Importance of Free-Text in EHR and Role of Artificial Intelligence

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National Academies of Science, Engineering, and Medicine

Workshop on Health Disparities in the Medical Record and Disability Determinations,

Session 6



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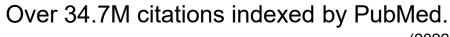


Unstructured Data = Iceberg Under Water

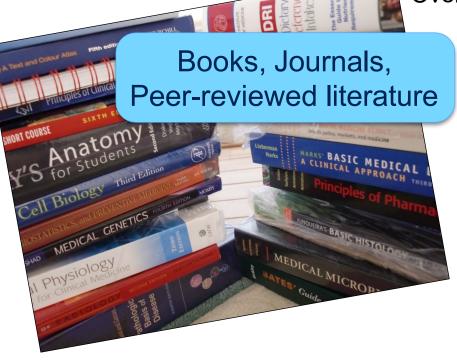


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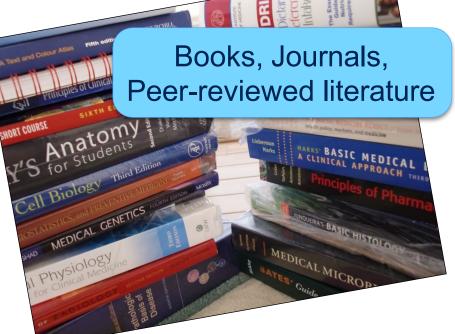








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Prescriptions

6.7B retail prescriptions filled at US pharmacies in 2022

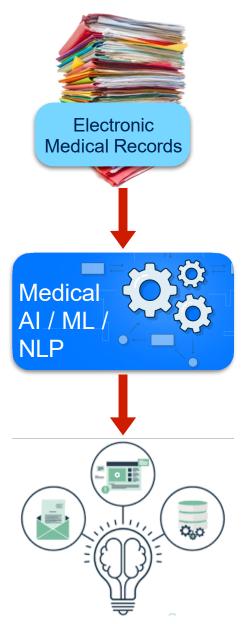








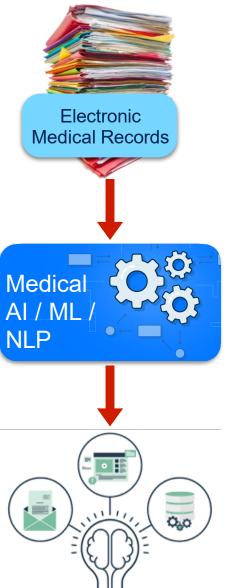




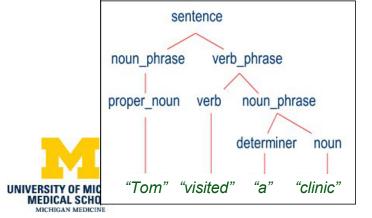






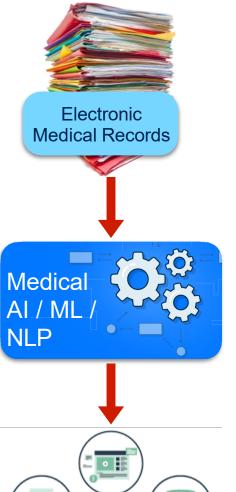




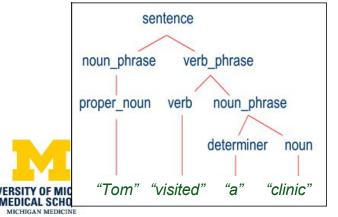








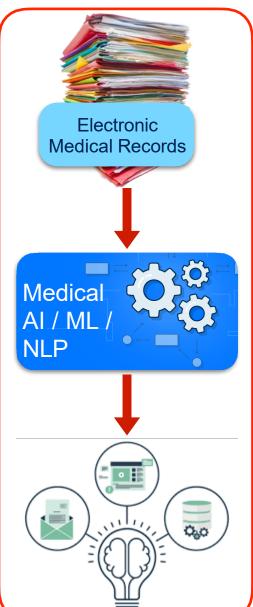




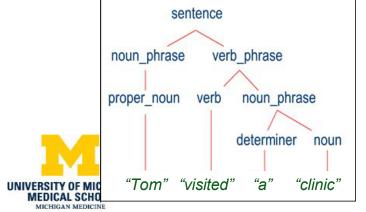














Case study: Cohort Identification

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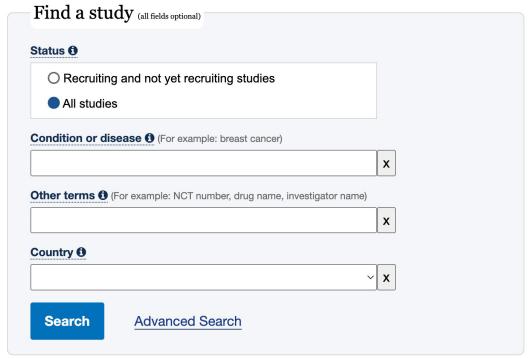
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Goal: Use narrative medical records to identify patients who meet certain selection criteria (e.g., for clinical trials)





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Date of Birth: [**2036-1-16**] Sex: M

Service: SURGERY

Allergies:

No Known Allergies / Adverse Drug Reactions

Attending:[**First Name3 (LF) 1390**]

Chief Complaint:

right hemopneumothorax, bilateral pulmonary c rib fractures, multiple facial fractures, degloving

Major Surgical or Invasive Procedure: right chest tube placement

History of Present Illness:

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Social History:

Patient lives in [**Location 1411**] with his wife

drinks 2 glasses wine nightly.

Family History: Non-contributory. Discharge Date [**2113-3-28**] VS: 97.6 90 138/77 18 98 Her Hospital Course: [**Last Name (un) **]: soft Ext: warm, no edema, wel

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his respiratory status remained stable and he did not require all ted by:[**2113-3-29**]

[**2113-3-27**] CHEST (DRUMA PIECE) A chest tube was placed for hemopherum of heast contact your primary care provider and make [**Name In Posteries to be accounted as a small right apical preumothers. In the second of the provider and make [**Name In Posteries to be accounted as a small right apical preumothers. In the second of the provider and make [**Name In Posteries to be accounted as a small right within 2 weeks. You will need to have an ultrasoun interspace, slightly smaller than the state of the provider and make [**Name In Posteries to be accounted by the state of the posteries of t

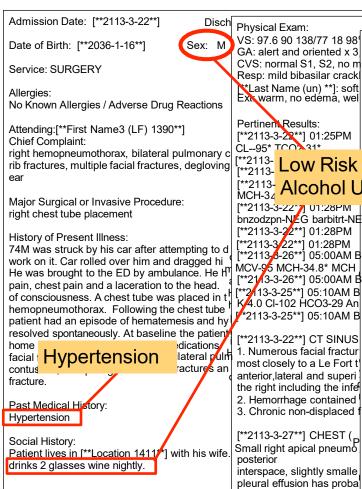
tumshinace กับการอักษาอาการบางการบางการ esulted pain is not improving within 8-12 hours or is not gone within 24 hours. Call or return immediately if your pain is

in walls of the maxiliary single. He suffered an initial period of Please contact the Dr. [**Last Name (STitle) 90000**] at [**Telep in properties of in the emerging place the difference of the difference of the difference of the dense of

n you urinate, have blood in your



Goal: Use <u>narrative medical records</u> to identify patients who meet certain selection criteria (e.g., for clinical trials)



Family History:

Non-contributory.

VS: 97.6 90 138/77 18 98 Brief Hospital Course: GA: alert and oriented x 3 Summary of Injuries sust CVS: normal S1, S2, no m fractures, right hemopne Resp. mild bibasilar crack contusions, L zygomatic a *Last Name (un) **]: soft Ext warm, no edema, wel plate fractures, left lateral minimally displaced orbit. papyrica fracture, right or Pertinent Results: lateral wall maxillary sinu [**2113-3-22**] 01:25PM CL--95* TCO 31* Poviou of Systems: [**2113-[**2113- **Low Risk** gic: Patient was i [**2113- Alcohol Use IV prn during his n medication. At di [**2113-3-22°] U1:28PM | medication. Opthalmolog bnzodzpn-NEG barbitrt-NE status following displace [**2113-3-22**] 01:28PM assessed facial fractures [**2113-3/22**] 01:28PM they will follow up with his **2113**/**3-26**] 05:00AM B fractures he was placed MCV-95 MCH-34.8* MCH [**21/3-3-26**] 05:00AM B dens fracture and it was [**2/13-3-25**] 05:10AM B from an injury 20 years a K4.0 Cl-102 HCO3-29 An hospital day 6 he was tri [/*2113-3-25**] 05:10AM B receiving valium. Standi to baseline mental status [**2113-3-22**] CT SINUS requires no further neuro 1. Numerous facial fractur fracture. most closely to a Le Fort t anterior, lateral and superi

hemodynamically stable. hypotension in the emerg hemodynamically stable. Pulmonary: A chest tube Small right apical pneumo ED. The chest tube was increase in pneumothora CXR revealed this chang was stable. While in the

decompensation due to s

his respiratory status rem

clear. Moderate cardiome,

lateral rib fractures.

GI: Patient suffered no intra soft diet without issue. He w his facial fractures.

GU/Renal: Patient has a fol but it was discontinued when His electrolytes were replet the following: remained stable.

Endocrine: He was placed ICU. At discharge sliding so was no longer requiring ins noted on CT and needs to outpatient.

Heme: Patient underwent s down slowly. He received o hospital, after which he requ restricted to a soft diet N hematocrit was stable. He prophylaxis.

> Skin: Patient right ear lacer plastic surgery. He was plac back. treatment course, was disc

Medications on Admission: Cardiovascular: Followin lopressor (unknown dosage

> Discharge Medications: DROP BOTH EYES, Levofl

Discharge Disposition: Home With Service

Facility: [**Location (un) 932**] vna

epidural for pain control Discharge Diagnosis:

Discharge Condition: Good

Discharge Instructions:

Please call your doctor or nurse practitioner if you experience

*You experience new chest pain, pressure, squeezing or

*New or worsening cough, shortness of breath, or wheeze. 'If you are vomiting and cannot keep down fluids or your

medications. *You are getting dehydrated due to continued vomiting, diarrhea

or other reasons. Signs of dehydration include dry mouth, rapid heartbeat, or feeling dizzy or faint when standing. You see blood or dark/black material when you vomit or have a

bowel movement. *You experience burning when you urinate, have blood in your

urine, or experience a discharge.

*Your pain is not improving within 8-12 hours or is not gone within 24 hours. Call or return immediately if your pain is getting worse or changes location or moving to your chest or

*You have shaking chills, or fever greater than 101.5 degrees Fahrenheit or 38 degrees Celsius.

*Any change in your symptoms, or any new symptoms that conc

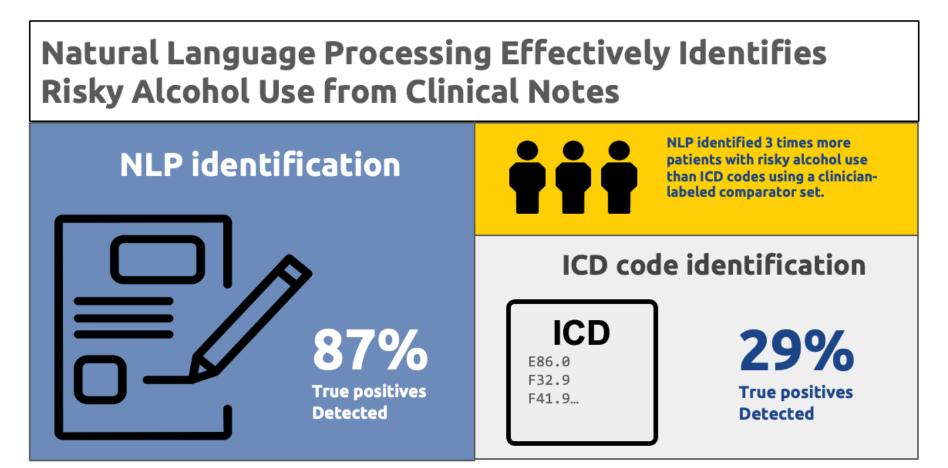
Please contact the Dr. [**Last Name (STitle) 90000**] at [**Telep Metoprolol Tartrate 12.5 mg Surgery to make a follow-up appointment for 1 week from discharge.

> Please contact your primary care provider and make [**Name In appointment within 2 weeks. You will need to have an ultrasoun of your thyroid as well as work-up of an inquinal hernia.

Completed by:[**2113-3-29**

Al models can better identify disease traits than just ICD codes

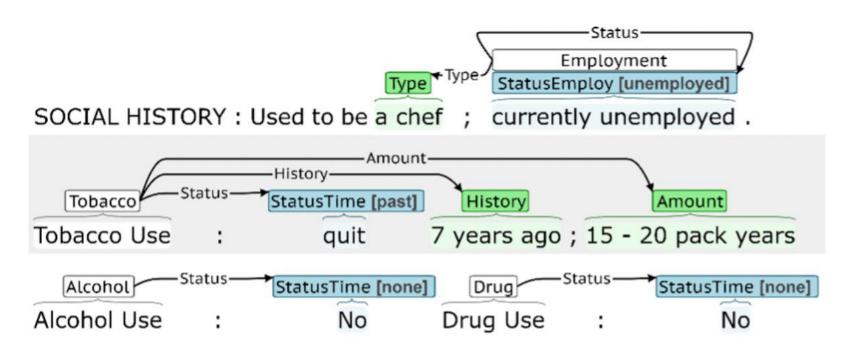
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Vydiswaran, et al. Automated-detection of risky alcohol use prior to surgery using natural language processing. *Alcohol, Clinical and Experimental Research*, 2024 Jan; Volume 48, Issue 1 p.153-163. DOI: 10.1111/acer.15222

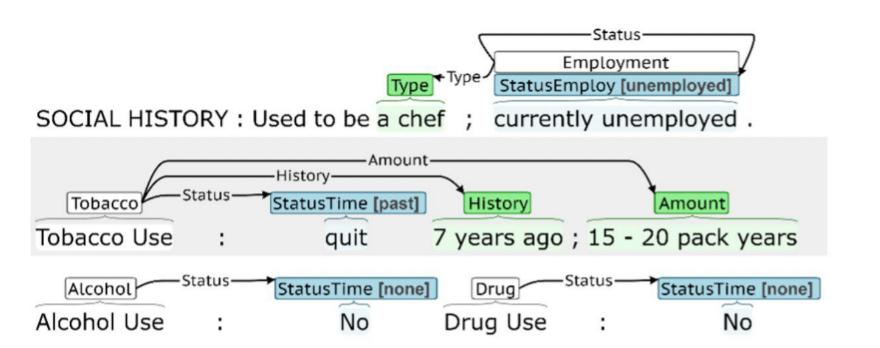
- N2C2 '22 shared task on extracting social determinants of health
 - Annotated dataset made available to researchers
 - Alcohol Use, Drug Use, Tobacco Use, Employment status

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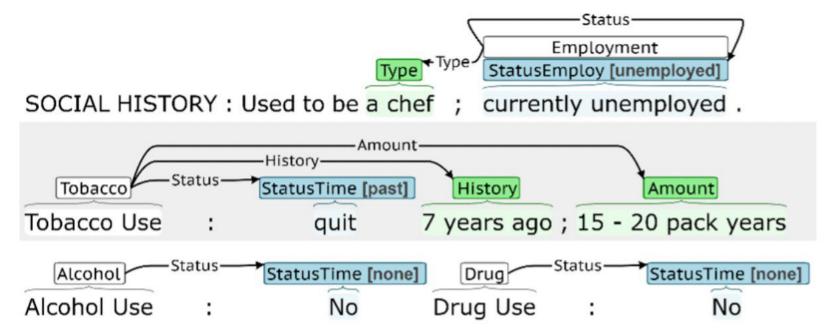
Lybarger K, Yetisgen M, Uzuner, Ö, The 2022 n2c2/UW shared task on extracting social determinants of health, *J Am Med Inform Assoc*, 2023 Aug; Volume 30, Issue 8, 2023, p.1367–1378, DOI: 10.1093/jamia/ocad012

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- N2C2 '22 shared task on extracting social determinants of health
 - Annotated dataset made available to researchers
 - Alcohol Use, Drug Use, Tobacco Use, Employment status
 - Research teams submitted models that capture SDoH effectively
 - Current state-of-the-art systems use deep neural network models



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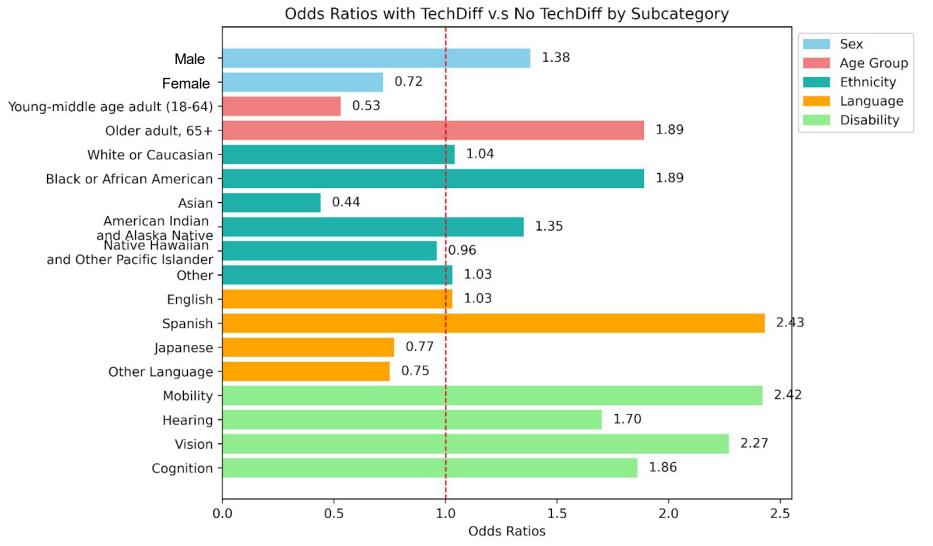


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Patients with completed encounters were more likely to be younger than 65 years old (71.8%-74.1%), be female (58.8%-61.8%), be White (75.6%-76.7%), and have no significant comorbidities (63.2%-66.8%) or no disabilities (53.2%-61.1%) in all time periods than those who had only canceled or missed encounters









Li J, et al. Active learning to identify patients encountering technical difficulties during care virtualization. Under preparation.



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Questions, Comments: vgvinodv@umich.edu

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- Computable biomedical knowledge objects and a Learning Health System Infrastructure are essential to scale it up!





Department of Learning Health Sciences