Using the self-service EMERSE tool to search for terms embedded in the clinical notes

October 11, 2022
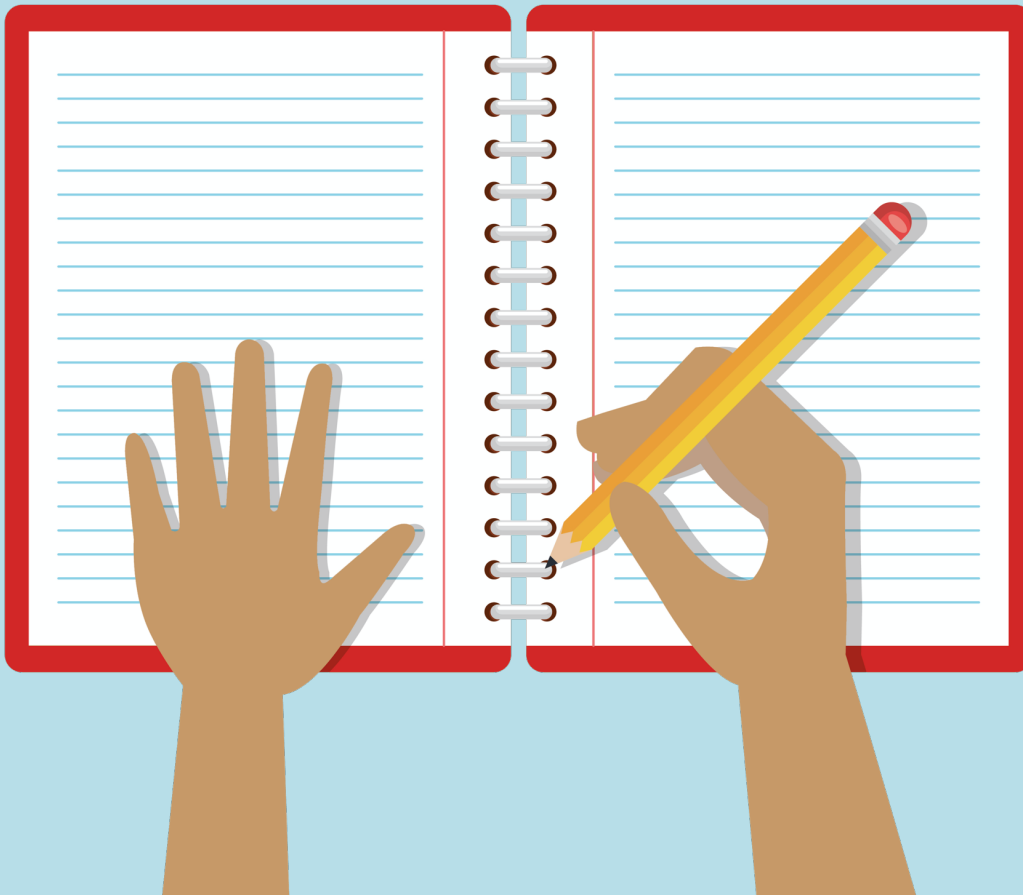

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http://project-emerse.org/presentations.html

If you're thinking of taking notes or want to visit links

these slides can be found at:

this link will be on most slides

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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

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 <u>far too few people both within and outside of their network knew about the tool's existence</u>."

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Unstructured vs Structured Data

EMERSE is for this…	…not this
Unstructured Data (free text)	*Structured Data*
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

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80% of EHR data are in unstructured free text

structured data

unstructured data/free text

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The Problem(s)

Free text is: complex

it's a representation of the mind

The Problem(s)

Free text is: a mess

"domino pain"

The Problem(s)

Free text is: difficult to access

The Problem(s)

Many free text tools are hard to use

Ease of adoption of clinical natural language processing software:
An evaluation of five systems

Kai Zheng [a,b,*], V.G. Vinod Vydiswaran [k], Yang Liu [b], Yue Wang [c], Amber Stubbs [d], Özlem Uzuner [e], Anupama E. Gururaj [f], Samuel Bayer [g], John Aberdeen [g], Anna Rumshisky [h], Serguei Pakhomov [i], Hongfang Liu [j], Hua Xu [f,*]

"The average ratings provided by the end user evaluators on ease of use and ease of interpreting output... indicat[e] that <u>this group of users generally deemed the systems extremely difficult to work with</u>"

https://pubmed.ncbi.nlm.nih.gov/26210361/

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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The EMERSE is the…

- <u>E</u>lectronic <u>M</u>edical <u>R</u>ecord <u>S</u>earch <u>E</u>ngine
  - Supports Google-like searching to find patients
  - Supports chart reviews by highlighting terms within notes

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EMERSE is mature

Software we've been developing and refining for 17 years

2022

2005

EMERSE is a tool for free text

picking the right tool for your research is
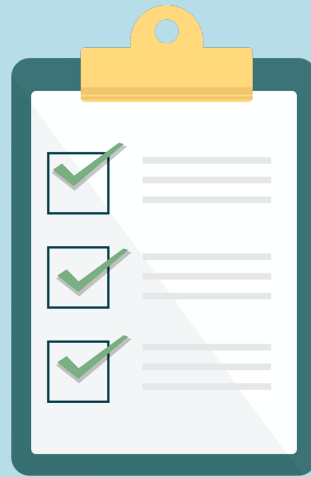important; multiple tools are often needed

Find cohorts

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

- – diseases

- – drugs

- – symptoms

- – anything*

*if it is mentioned

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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 multicompartment 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.

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EMERSE Bundles

Saved sets of search terms

Shared among users

Helps standardize searches

Supports reproducibility

- Some teams publish Bundles

  in their publication's appendix
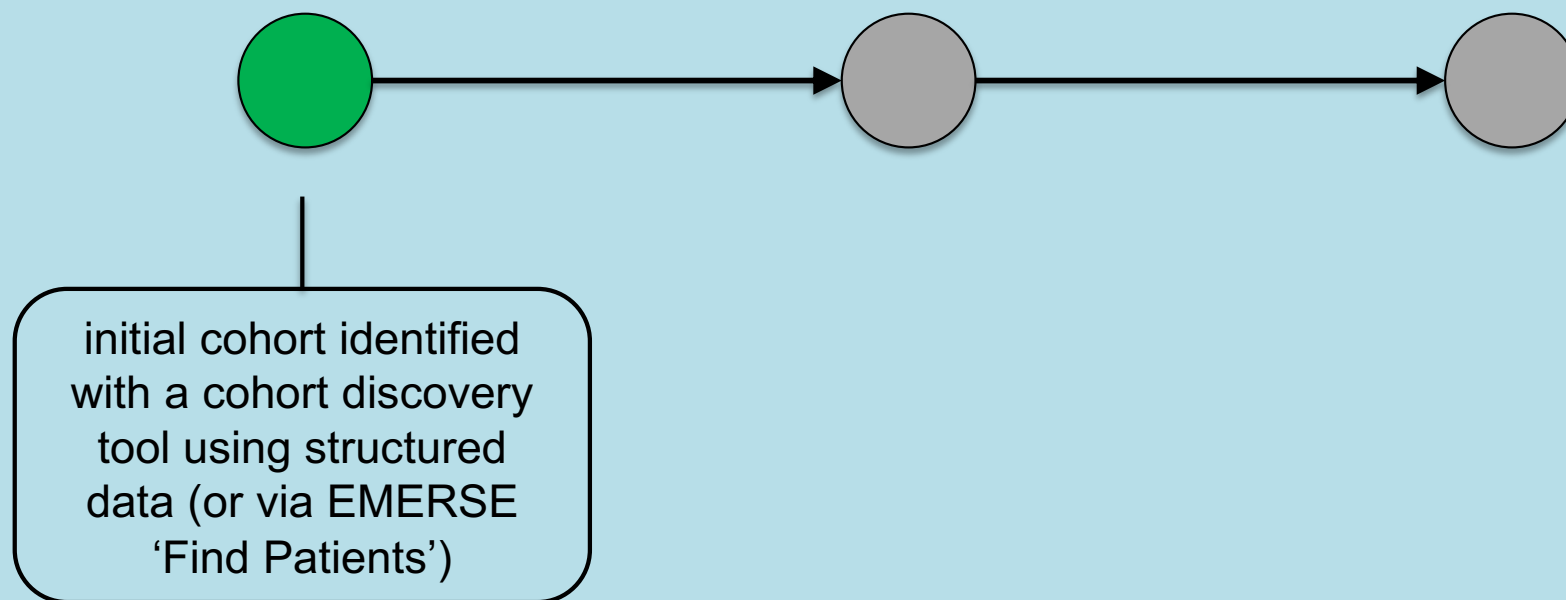 (example: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3860174/)

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

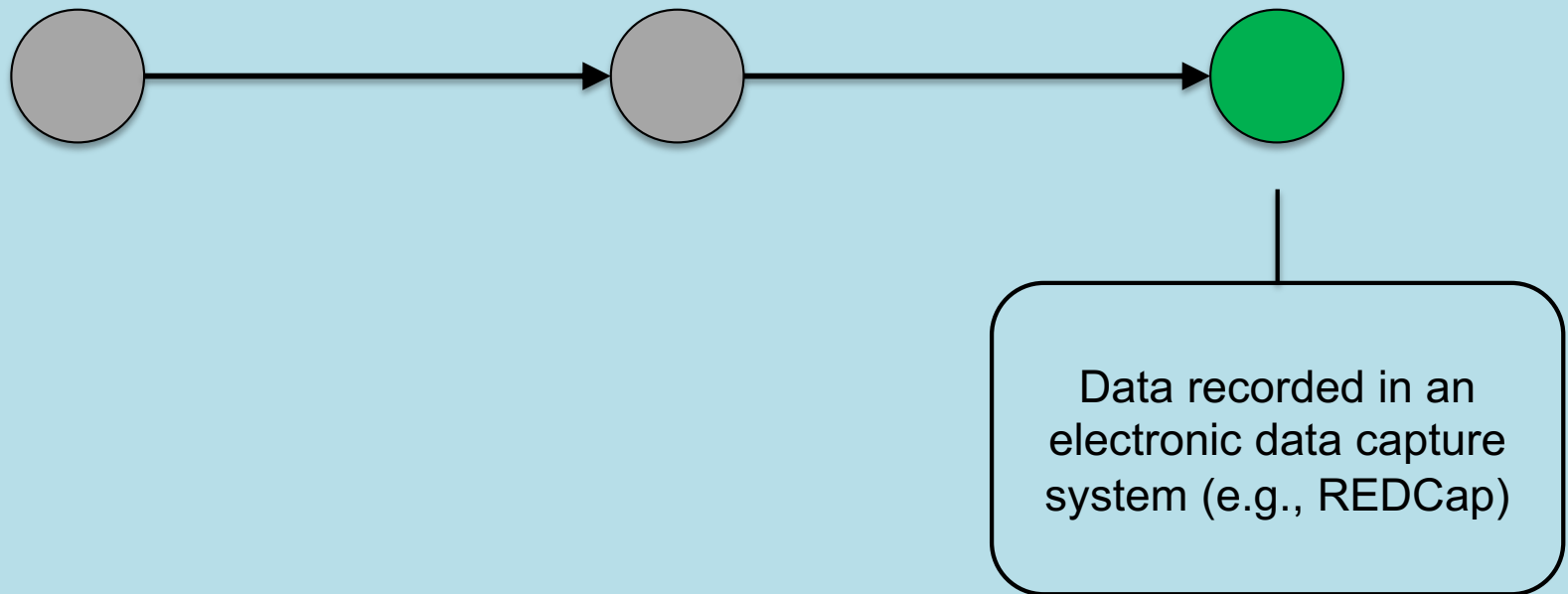...enabling real-time querying

Typical workflow

initial cohort identified with a cohort discovery tool using structured data (or via EMERSE 'Find Patients')

Cohort discovery tools: i2b2, TriNetX, LEAF, etc.

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Typical workflow

additional details abstracted from the free text using EMERSE

Typical workflow

Data recorded in an electronic data capture system (e.g., REDCap)
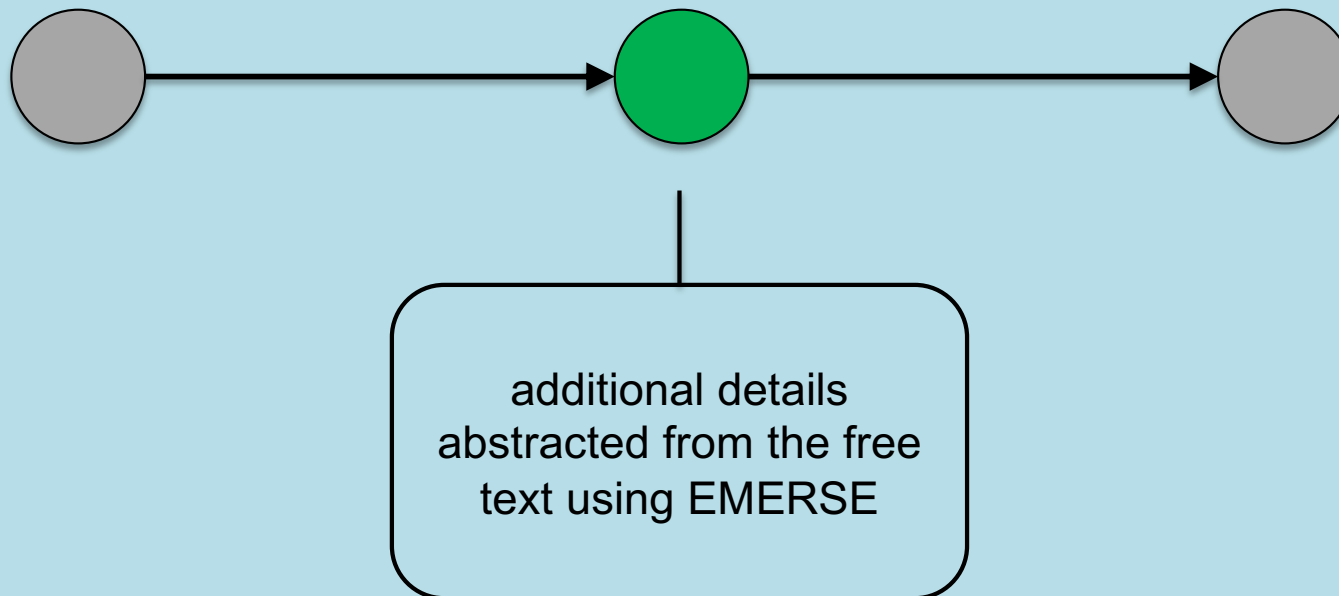
Cincinnati specifics

EMERSE stats at Cincinnati:

- Available since 2018

- Data from 2017-present, refreshed quarterly

- 750k patients

- 45M documents

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Cincinnati specifics

Potential workflow:

Identify patients with
TriNetX → contact BMI for
MRNs → import MRNs
into EMERSE

To request access: https://chi.uc.edu/research

Publications using EMERSE

575

papers and abstracts

Full list at:

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

Where is EMERSE?

● installed

● installing

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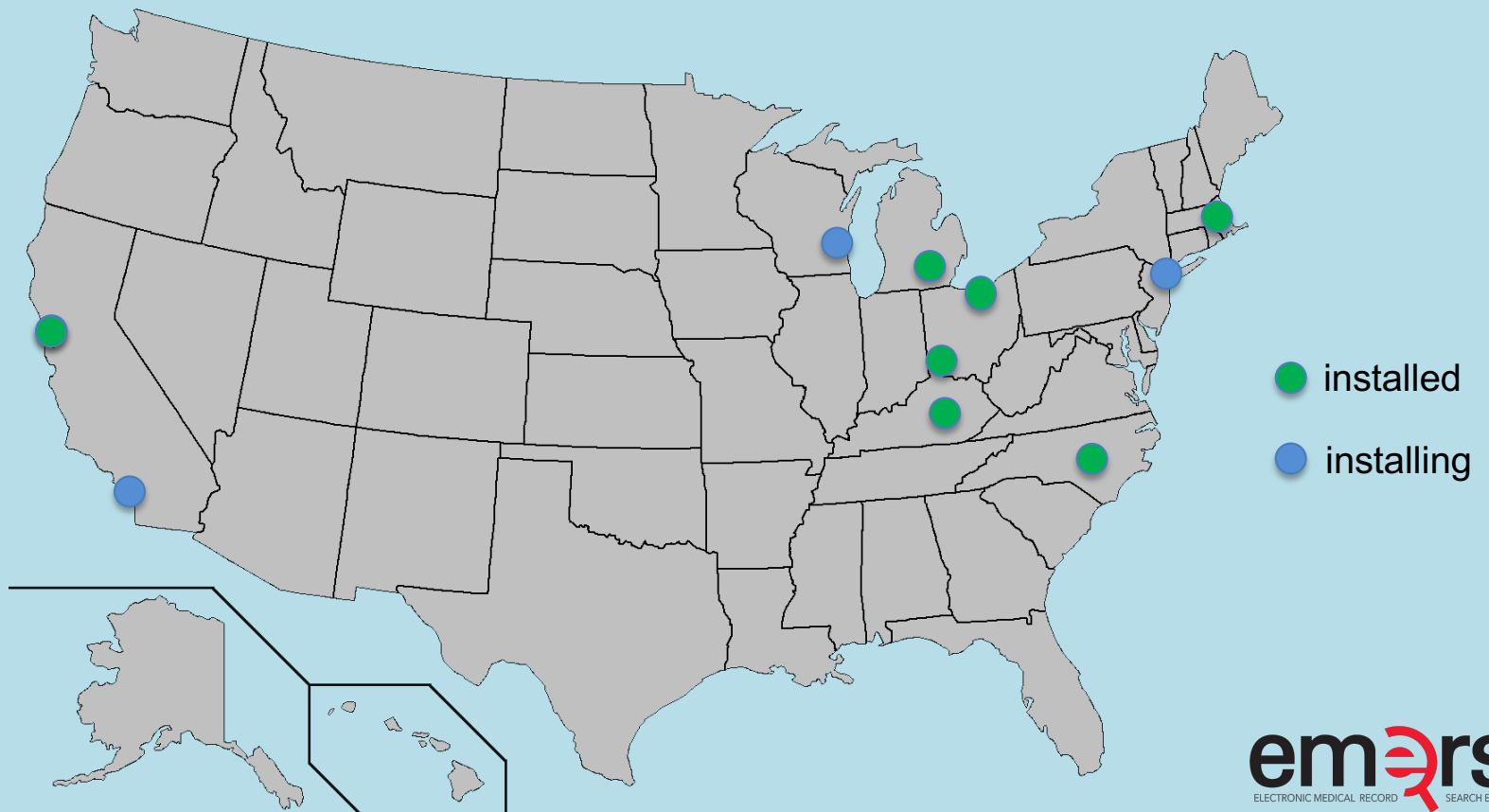
Now available…

EMERSE Research Informatics Network

real-time, secure
cross-site queries

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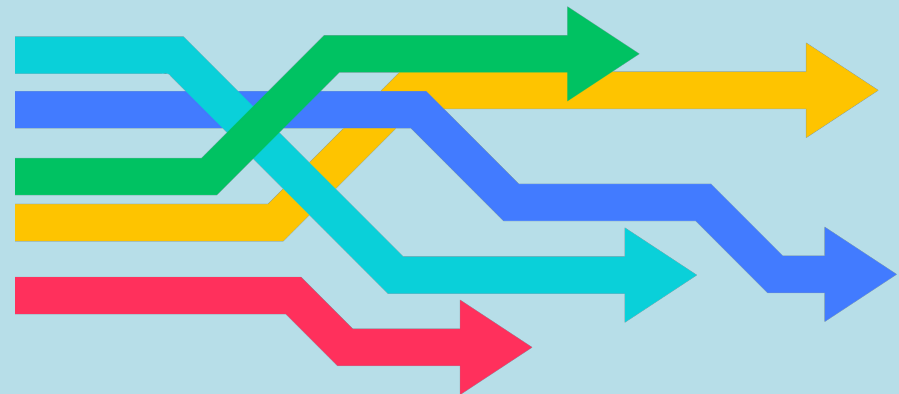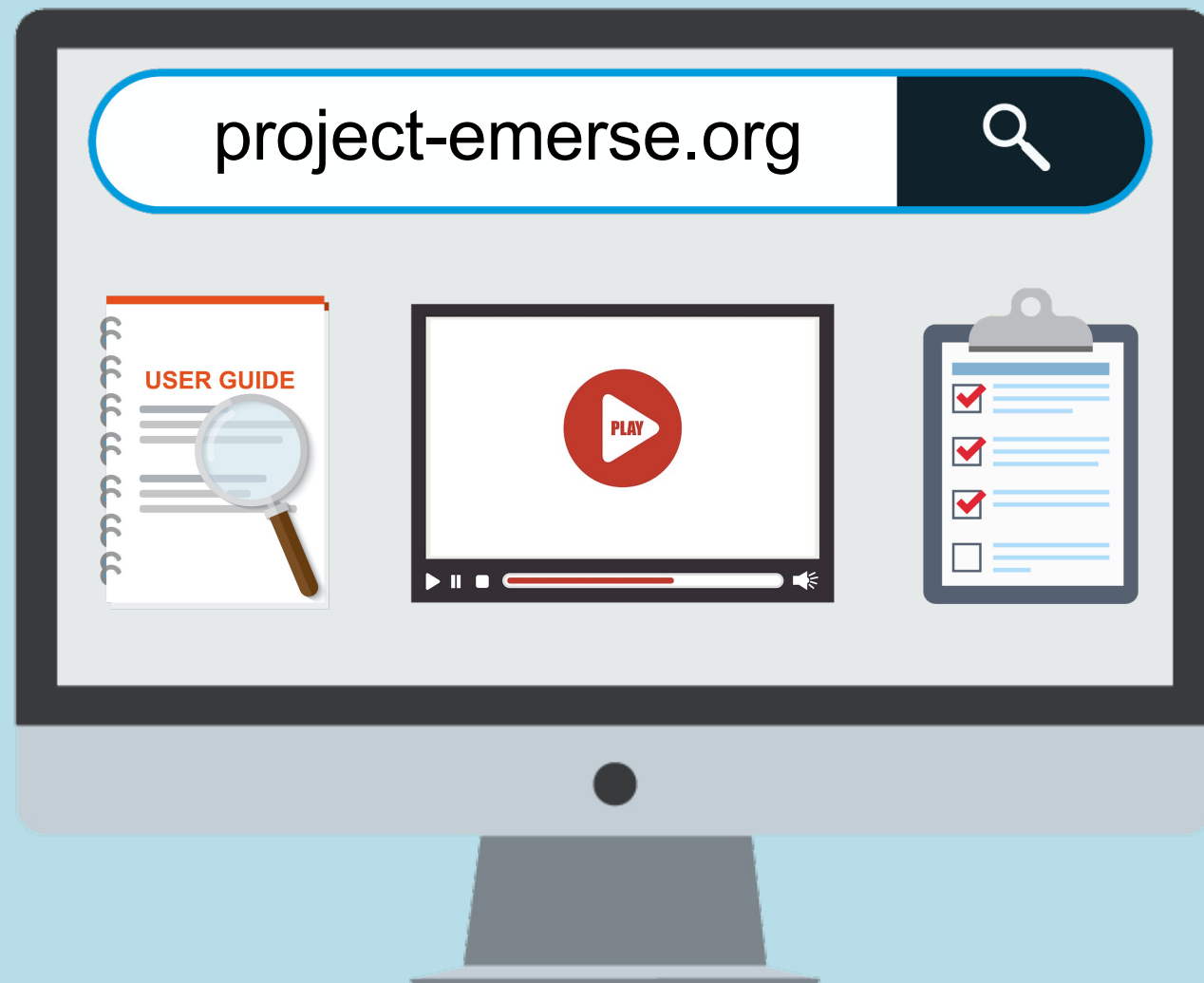
EMERSE Research Informatics Network

The future…

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

Data extraction from templated notes

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Contact us to schedule a time with your team for:

- Discussions about research strategies
- Training
- Live demonstrations

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EMERSE-team@umich.edu

Lisa Ferguson

David Hanauer

Kellen McClain

Guan Wang

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Another presentation…TODAY!

EMERSE Community Meeting Series

"Unlocking Real World Data Buried in the EHR: The EMERSE Experience at Case Western Reserve University and University Hospitals of Cleveland", Mark Beno,MSM

Tuesday, October 11, 2022. 1:00-2:00 PM ET

More info at: http://project-emerse.org

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