

# DISCOVERING AI APPLICATIONS FOR TBI CARE





**Health Policy & Innovation** 

**Brain & Society** 

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**BACKGROUND GOALS** 

Traumatic brain injury (TBI), caused by a physical blow to the brain, affects nearly 5 million Americans annually and is a leading cause of death and disability in young adults. Accurate prognosis and treatment remain challenging due to complex patient data and conditions.

Uncovering care gaps in TBI to inform AI solutions Clinically Validate EHR Data using QA Frameworks

This project unites 21 students from diverse fields—engineering, anthropology, statistics, CS, neuroscience, economics, and medicine—combining interviews, shadowing, and rapid qualitative analysis with the curation and analysis of multimodal EHR data from TBI patients.

**TEAM COMPOSITION** 

## Qualitative Study

response

rate

### Laying the Foundation Lit review of TBI qualitative studies, developing interview

2024

**Guest Speakers Experts in Qualitative** Studies, Clinical TBI,

Shadowing

**Qualitative Study** 

Spring

2025

**Quantitative Study** DQA Processes to

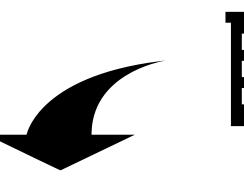
**Interim Presentations** Quantitative students

**Publications** Finalizing data analysis and drafting research paper for publication

Summer

2025

## Quantitative Study



62,652 hospital encounters

for Duke patients with TBI



110

**Emails Sent** 

**30** 

Transcripts

23\*

Summary templates

Challenges with

TBI Care

Inconsistencies in

documentation and

High variability of

despite similar data

"I am sure that there are patterns there

that, I am blind to... I think it would be

amazing to have a system that can actually

use that data in real time and tell me

[if, for a specific patient, I] need to be

patient outcomes

summarizing EMR data

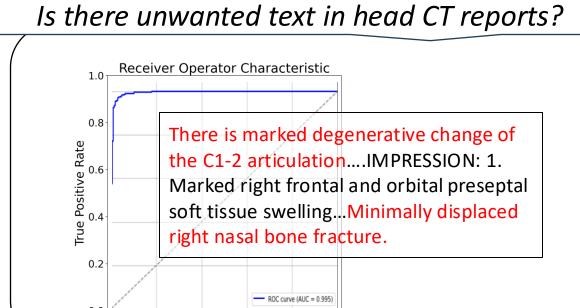
# guide, EHR data

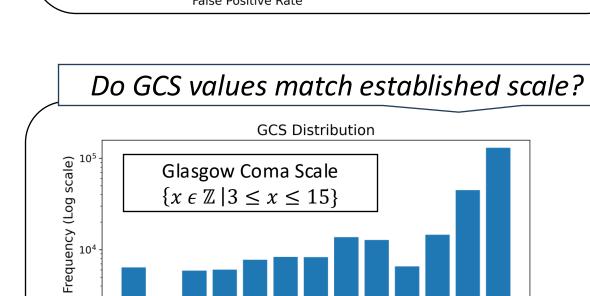


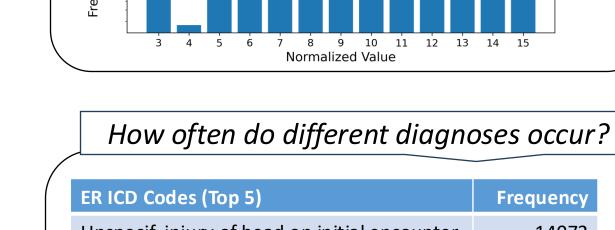


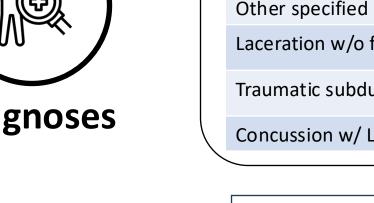
Modalities

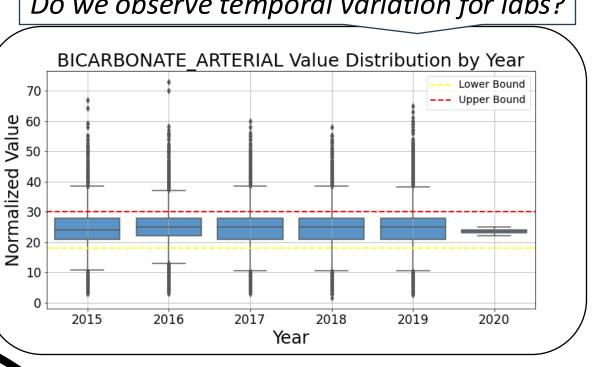
### **Example QA Checks**











**Exploration &** 

# **Quality Assurance**

# **PREPROCESSING**

What initial cleaning is needed?

expectations?

COMPLETENESS

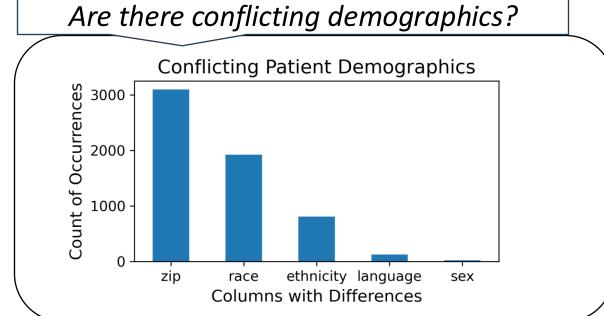
How frequent/

missing is the data?

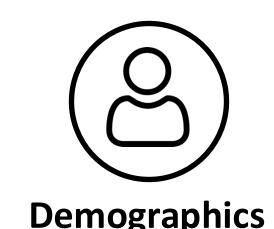
**PLAUSIBILITY** 

Is the data credible

in a clinical context?



**Example QA Checks** 

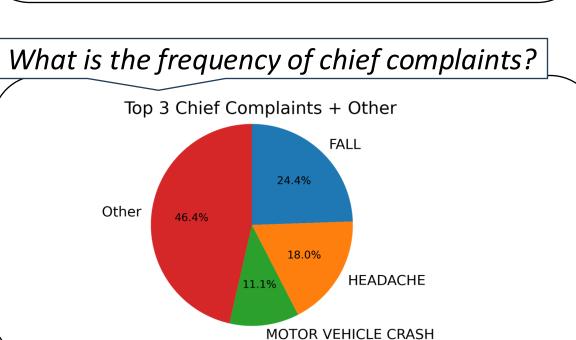


**Modalities** 

# Demographics

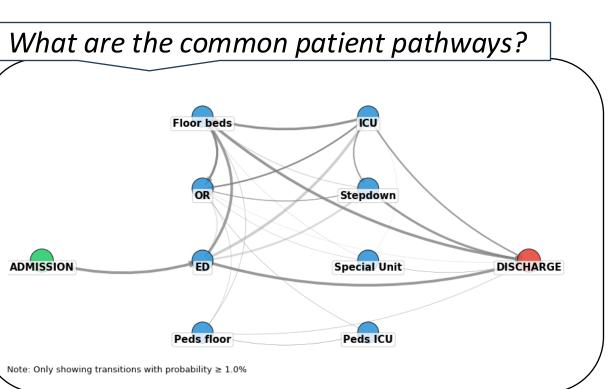
### **CONFORMANCE** Do values, types, and **Orders** ranges match our

Are order times standardized?



Hour of the Day (Eastern Time)







Transfer

# What feedback do

stakeholders have?

What data to exclude? To repull? Evidence of bias? How best to visualize?



# Health-Al

### Across 18 diverse clinicians who care for TBI patients

Begin Interviews, Transcription, and RAPID Analysis

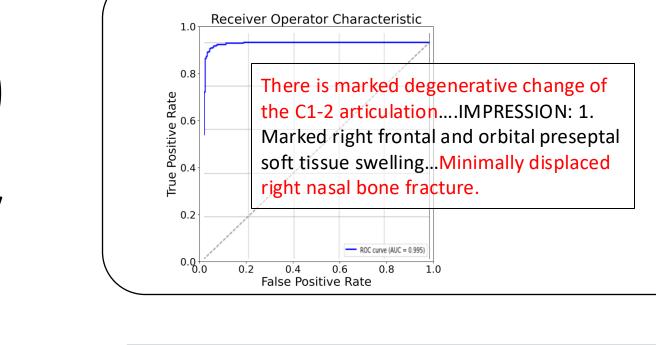
efficiently clean EHR data

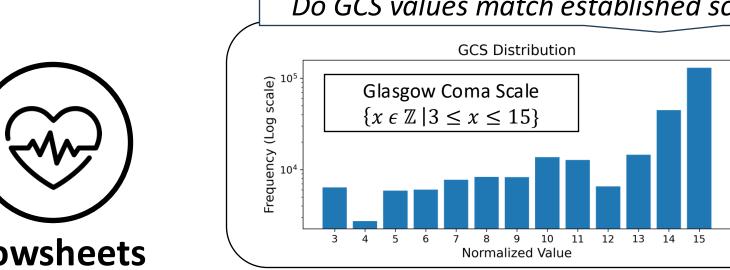
Qualitative and presented initial findings

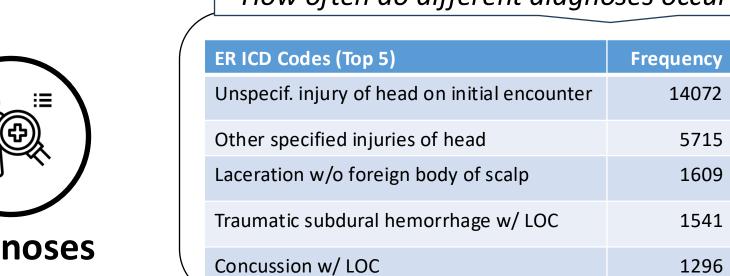
How can we leverage electronic health records to build a dataset for potential AI/TBI applications?

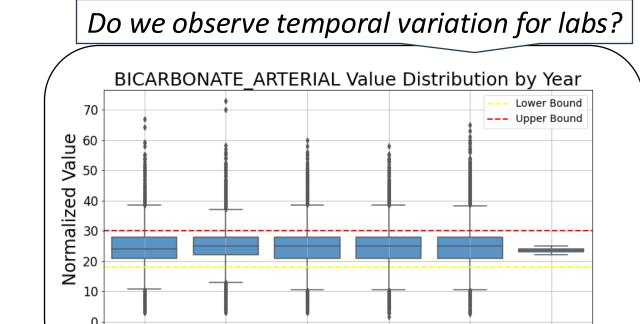
# Radiology

Reports



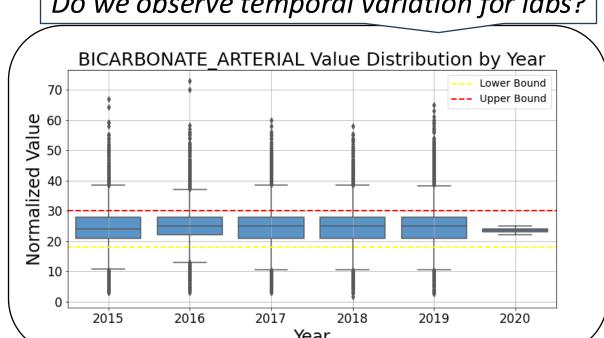






# Diagnoses

Labs





Qual. **Curated** Analysis **Findings Dataset** Manuscripts

Building successful EHR applications <u>requires</u> input from diverse stakeholders.

## targeting different things." the minimum."

### Responses ,-------93% consent rate 1-1 Zoom Interviews 33 Mins (Avg) 28 Interviews 28 CLINICIAN INTERVIEWS **Transcribed** 28 \_\_\_\_\_ verbatim

RAPID QUALITATIVE ANALYSIS

18 CLINICIANS SHADOWED

■ RN

PA-C

"...just because

of one spelling

person, it could

completely change

what the AI model

was producing for

one

from one

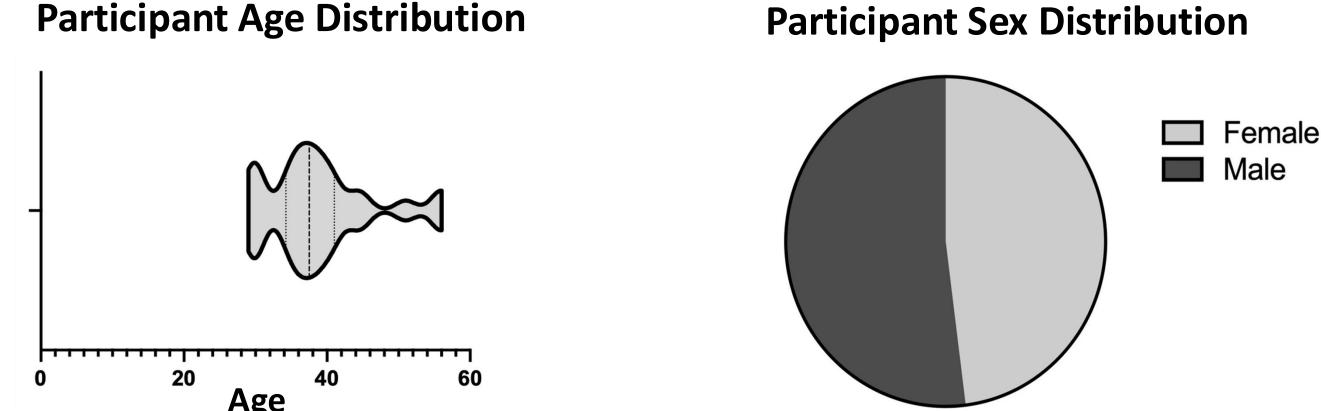
mistake

us."

Clin. Pharm

**Provider Role Distribution** 

RAPID Qualitative Analysis, findings from interviews were categorized into domains that were then compiled into a matrix for rapid identification of common themes



## How can Al Improve TBI Care?

- Enhancing workflow efficiency
- An aide for predicting early prognosis Justification for

insurance coverage

 Provider education required due to limited familiarity

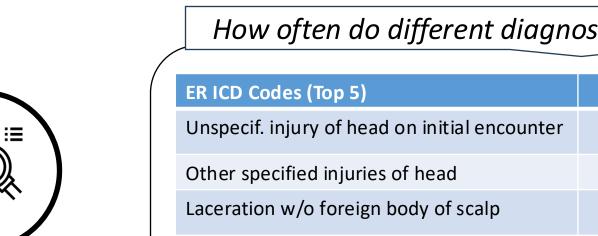
Barriers to Al

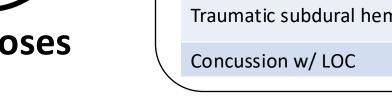
Implementation

- Lack of trust (when does it fail?)
- Potential for bias and inconsistencies

"[hypothetically] if we have 'this' demographic [and] 'this' insurance, based on 'this' level of alertness 'this' measure outcome [physical therapists] should try to see this person 3 times a week at

**Flowsheets** 





# **ADJUDICATION**