

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Renal category** | **Regular expression search pattern** |
| Renal Inclusion | Renal Class II | ‘nephritis class II’  ,’class II nephritis’  ,’class II lupus nephritis’  ,’nephritis, class II’  ,’class II SLE nephritis’  ,’renal biopsies class II’  ,’renal biopsy class II’  ,’bx class II’  ,’WHO class II’  ,’SLE class III’  ,’nephritis class II’  ,’class II LN’  ,’class II GN’  ,’class II lupus GN’  ,’nephritis (class II)’  ,’class III class II’  ,’class\\b(II|III|IV|V)\\b\/(II|III|IV|V) lupus nephritis’  ,’mesangial proliferative GN’  ,’mesangial class V’  ,’proliferation of mesangial’ |
| Renal Inclusion | Renal Class III | ‘nephritis class III’  ,’class III nephritis’  ,’class III lupus nephritis’  ,’nephritis,? Class III’  ,’class III SLE nephritis’  ,’renal biopsies class III’  ,’renal biopsy class III’  ,’bx class III’  ,’WHO class III’  ,’SLE class III’  ,’class III LN’  ,’class III GN’  ,’class III lupus GN’  ,’nephritis (class III)’ |
| Renal Inclusion | Renal Class IV | ‘nephritis class IV’  ,’class IV nephritis’  ,’class IV lupus nephritis’  ,’nephritis,? Class IV’  ,’class IV SLE nephritis’  ,’renal biopsies class IV’  ,’renal biopsy class IV’  ,’bx class IV’  ,’WHO class IV’  ,’SLE class IV’  ,’class IV LN’  ,’class IV GN’  ,’class IV lupus GN’  ,’nephritis (class IV)’  ,’Class IV + Class V lupus nephritis’  ,’nephritis class IV’  , ‘class IV DPGN’ |
| Renal Inclusion | Renal Class V | ‘WHO class V’  ,’class V nephritis’  ,’Class V LN’  ,’class V lupus nephritis’  ,’Lupus Nephritis class V’  ,’class V lupus nephritis’  ,’Class V-C lupus nephritis’  ,’class V nephritis’  ,’Class V glomerulonephritis’  ,’Lupus Nephritis, Class V’  ,’class V nephritis’  ,’lupus class V’  ,’Membranous (class V)’  ,’class V LN’  ,’SLE class V’  ,’advanced membranous (class V) lupus nephritis’  ,’biopsy class V’  ,’bx class V’  ,’biopsies class V’  ,’SLE class V\/IV nephritis’  ,’class V membranous nephritis’  ,’class V membranous lupus nephropathy’  ,’nephritis class V’  ,’class V nephritis’  ,’class V lupus nephritis’  ,’nephritis, class V’  ,’class V SLE nephritis’  ,’renal biopsies class V’  ,’renal biopsy class V’  ,’SLE class V’  ,’class V LN’  ,’class V GN’  ,’class V lupus GN’  ,’nephritis (class V)’  ,’membranous with prolife’  ,’SLE membranous’  ,’membranous GN’  ,’membranous Glomerulonephritis’  ,’membranous lupus’  ,’lupus membranous nephritis’  ,’renal membranous’  ,’membranous (class V)’  ,’class V membranous nephritis’ |
| Renal Inclusion | Proteinuria | 'proteinuria>0.5 gm'  , 'proteinuria\s?>\s?0.5\s?gm' ,'(\\d{0,2}\.\d{1,2}|\\d{1,2})\s\*gm.{1,10}proteinuria' ,'proteinuria.{1,10}(\\d{0,2}\.\\d{1,2}|\\d{1,2})\s\*gm'  ,'(proteinuria.)((\w+\s\*){0,10}).\d\*grams'  ,'(proteinuria.)((\w+\s\*){0,10}).\d\*gms'  ,'(proteinuria.)((\w+\s\*){0,10}).\.\d\*.grams' ,'(proteinuria.)((\w+\s\*){0,10}).\.\d\*.gms'  ,'\d\*.grams\*.((\w+\s\*){0,10})(proteinuria)' #  ,'\d\*.gms\*.((\w+\s\*){0,10})(proteinuria)'  ,'\d\*\.\d\*.grams\*.((\w+\s\*){0,10})(proteinuria)'  ,'\d\*\.\d\*.gms\*.((\w+\s\*){0,10})(proteinuria)'  ,'(proteinuria.)((\w+\s\*){0,10}).\d\*\s{0,1}grams'  ,'\d\*\s{0,1}grams proteinuria' |

**Thrombocytopenia Inclusion Criteria**

Any of the following **abnormal lab results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Thrombocytopenia Inclusion | Lab Test | Platelet Count < 100K | Thrombocytopenia |

**Thrombocytopenia Exclusion Criteria**

And patients also need to NOT have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Thrombocytopenia Exclusion | ICD9 Diagnosis | 287.39 | Thrombotic Thrombocytopenia Purpura |
| Thrombocytopenia Exclusion | ICD9 Diagnosis | 287.49 | Drugs |
| Thrombocytopenia Exclusion | ICD9 Diagnosis | 572.3 | Portal Hypertension |
| Thrombocytopenia Exclusion | ICD10 Diagnosis | D69.49 | Thrombotic Thrombocytopenia Purpura |
| Thrombocytopenia Exclusion | ICD10 Diagnosis | D69.59 | Drugs |
| Thrombocytopenia Exclusion | ICD10 Diagnosis | K76.6 | Portal Hypertension |

**Leukopenia Inclusion Criteria**

Any of the following **abnormal lab results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Leukopenia Inclusion | Lab Test | White Blood Cell Count: <4 K | Leukopenia |
| Leukopenia Inclusion | Lab Test | Lymphocytes: <1.5K | Lymphopenia |

**Leukopenia Exclusion Criteria**

And patients also need to NOT have any of the following codes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Leukopenia Exclusion | ICD9 Diagnosis | 288.03 | Drugs |
| Leukopenia Exclusion | ICD9 Diagnosis | 305.90 | Drugs |
| Leukopenia Exclusion | ICD9 Diagnosis | 572.3 | Portal Hypertension |
| Leukopenia Exclusion | ICD9 Diagnosis | 714.1 | Felty’s Syndrome |
| Leukopenia Exclusion | ICD9 Diagnosis | D70.1 | Drugs |
| Leukopenia Exclusion | ICD9 Diagnosis | D70.2 | Drugs |
| Leukopenia Exclusion | ICD10 Diagnosis | F18.10 | Drugs |
| Leukopenia Exclusion | ICD10 Diagnosis | K76.6 | Portal Hypertension |
| Leukopenia Exclusion | ICD10 Diagnosis | M05.00 | Felty’s Syndrome |

**Hemolytic Anemia Inclusion Criteria**

To have Hemolytic Anemia you need to have **abnormal lab results for (hemoglobin and LDH) or (Reticulocyte and LDH) labs**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Hemolytic Anemia Inclusion | Lab Test | Hemoglobin : < 8 g/dl | Hemoglobin |
| Hemolytic Anemia Inclusion | Lab Test | Reticulocyte : >3% | Reticulocyte |
| Hemolytic Anemia Inclusion | Lab Test | LDH : > 2 u/L upper limit of normal | LDH (Lactate Dehydrogenase) |

**Antinuclear Antibody Inclusion Criteria**

Any of the following **abnormal lab results OR these labs have a positive result**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Antinuclear Antibody Inclusion | Lab Test | Antinuclear antibody: we are looking for positive results where results will say positive or have similar wording, or >=8 IU/mL or >=1:80. These titers can include '%1:1%', '%1:2%','%1:3%','%1:4%', '%1:5%','%1:6%','%1:7%', '%1:8%','%1:9%'.  This number can be different at each site. A clinician at each site will need to determine what is considered significant positive. | Antinuclear Antibody |

**Anti-Smith Antibody Inclusion Criteria**

Any of the following **abnormal lab results OR these labs have a positive result**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Anti-Smith Antibody Inclusion | Lab Test | Anti-Sm > 20 units | Anti-Smith |

**Antiphospholipid Antibody Inclusion Criteria**

Patient has any of the following **abnormal lab results OR these labs have a positive or reactive result**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Antiphospholipid Antibody Inclusion | Lab Test | Cardiolipin IgG/M: >20 G/MPL | Antiphospholipid Antibody |
| Antiphospholipid Antibody Inclusion | Lab Test | Lupus Anticoagulant: we are looking for positive results where results will say positive or have similar wording | Antiphospholipid Antibody |
| Antiphospholipid Antibody Inclusion | Lab Test | Rapid Plasma Reagin (RPR): we are looking for reactive results where results will say reactive or have similar wording | Antiphospholipid Antibody |
| Antiphospholipid Antibody Inclusion | Lab Test | Venereal Disease Research Laboratory (VDRL) test: we are looking for reactive results where results will say reactive or have similar wording | Antiphospholipid Antibody |
| Antiphospholipid Antibody Inclusion | Lab Test | Beta-2 Glycoprotein > 20 U/mL | Antiphospholipid Antibody |

**Anti-dsDNA (Anti Double Stranded DNA) Inclusion Criteria**

Any of the following **abnormal lab results OR these labs have a positive result**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Anti-dsDNA Inclusion | Lab Test | Anti-dsDNA: >1:10 crithidia or equivalent;  This number can be different at each site. A clinician at each site will need to determine what is considered significant positive. | Anti-dsDNA |

**Direct Coombs Test Inclusion Criteria**

**Positive results for this test**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Direct Coombs Test Inclusion | Lab Test | Coombs Test or direct antiglobulin test (DAT): we are looking for positive results where results will say positive or have similar wording | Direct Coombs Test |

**Complement Test Inclusion Criteria**

Any of the following **abnormal lab results**

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Code Type** | **Code** | **Description** |
| Complement Inclusion | Lab Test | Complement C3: C3/75 <1 mg/dL | Complement C3 |
| Complement Inclusion | Lab Test | Complement C4: C4/20 <1 mg/dL | Complement C4 |

**References:**

1. Petri M, Orbai A-M, Alarcón GS, et al. Derivation and Validation of Systemic Lupus International Collaborating Clinics Classification Criteria for Systemic Lupus Erythematosus. *Arthritis and rheumatism*. 2012;64(8):2677-2686. doi:10.1002/art.34473.