EMERSE: An easy-to-use text processing tool for unstructured clinical notes in MiChart

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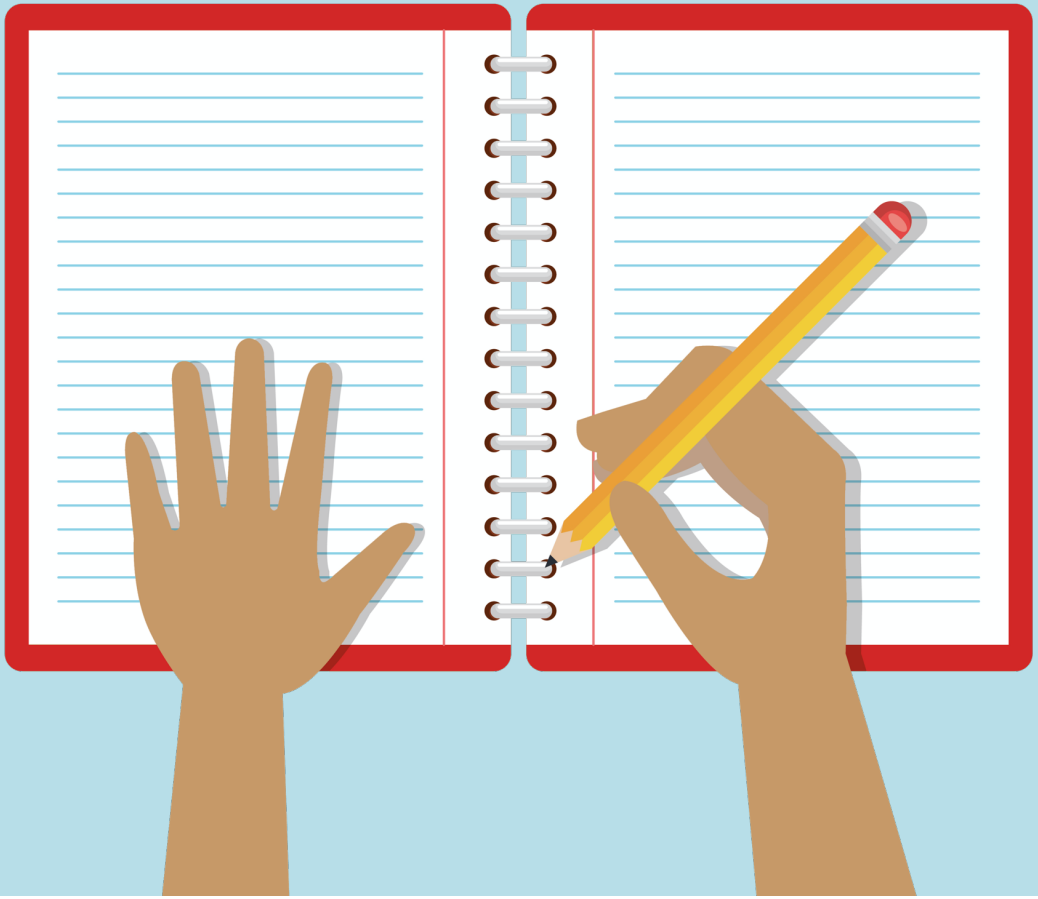
http://project-emerse.org/presentations.html

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

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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
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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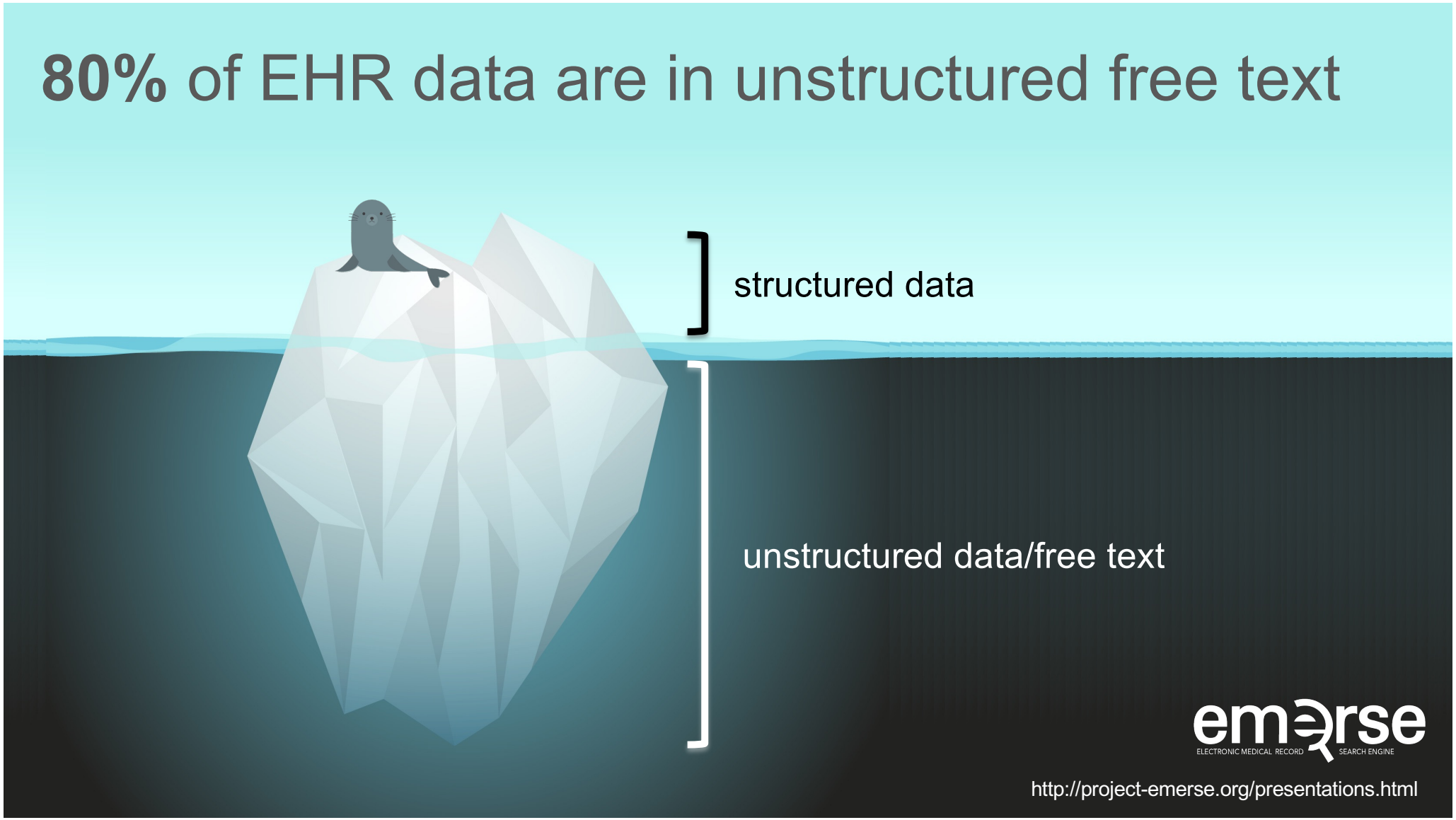
80% of EHR data are in unstructured free text



The Problem(s)

Free text is: complex

it's a representation of the mind

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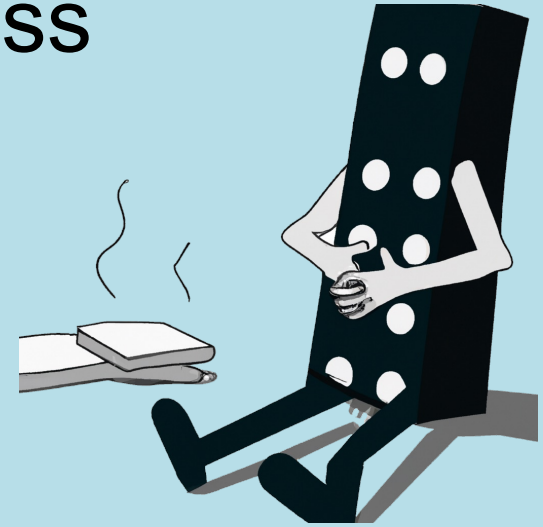
The Problem(s)

Free text is: a mess



“domino pain”

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The Problem(s)

Free text is: difficult to access

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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 this group of users generally deemed the systems extremely difficult to work with"

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

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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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The EMERSE is the…

- Electronic Medical Record Search Engine
  - 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

2005

2022

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EMERSE is a tool for free text

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

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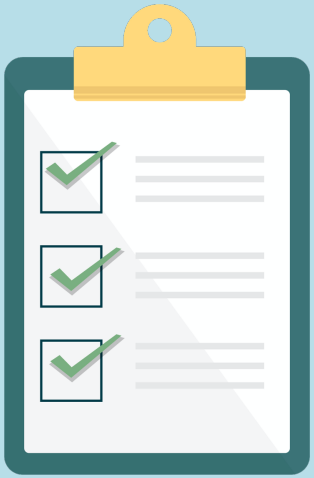
Find cohorts

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

- diseases
- drugs
- symptoms
- anything*



*if it is mentioned

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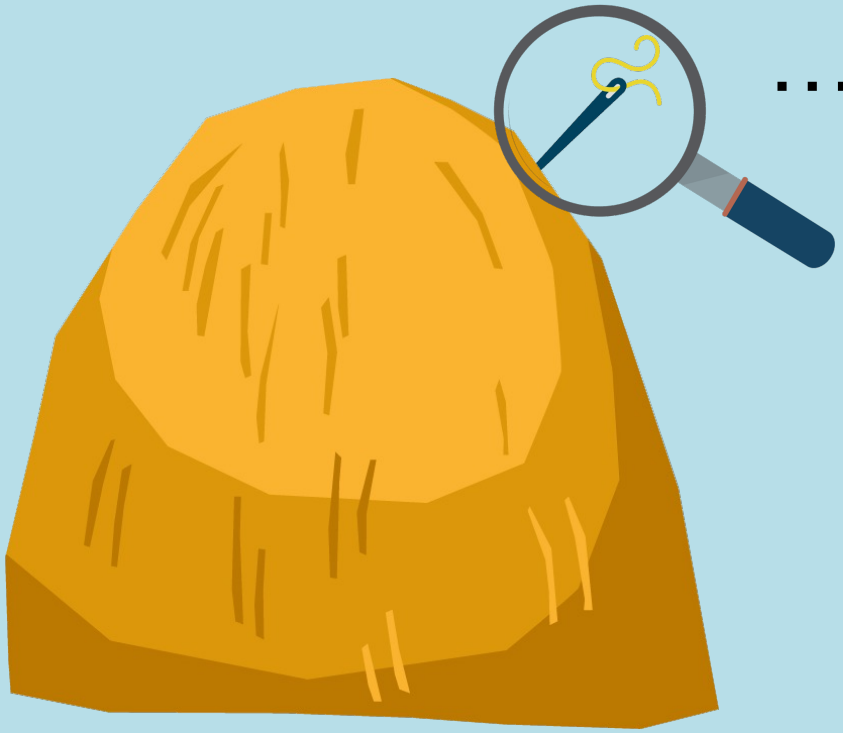
Find cohorts

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.

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

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EMERSE Bundles

Saved sets of search terms

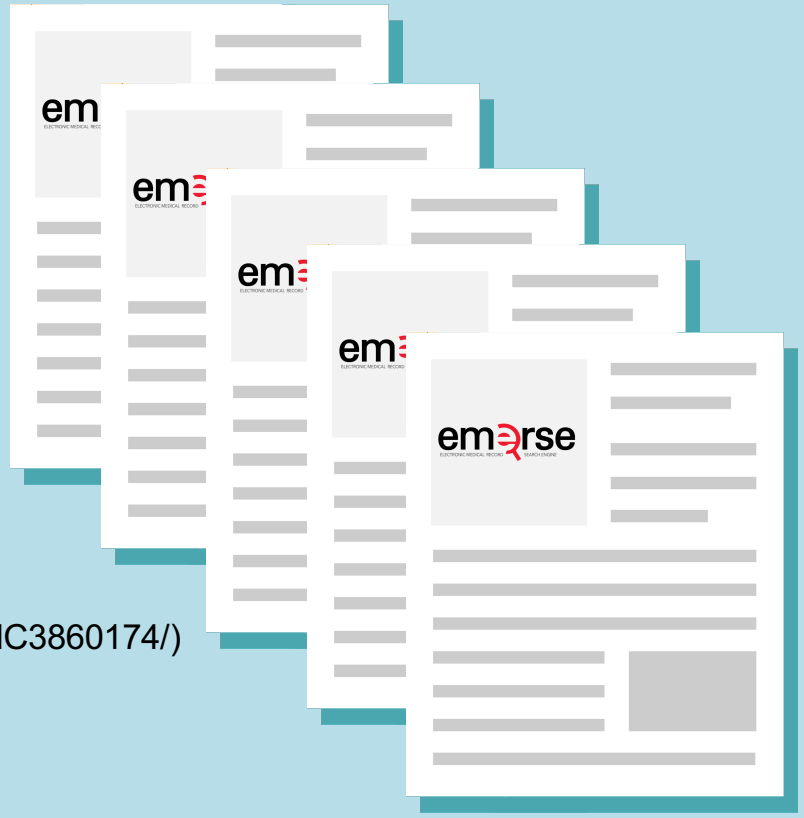
Shared among users

Helps standardize searches

Supports reproducibility

- Some teams publish Bundles in their publication's appendix

(example: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3860174/)



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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

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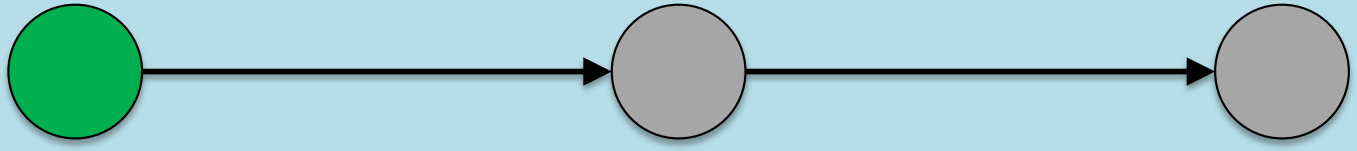
Typical workflow



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

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

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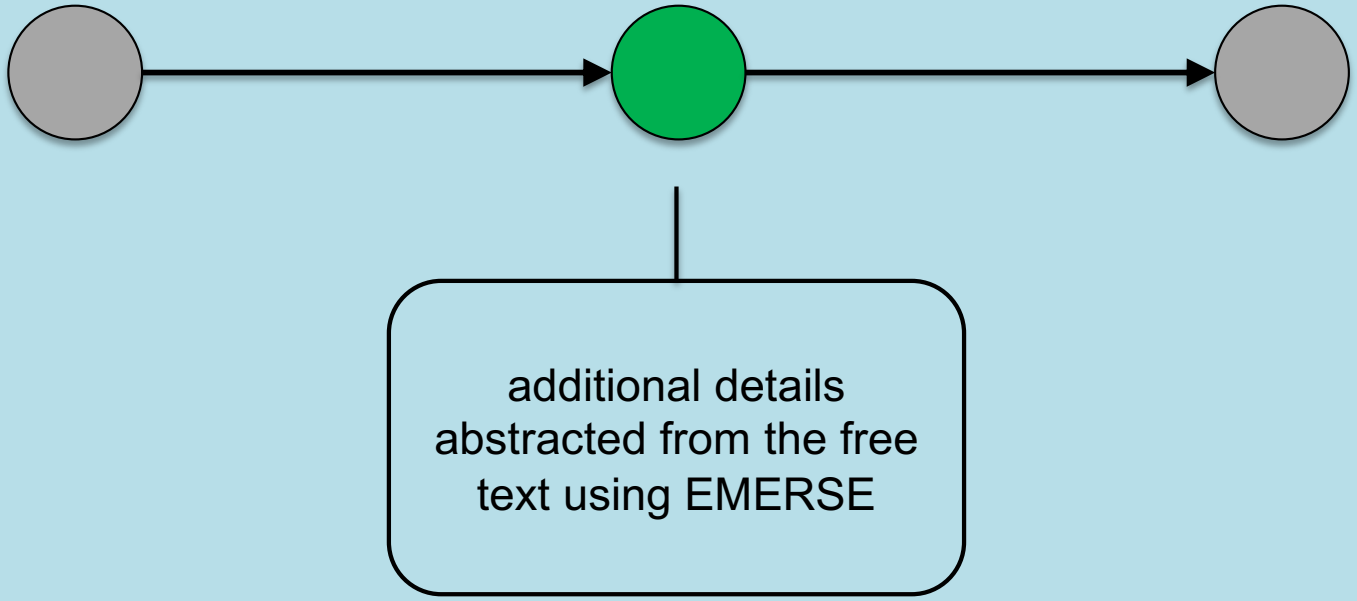
Typical workflow



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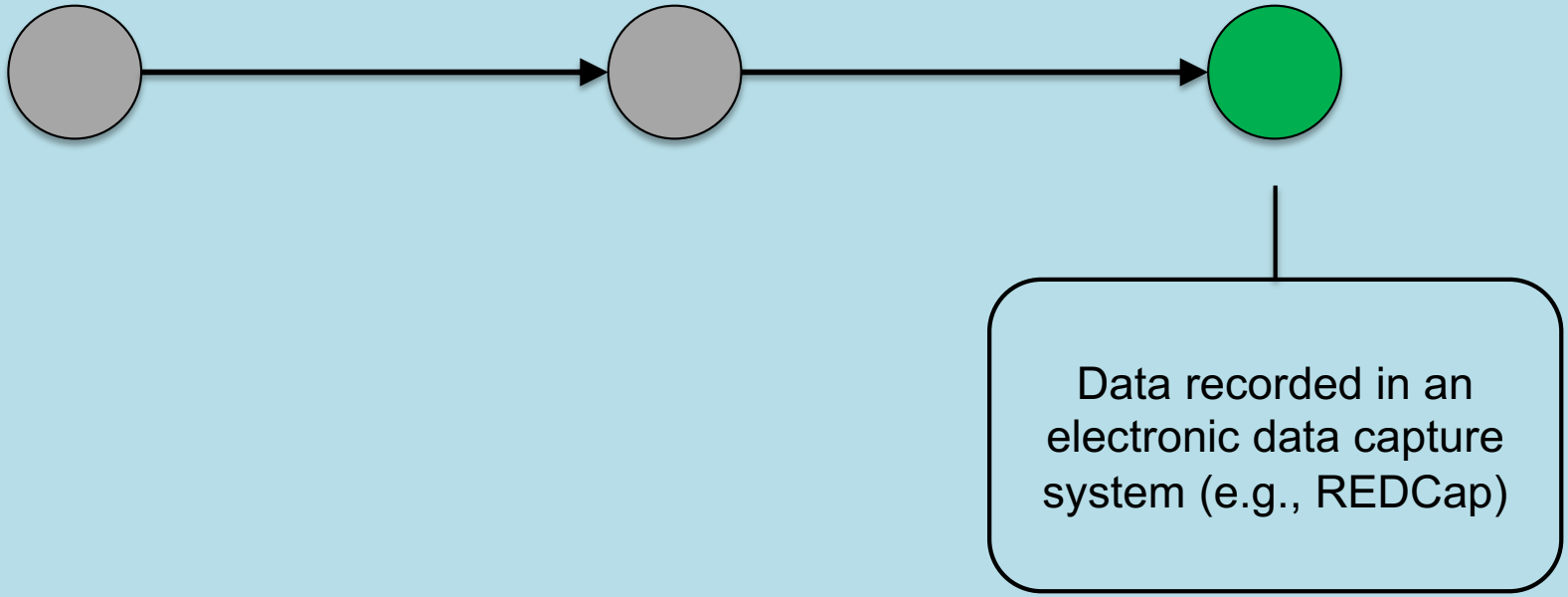
Typical workflow



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Michigan specifics

EMERSE stats at Michigan:

- Available since 2005
- Data from ~1998 to present, refreshed daily
- 2.6M patients
- 250M documents
  - Epic (MiChart)
  - CareWeb
  - Radiology
  - Pathology
  - & more

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Publications using EMERSE

565

papers and abstracts

Full list at:

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

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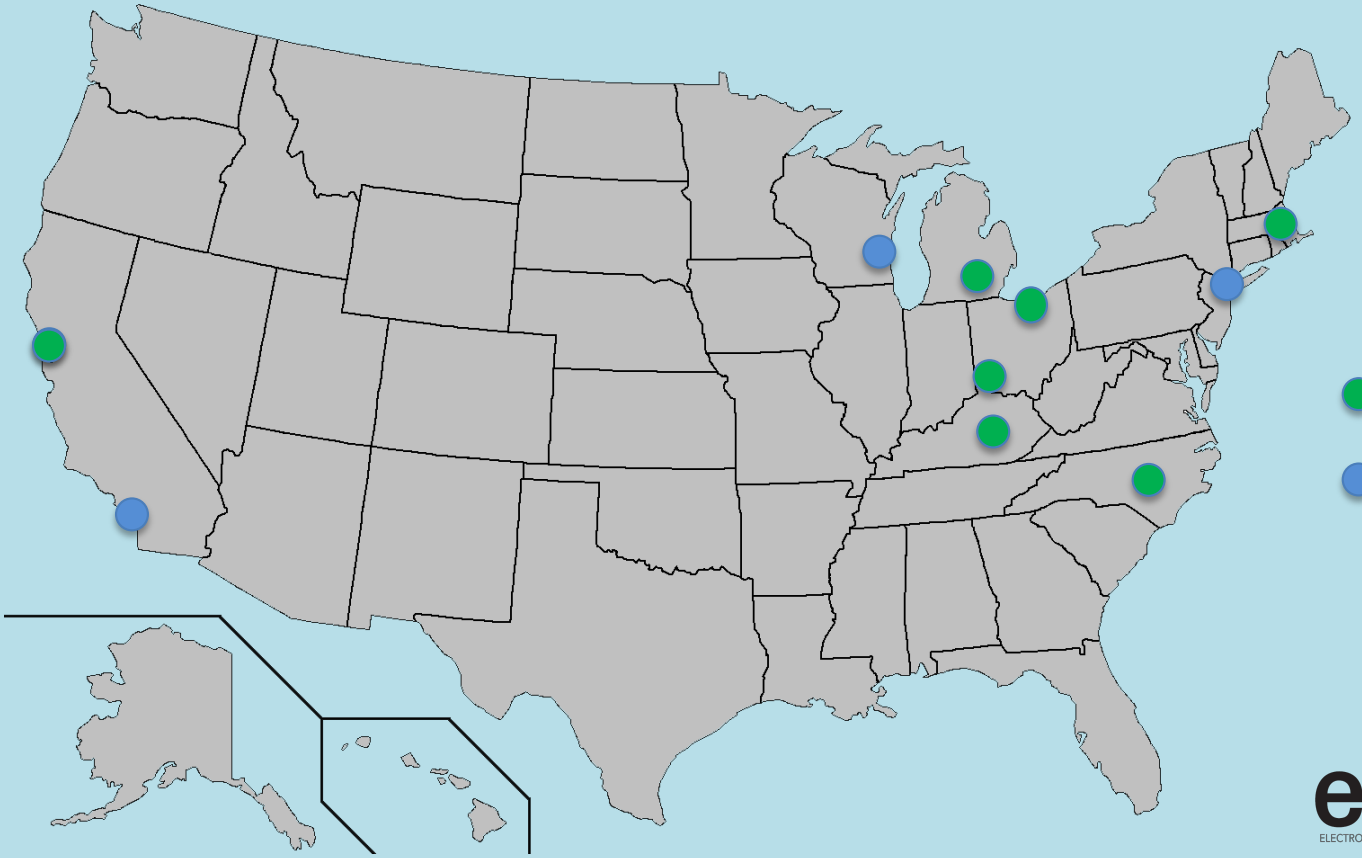
Where is EMERSE?



installed

installing

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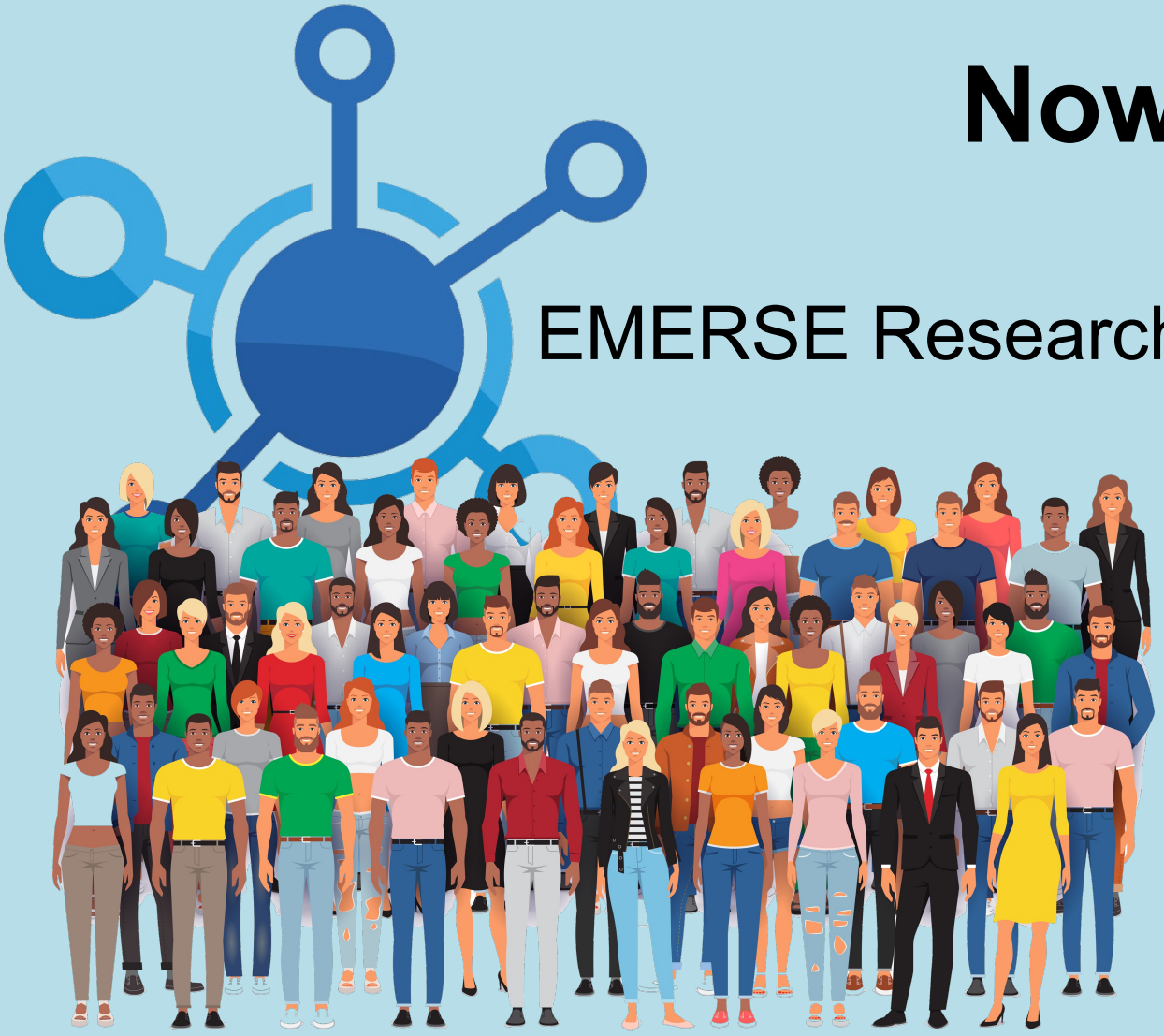
Now available…

EMERSE Research Informatics Network



real-time, secure
cross-site queries

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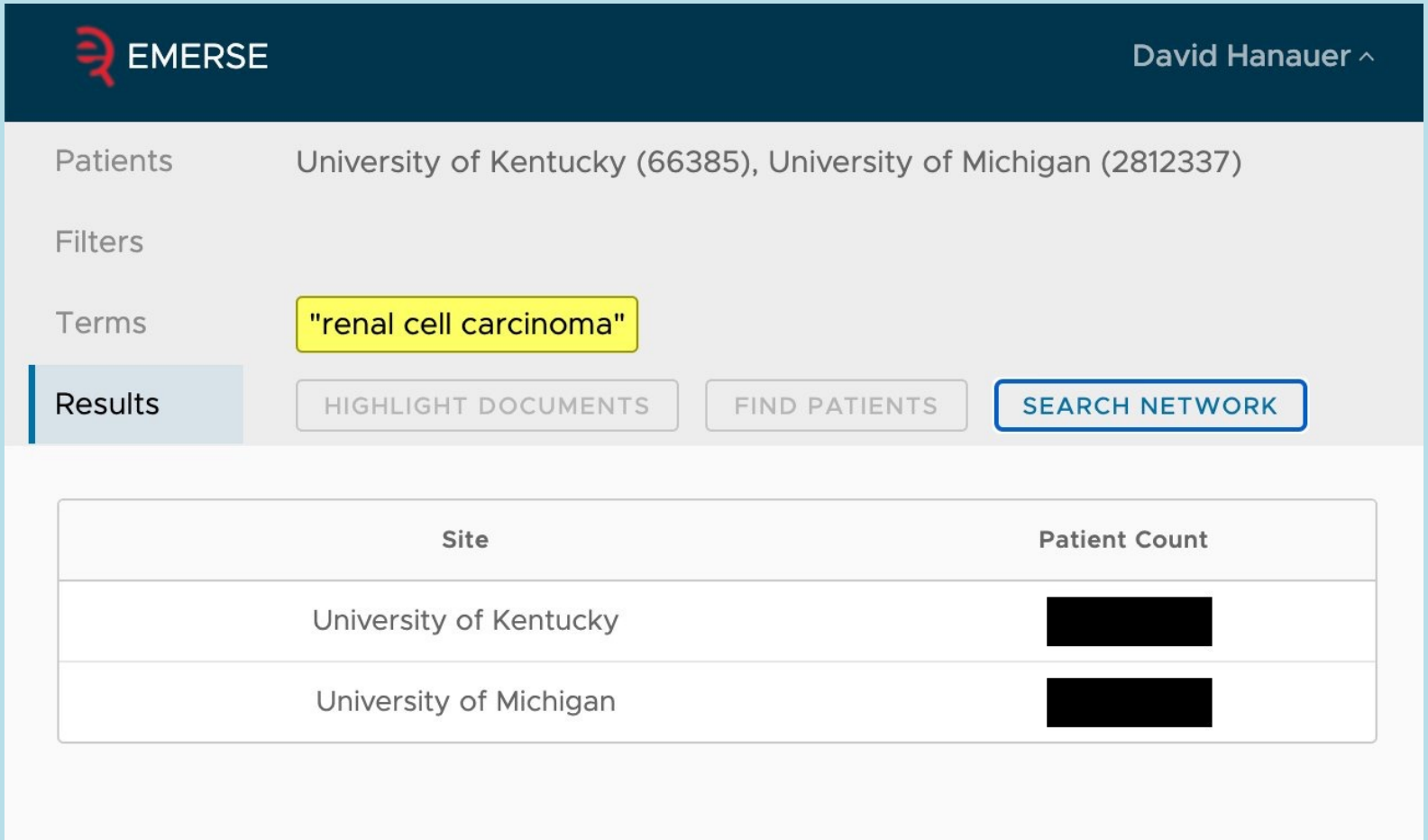
EMERSE Research Informatics Network



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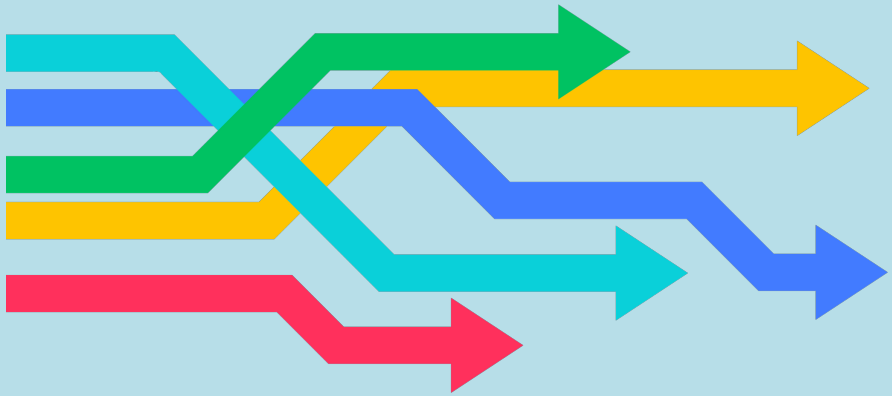
The future…

Incorporation of NLP features

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



Data extraction from templated notes

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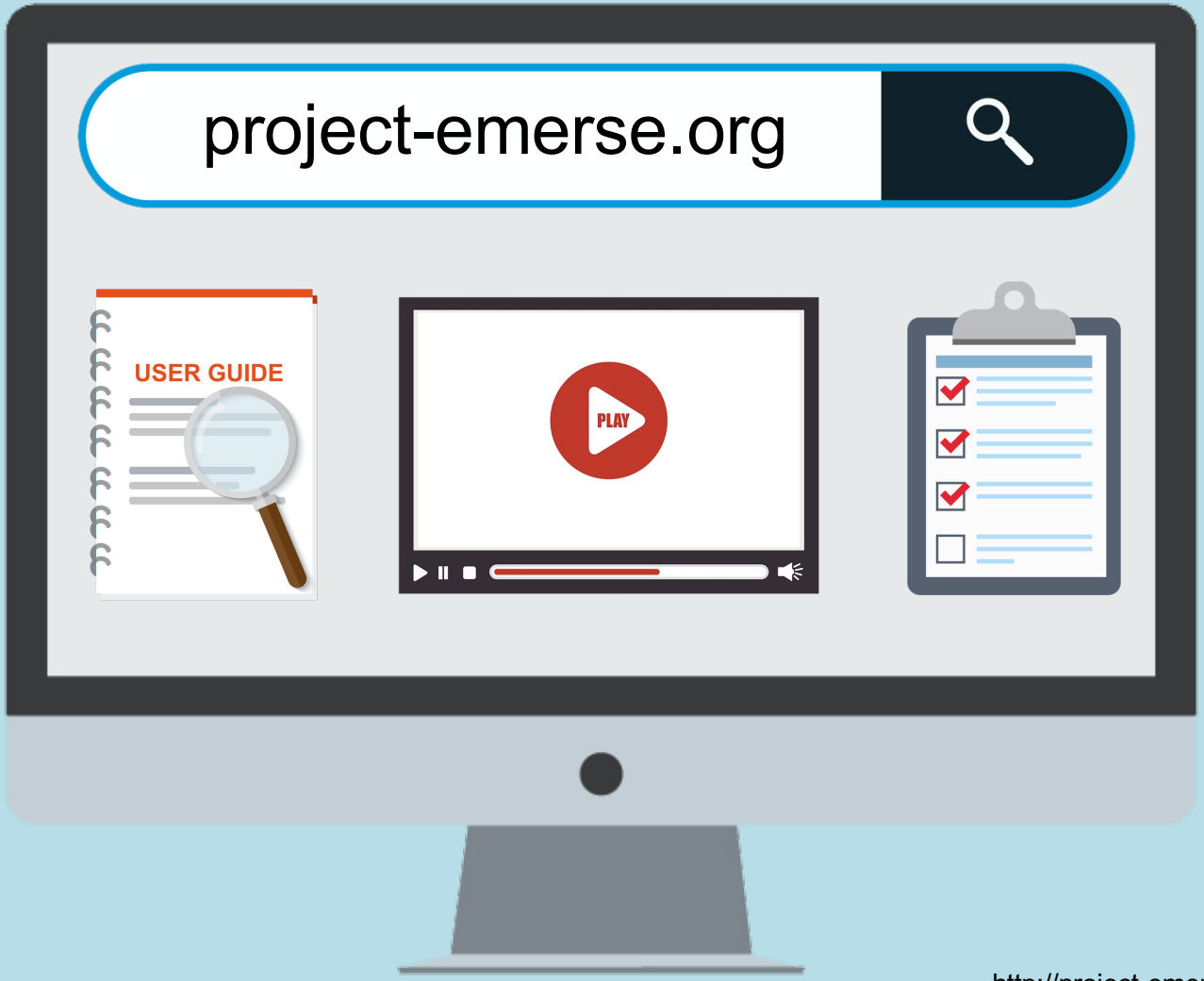

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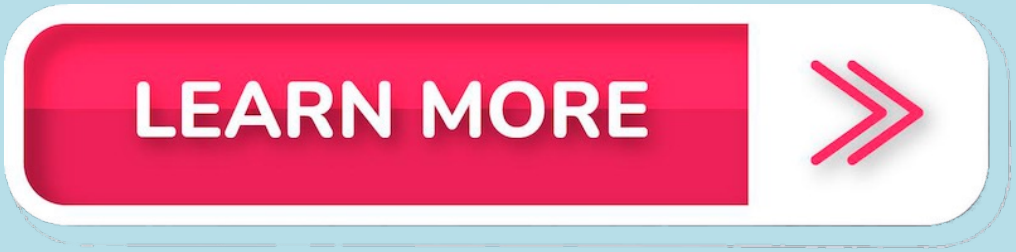

Contact us to schedule a time with your team for:

- Discussions about research strategies
- Training
- Live demonstrations

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EMERSE Community Meeting Series

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

Tuesday, Oct 11, 1-2 PM

Register at: https://bit.ly/emerse-talk-october-2022

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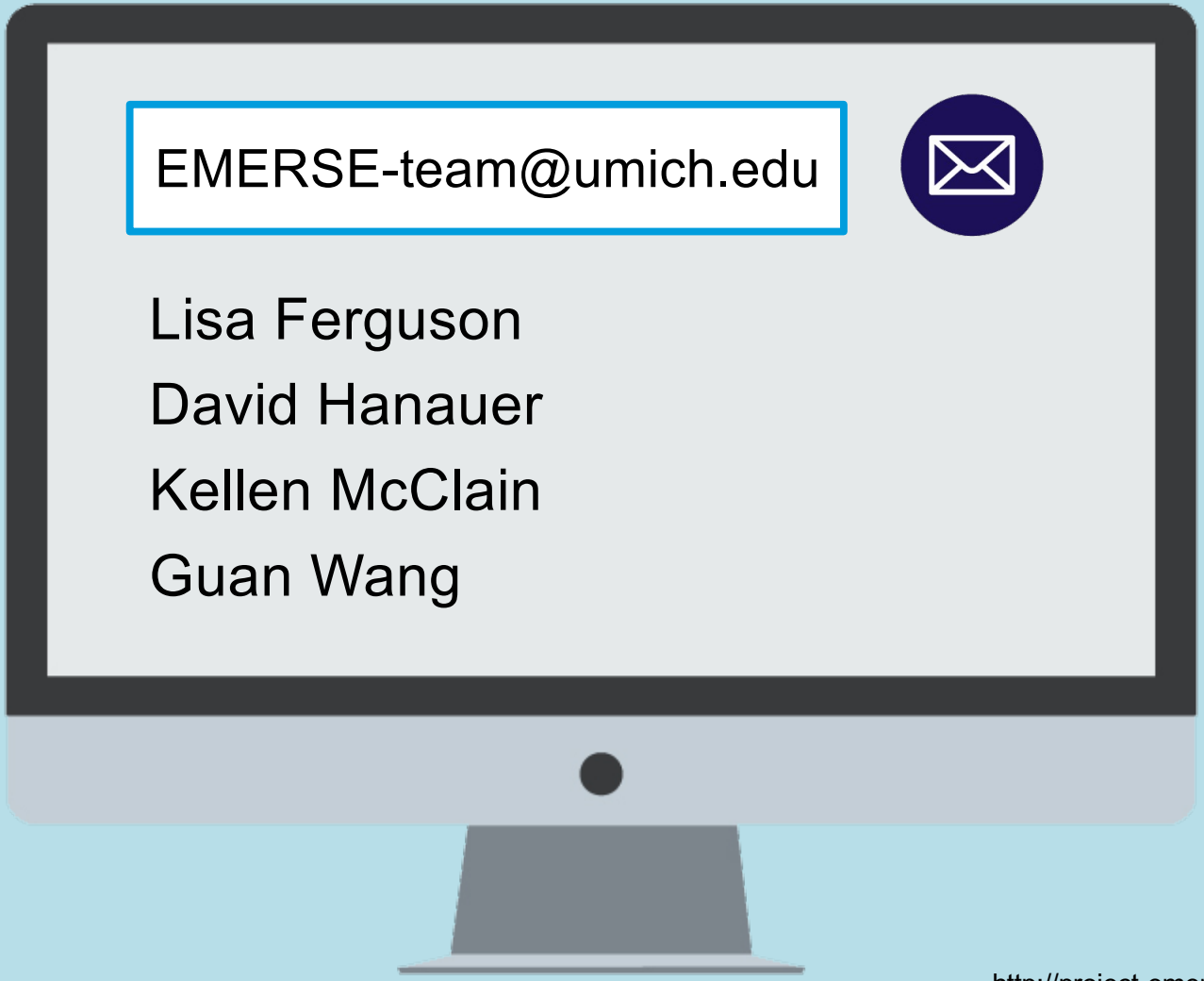

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