Poster SA48

Identifying Flares in Lupus Nephritis Patients by Combining Structured and Unstructured Medical Records with Lab Data

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BACKGROUND

- Lupus nephritis (LN), a common complication of systemic lupus erythematosus, is an inflammatory renal disease in which deposits of immune complexes accumulate in the kidney leading to injury.
- Renal flares can signal a worsening of LN but are difficult to track outside of clinical trials.
- Many real-world data (RWD) sources have limited data availability for certain clinical events, including renal flares:
  - Medical claims data and associated coding systems contain insufficient clinical specificity (e.g., no ICD code exists for renal flares)
  - Data abstraction from medical records is often restricted to structured portions of the record, which may under-capture clinical data.
- Abstracting from unstructured narrative text and combining signals of renal flares from multiple data sources may help identify patients experiencing LN flares using RWD.
- The objective of this study was to explore the feasibility of using narrative mentions of 'flare' and 'remission', in combination with lab data, to improve identification of renal flares using RWD.

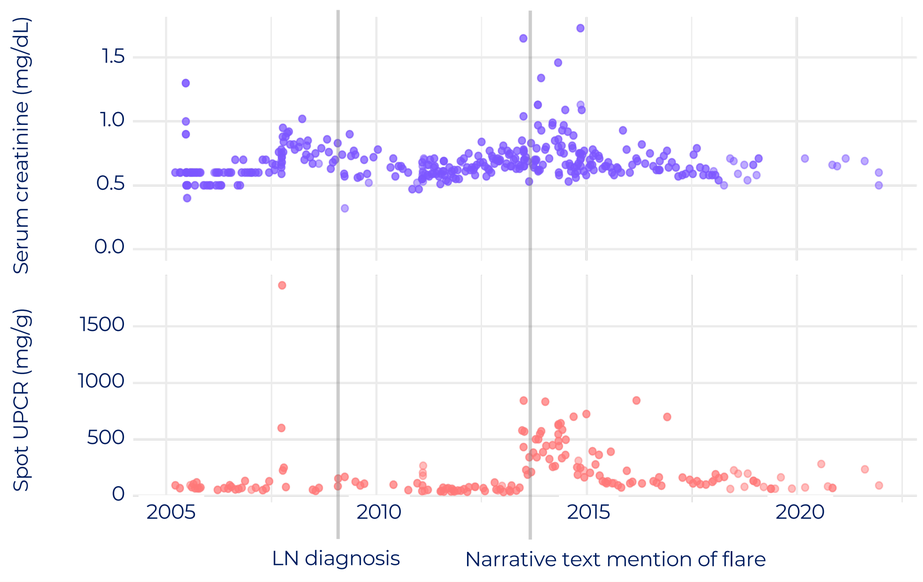
CONCLUSIONS

- Narrative text abstraction did identify provider-specified episodes of 'flare' and 'remission' in 53 (30.5%) of patients.
- Narrative text abstraction in combination with a lab-based proxy identified the greatest number of potential LN flares.
- Consistent with clinical expectations, lab measures showed a decrease in renal function around flare events relative to remission events identified in structured and unstructured parts of medical records.
- Surprisingly, lab measures showed the greatest decrease in renal function around partial remission. This may be attributable to the limited number of partial remission mentions or that 'partial remission' may lack a standardized definition adopted in clinical practice.
- Future research should further explore the relationships between narrative mentions of disease status, quantitative disease measures and changes in disease management and how these relationships translate across RWD sources.

METHODS

- Between July 1, 2020 and March 12, 2022, 174 patients with LN from across the United States provided consent and enrolled into this cohort.
- Recruitment sources included affiliate partners, digital advertising, social media, advocacy and referrals. All patients who signed up with the PicnicHealth platform were evaluated for eligibility.
- Retrospective medical records were collected from all relevant care facilities to evaluate patient eligibility. Inclusion required confirmed diagnosis of LN documented in their medical records. Follow-up continued through repeated, prospective collection of medical records.
- Data were abstracted from structured and unstructured portions of medical records using natural language processing and human-reviewed machine learning:
  - Routine lab results were abstracted from lab reports.
  - Mentions of LN disease status were abstracted from physician notes. These included mentions of 'flare', 'remission', 'partial remission' and 'complete remission'.
- Flare events were examined from two lenses: 1) text-based flares only, and 2) combination of text- and lab-based flares (≥25% increase in serum creatinine from the most recent previous measurement to a value above upper limit of normal). Remission events were defined using only mentions from narrative text.
- Spot urine protein-to-creatinine ratio (UPCR) results within 1 month of each flare or remission event were used to validate the clinical accuracy of disease status mentions from narrative text.
- An example of available data over time (serum creatinine, UPCR, and disease event information from narrative text) for a single patient is illustrated in Figure 1.

Figure 1. Key data elements over time for 55-year-old female with class III LN.



RESULTS AND INTERPRETATION

- Prevalence of key data elements are reported in Table 2.
- Serum creatinine (SCr) and spot UPCR monitoring were found in the majority of patients.
- Patients had a median of 3-4 provider visits per year (rheumatology, nephrology or primary care), the source of potential text-based mentions of flare or remission.
- Narrative text mentions of disease status (flare or remission) were found for 53 (30.5%) patients.
- Mentions of 'remission' (complete, partial or unspecified) were more common than mentions of 'flare'.
- The combination of lab-based flares and narrative text mentions of 'flare' identified more patients with flares than narrative text mentions alone.

Median (IQR) **annualized rate of flares** (narrative text mentions + lab-based proxy) among patients with at least one flare was 0.49 (0.27, 1.00).

Table 1. Demographic and clinical characteristics.

Characteristic	n (%) or Median (IQR)
Total	174 (100%)
Age	44 (34, 55)
Sex	
Female	160 (92%)
Male	14 (8.0%)
Race	
White	83 (48%)
Black or African American	53 (30%)
Hawaiian/Pacific Islander	3 (1.7%)
Asian	2 (1.1%)
More than one race	5 (2.9%)
Declined/Unknown	28 (16.6%)
Ethnicity	
Hispanic or Latino	17 (9.8%)
Not Hispanic or Latino	94 (54%)
Declined/Unknown	63 (36.1%)
LN Class (non-exclusive) Among 107 (41%) patients with known class	
Class I	5 (4.7%)
Class II	17 (15.9%)
Class III	27 (25.2%)
Class IV	37 (34.6%)
Class V	55 (51.4%)
Class VI	4 (3.7%)
Observation Time (years)	
Before LN diagnosis	3.5 (0.1, 10.2)
After LN diagnosis	4.3 (2.2, 9.6)

Geographic distribution of patients

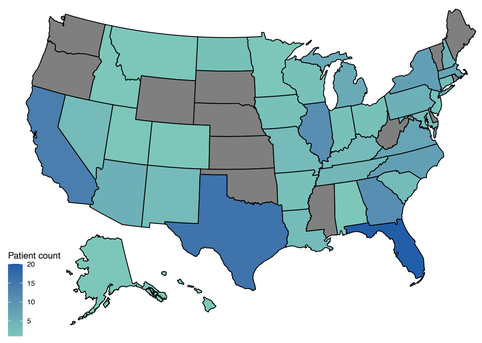
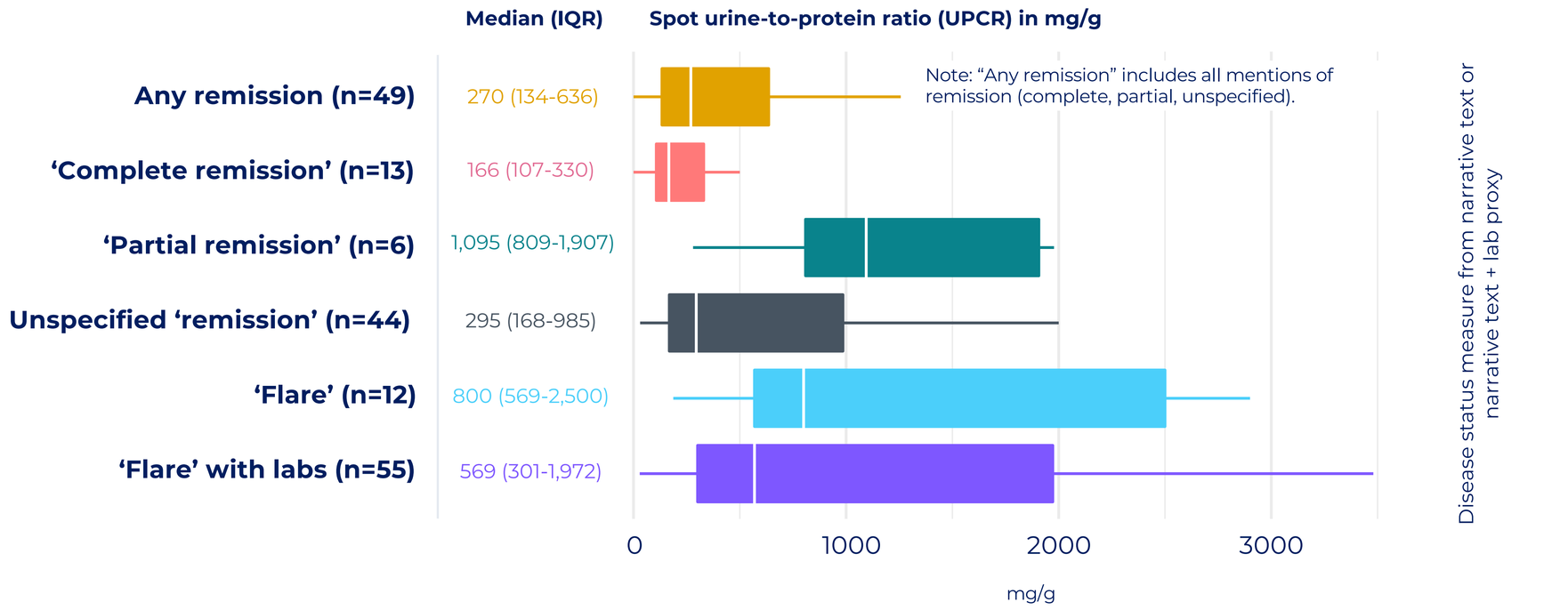


Table 2. Prevalence of narrative text mentions of disease status (flare and remission), key lab results and specialist visits.

Measure	n (%) Patients with Measure	Median (IQR) Events per Patient
Any mention of remission	49 (28%)	3 (1, 8)
Complete remission	13 (8%)	2 (1, 6)
Partial remission	6 (3%)	2 (1.3, 4.3)
Unspecified remission	44 (25%)	3 (1, 7)
Any mention of flare	12 (7%)	1 (1, 1)
Any mention of flare or lab-based flare	55 (32%)	1 (1, 2.5)
Serum creatinine	171 (98%)	16 (8, 35)
Spot UPCR	123 (71%)	6 (2, 11)
Provider visit*	173 (99%)	29 (17, 52)

*Provider specialities limited to rheumatology, nephrology, primary care

Figure 2. Urine protein-to-creatinine ratio measured within one month of LN disease status measures for 92 patients with at least one disease status measure.



- UPCR values are known to increase with worsening renal function. Spot UPCR values within one month of any narrative text mention of disease status (flare or remission) were used to compare these narrative text findings to a contemporaneous quantitative disease status measure.
- The median (IQR) UPCR was higher within 1 month of a 'flare' mention or flare mention plus lab-based proxy and lower within 1 month of mentions of 'complete remission' and 'unspecified remission'.
- Unexpectedly, UPCR was highest within 1 month of mentions of 'partial remission', though very few patients had mentions of 'partial remission' (n=6).

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