

EMERSE: an easy-to-use, self-service search engine and chart review tool for EHR notes

November 3, 2022

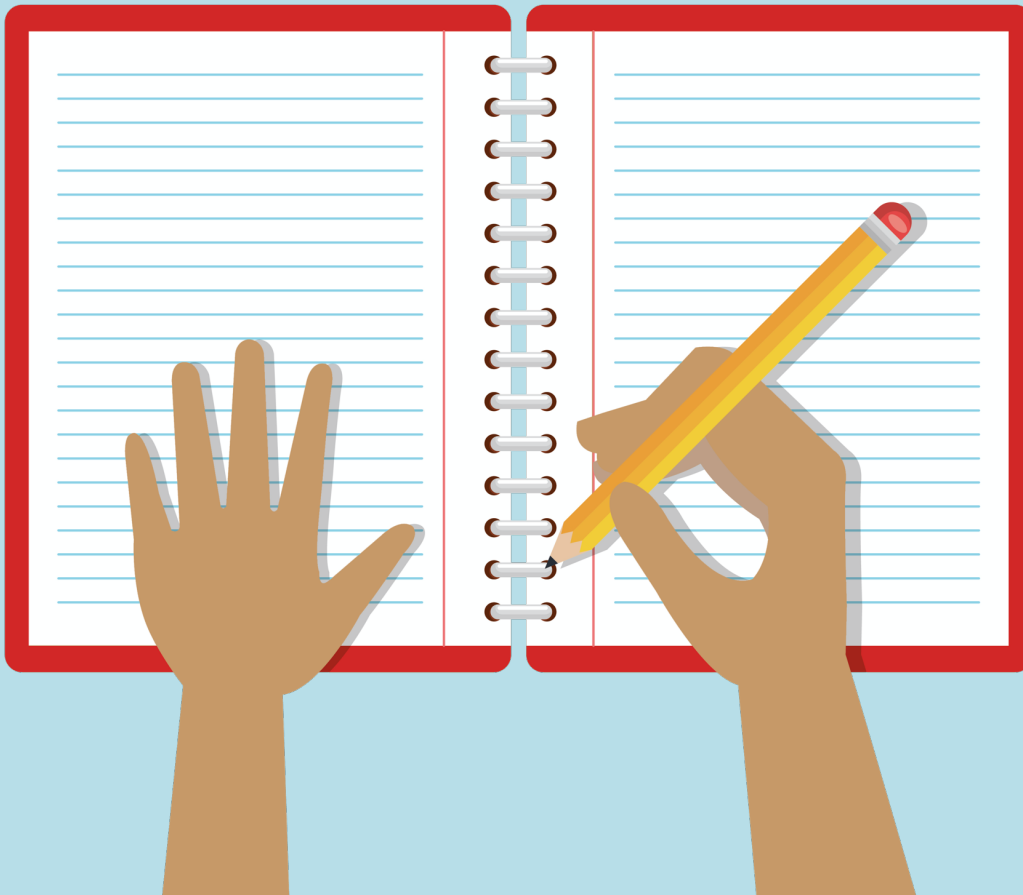


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<http://project-emerse.org/presentations.html>

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these slides can be found at:

this link will be
on most slides



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ELECTRONIC MEDICAL RECORD SEARCH ENGINE

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Disclosures



Funding: NIH (NCI, NCATS); PCORI

Licenses/Royalties: EMERSE “Synonyms”
(used for query expansion) which is
licensed by the U of Michigan



Randall's Island
N Eng J Med, Vol 347, No 22, Nov 28, 2002

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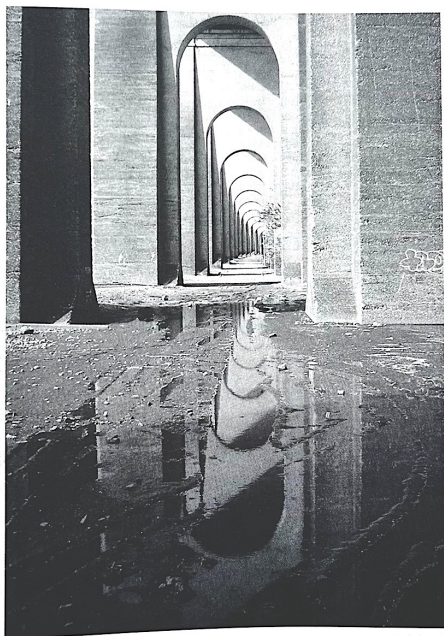
gests that the new member of the renin-angiotensin system, ACE2, is a critical regulator of cardiac function and may be an important therapeutic target. Drugs that specifically influence the production of ACE2, as well as dampen the activity of angiotensin II, may therefore have considerable clinical value.

MANFRED BOEHM, M.D.
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REFERENCES

1. Crackower MA, Sarao R, Oudit GY, et al. Angiotensin-converting enzyme 2 is an essential regulator of heart function. *Nature* 2002;417:822-8.
2. Tipnis SR, Hooper NM, Hyde R, Karran E, Christie G, Turner AJ. A human homolog of angiotensin-converting enzyme: cloning and functional expression as a captopril-insensitive carboxypeptidase. *J Biol Chem* 2000;275:33238-43.
3. Donoghue M, Hsieh F, Baronas E, et al. A novel angiotensin-converting enzyme-related carboxypeptidase (ACE2) converts angiotensin I to angiotensin 1-9. *Circ Res* 2000;87:E1-E9.

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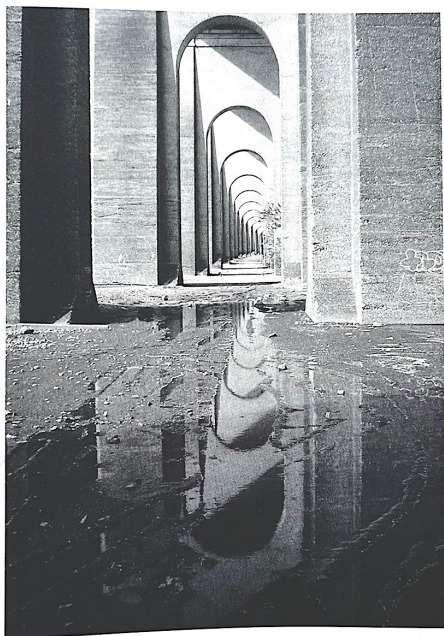
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I am here to tell you
about EMERSE

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2021 study out of UC Irvine: *Design, Implementation, and Usability of the Electronic Medical Record Search Engine (EMERSE) Tool*

<https://escholarship.org/uc/item/44p23878>

“Users unanimously responded that they would recommend the system to others, and...for a tool they found so useful, they believed that far too few people both within and outside of their network knew about the tool’s existence.”



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Unstructured vs Structured Data

EMERSE is for this...	...not this
<i>Unstructured Data (free text)</i>	<i>Structured Data</i>
Mrs. Jones is a 56 year old female with a history of HTN, hypercholesterolemia, and T2DM who comes to the clinic today with a 3 day h/o dizziness and severe headache on the left side.	WBC: 5.6 Total cholesterol: 182 Weight: 67.4 AST: 30 ALT: 52

80% of EHR data are in unstructured free text



] structured data

] unstructured data/free text

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The EMERSE solution



- A system “for the people”
- Users search the EHR on their own
 - No need to wait in a queue for an analyst or a data scientist
- Data are kept secure within a centralized, audited system
 - No need to download/store the data elsewhere
- Easy-to-use for non-technical researchers

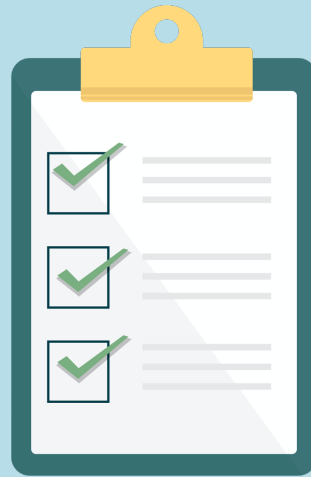
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Find cohorts

EMERSE allows you to find cohorts based on things mentioned in the notes

- diseases
- drugs
- symptoms
- anything*



*if it is mentioned

Find cohorts

It's perfect for finding rare things...

...like rare cancers



See this talk for more details:

<https://vimeo.com/677482835>

“Using EMERSE to Improve Research
Involving Rare Cancers”

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Highlight documents for chart review

Thoracocentesis confirmed the recurrence of mantle cell lymphoma. Disease restaging work-up revealed multicompartiment lymphadenopathy in the neck, mediastinal, retrocrural, retroperitoneal and pelvic regions. Bone marrow was also involved. The patient was treated with a total of six cycles of rituximab, cyclophosphamide, vincristine, doxorubicin and dexamethasone (R-HyperCVAD) completed in January 2007. That treatment led to complete remission that lasted until October 2008, when the disease was found to have recurred in the left pleural space and retroperitoneum without bone marrow involvement.

<https://jmedicalcasereports.biomedcentral.com/articles/10.1186/1752-1947-4-329>



EMERSE is *≡fast*

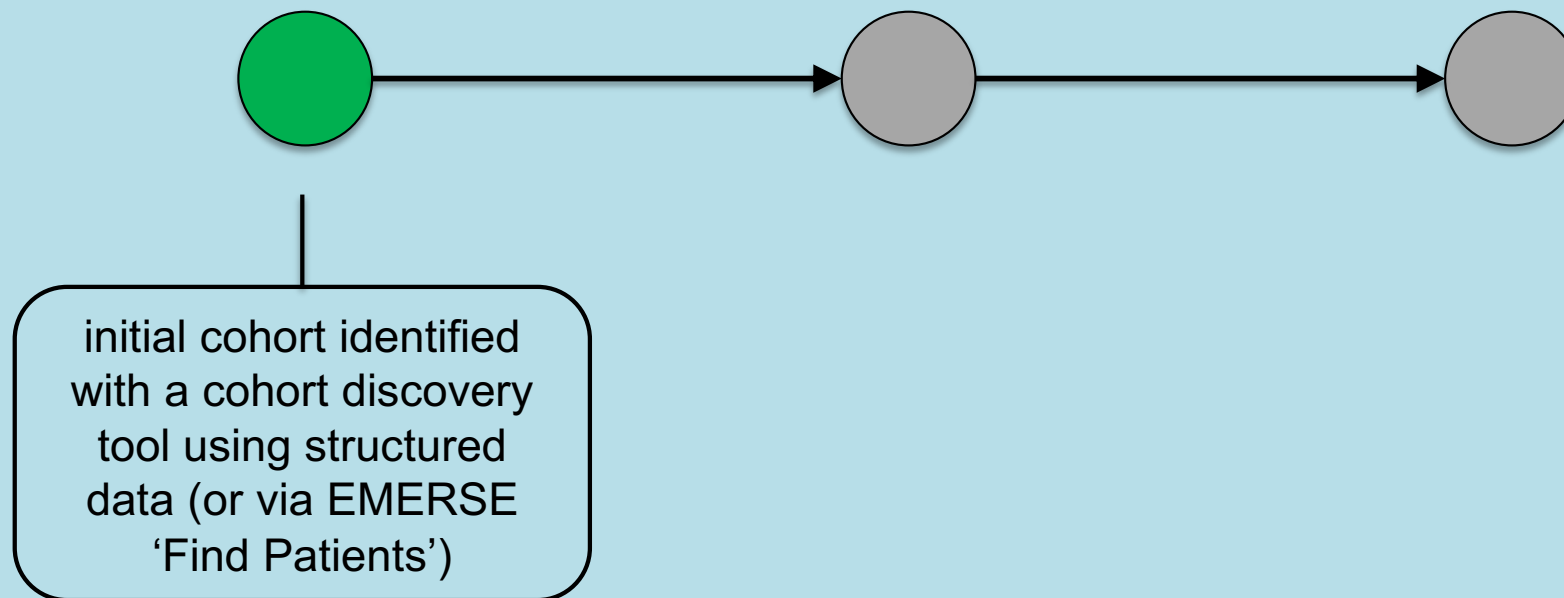
Query to identify all patients with the following	Reporting DB time (s)	EMERSE time (s)	EMERSE advantage
cavernous hemangioma	14,652	2	7,320x
gray platelet syndrome	14,940	2	7,470x
inferior lingular segment of the left upper lobe	17,784	9	1,980x

...enabling real-time querying



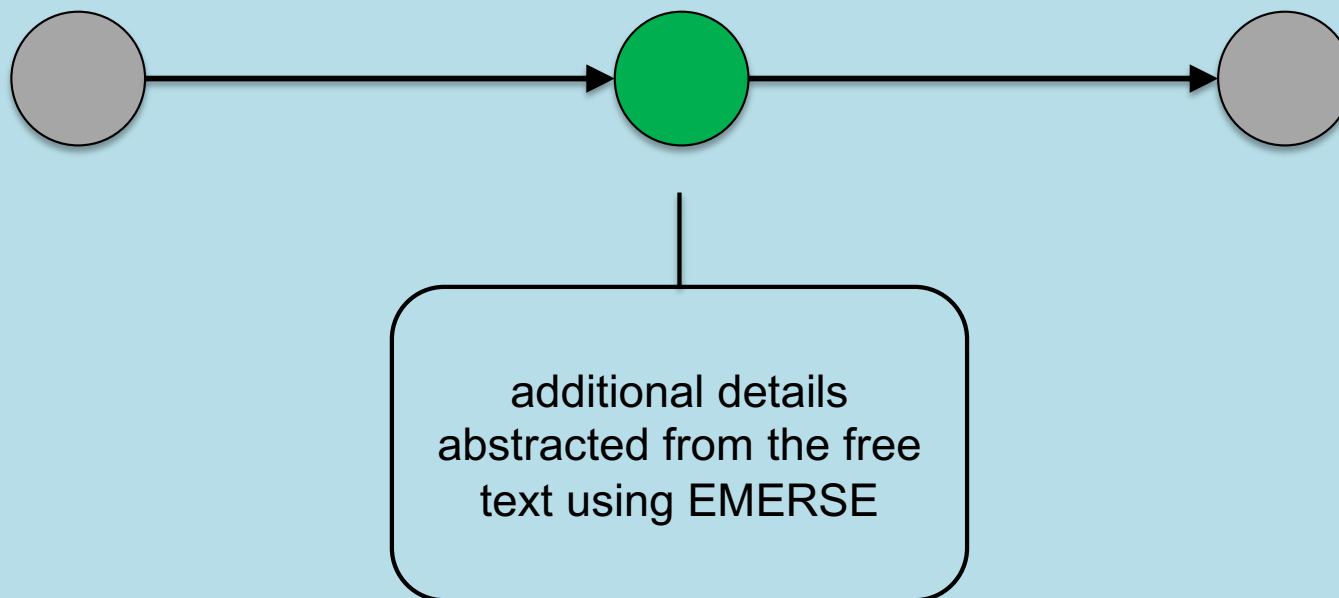
<http://project-emerse.org/presentations.html>

Typical workflow

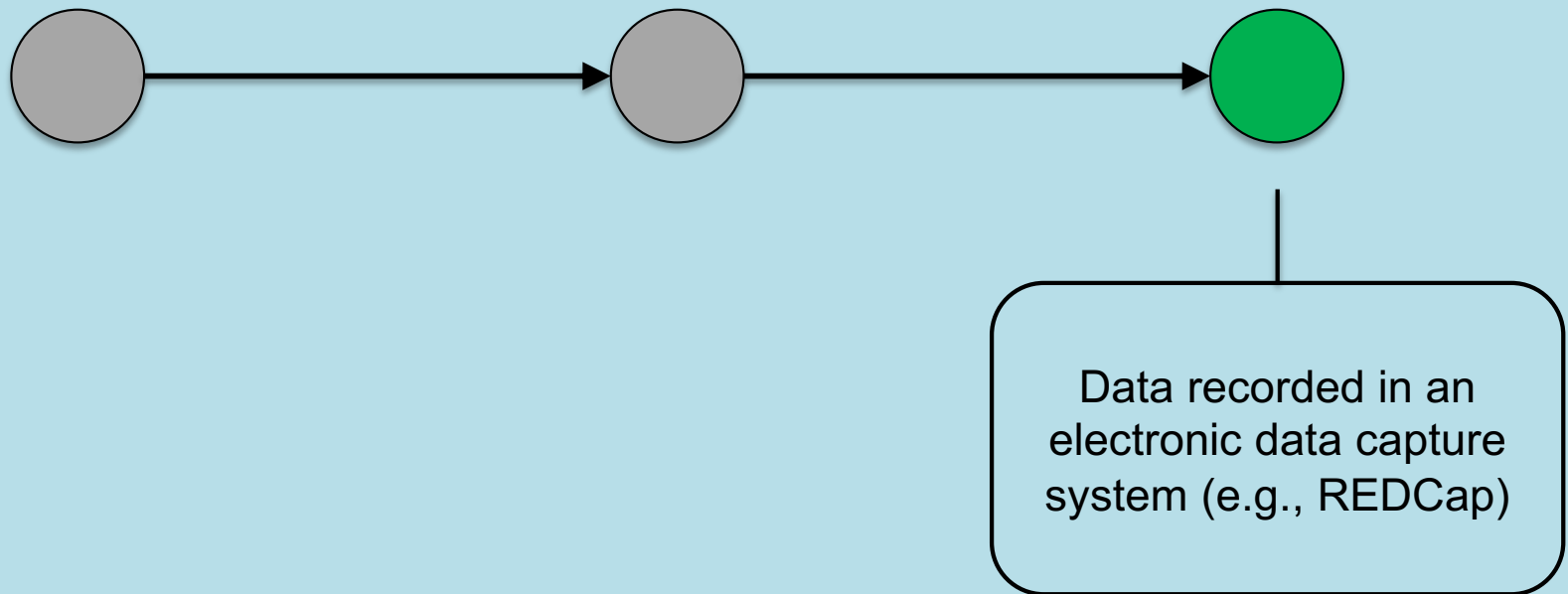


Cohort discovery tools:
i2b2, Leaf, etc.

Typical workflow



Typical workflow



Statistics at Michigan

Sept 2018 – Sept 2021

- 31,800 research logins
- 926 studies
- 525 PIs



Publications using EMERSE

576

papers and abstracts



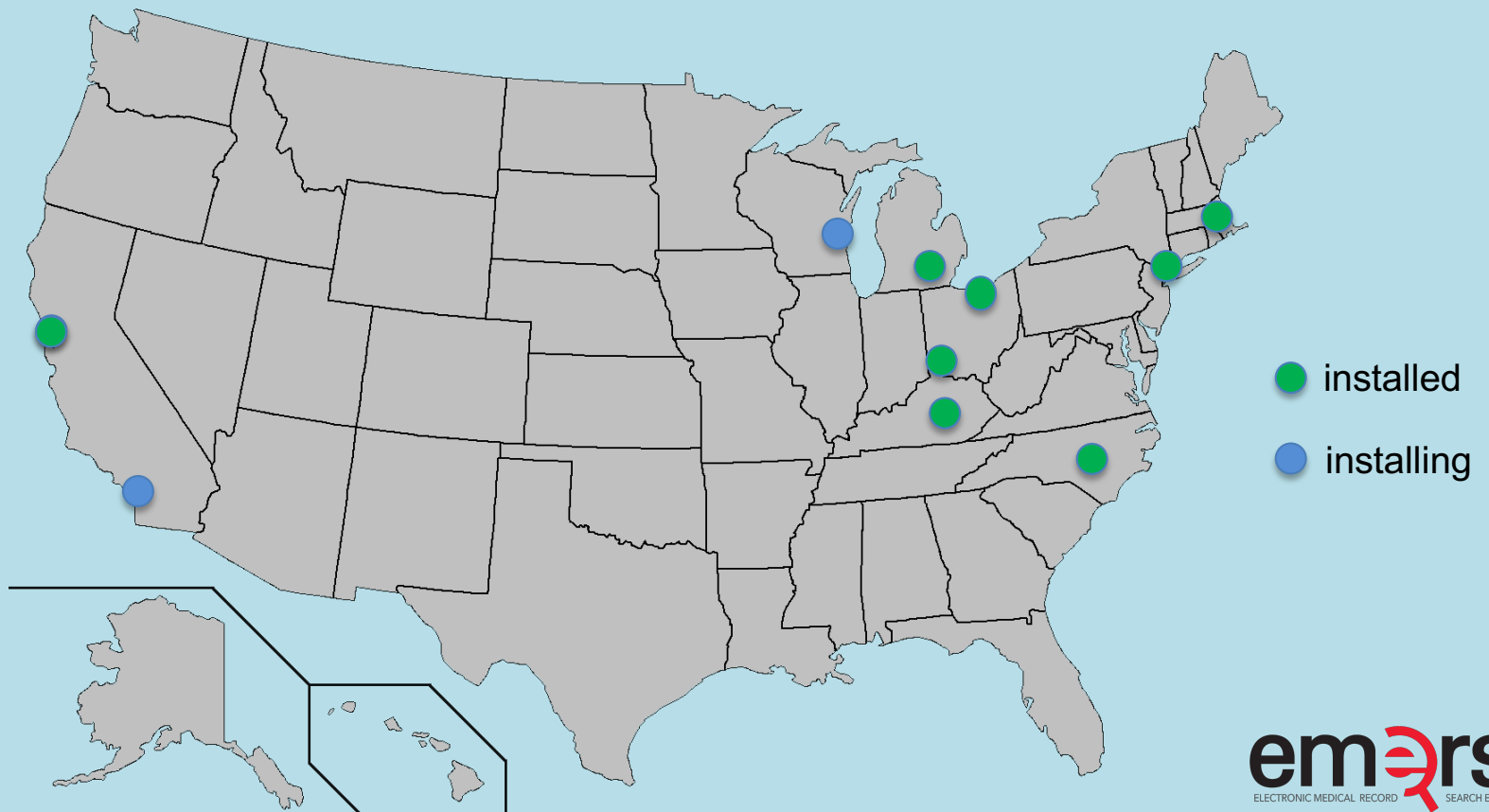
Full list at:

<http://project-emerse.org/publications.html>

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Where is EMERSE?





Now available...

EMERSE Research Informatics Network



real-time, secure
cross-site queries

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EMERSE Research Informatics Network



David Hanauer ^

Patients University of Kentucky (66385), University of Michigan (2812337)

Filters

Terms "renal cell carcinoma"

Results

HIGHLIGHT DOCUMENTS

FIND PATIENTS

SEARCH NETWORK

Site	Patient Count
University of Kentucky	
University of Michigan	

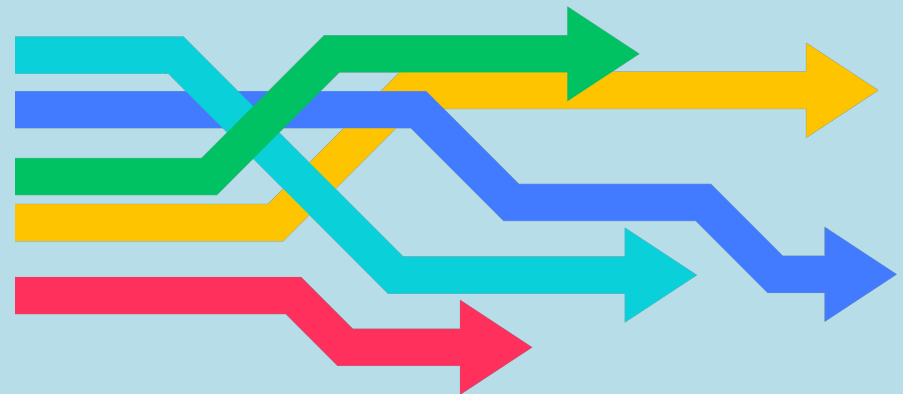


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The future...

Incorporation of NLP features

- negation
- uncertainty
- subject (patient vs other)
- named entity recognition/mapping to ontologies



Data extraction from templated notes

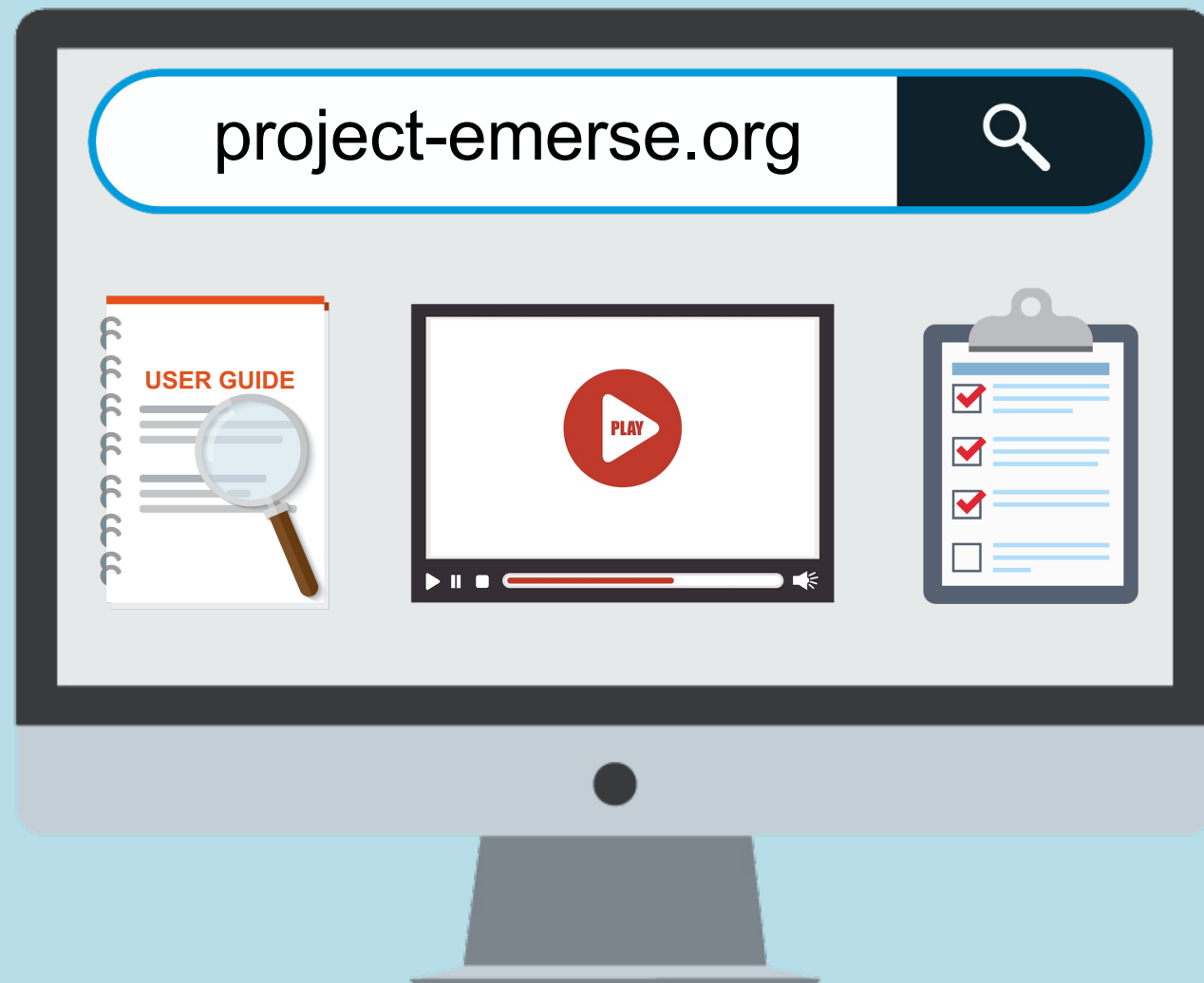
Ultrasonography displayed an inhomogeneous hypoechoic nodule measuring 20mm*17mm (Figure1).
 Biopsy examination of the lesion revealed **scirrhous carcinoma**. A chest computed tomography (CT) scan
 for metastases showed abnormal shadows in both upper lung fields. The patient was then referred to our
 department for definitive workup and treatment. She had no history of cough, sputum, or dyspnea. Our
 patient had no history of tobacco smoking and no exposure to any dusts associated with a high risk of lung
damage. Her past history and family history were unremarkable. A chest X-ray showed slight peripheral
 infiltration shadows in both upper and middle lung fields (Figure2). A chest CT scan showed patchy
 peripheral ground-glass opacities and thickened interlobular septa in both upper lung fields (Figure3A). A
 peripheral blood cell count and serum and biochemical tests were normal. Autoantibody and vasculitis
screening was negative. Testing for human immunodeficiency virus infection was negative. Serum
 carcinoembryonic antigen (CEA) and carbohydrate antigen 153 (CA15-3) were in the normal ranges
 (1.1ng/mL and 12.5U/mL, respectively), but granulocyte-macrophage colony-stimulating factor (GM-CSF)
 autoantibody was elevated (29.57?g/mL). Pulmonary function testing revealed normal lung volumes and
 diffusing capacity. Flexible fiberoptic bronchoscopy was then performed. The retrieved bronchoalveolar
 lavage fluid (BALF) was transparent; it did not have a milky appearance. However, BALF cytology showed
 alveolar macrophages with granular materials that stained positively with periodic acid-Schiff (PAS).
 Histological findings of a transbronchial lung biopsy specimen showed the alveolar spaces to be filled with
 PAS-positive granular materials (Figure4). As a result, this patient was diagnosed as having PAP.

From our NLP proof-of-concept system

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4140142/>



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- Training
- Live demonstrations



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Upcoming presentations

AMIA Annual Symposium, Washington DC, Nov 5-9, 2022

Title: Comparative Analysis of Social Connections/Isolation and Stress Documentation in Structured and Unstructured Machine De-Identified Data using PatientExploreR and EMERSE

Speaker: Shivani Mehta, University of California San Francisco

Date: Monday, Nov 07, 2022, 3:30 PM - 5:00 PM EDT

URL: <https://bit.ly/amia-emerse-2022-1>

Title: Design, Implementation, and Usability of the Electronic Medical Record Search Engine (EMERSE) Tool

Speaker: Colby Reyes, University of California, Irvine

Date: Wednesday Nov 9, 2022, 10:30 AM - 12:00 PM EDT

URL: <https://bit.ly/amia-emerse-2022-2>



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