



Informatics-Ready Cohorts

Creating Ideal Inclusion/Exclusion Criteria for Data-Driven Recruitment

Emily Pfaff, PhD, MS

NC TraCS Institute

Agenda

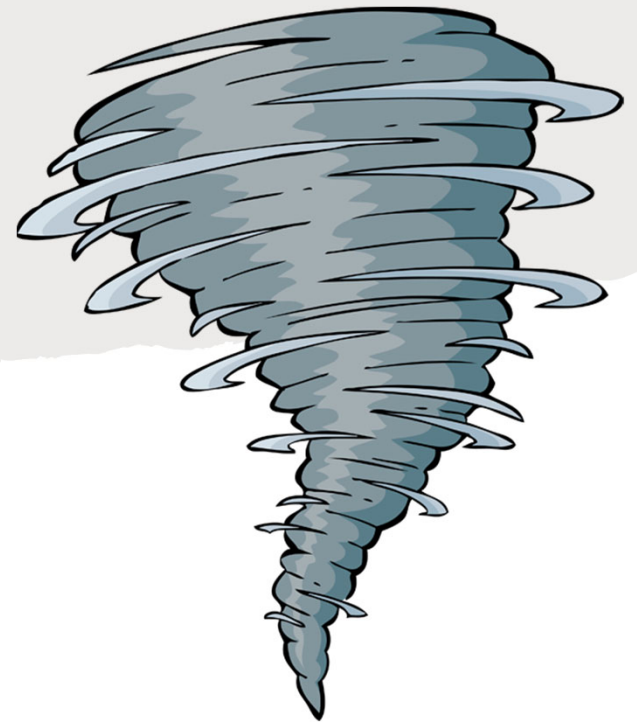


Examine how clinical data is captured in the EHR



Create an ideal request together

Part I: A Whirlwind Tour of EHR Data



Patients

Name: Elena Martinez

Birthdate: April 5, 1956

Race: Other

Ethnicity: Hispanic/Latino

Sex: Female

Gender identity: Female

Preferred Language: English



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Race: Other

Ethnicity: Hispanic/Latino

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Gender identity: Female

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"Problem List"

- Type I diabetes
- Chronic back pain

Location

123 Carolina Street
Durham, NC 27704

Phone Numbers

Work: 919-555-5555
Cell: 919-777-7777



Patients have visits.

January 2021

February 2021

26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	29	30	31	1	2
3	4	5 Endo. visit, 10AM	6	7	8 Ophth. visit, 2PM	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 ED visit: Chest pain	25	26	27	28	29	30
31	1	2	3	4	5	6

-----Hospital Stay-----



Things happen during visits: Diagnoses

- “Why are you here today?”
- Entered in the EHR as an *ICD-10-CM* code
- Can be used to:
 - Record a general reason for your visit.
 - Justify an order (e.g., lab test, biopsy, etc.)
 - Document for billing/insurance purposes.
- Not reliable for documenting symptoms
- Not necessarily a surefire way to know a patient has a disease.
- The lack of a diagnosis != lack of disease.

Things happen during visits: Vitals

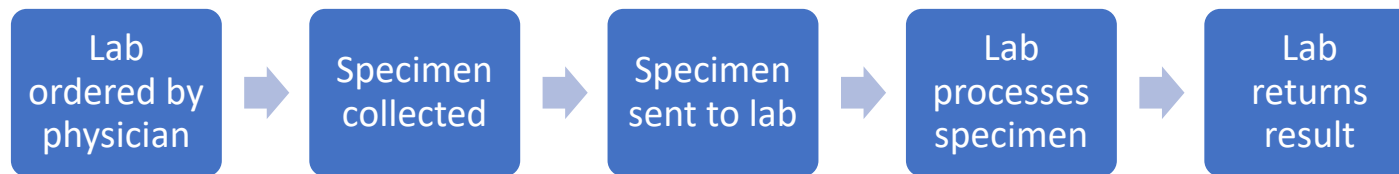
Example Vitals Include:

Blood pressure, heart rate (pulse), oxygen saturation, height, weight, BMI, respiration rate, temperature

- Inpatient vitals are collected very differently from outpatient vitals.
- Mostly quantitative variables that can be plotted over time.
- Not all vitals are collected at every visit.

Things happen during visits: Labs

- Labs are *orders* that have *results*.



- Results can be quantitative or qualitative.
- There can be one lab per order, or a *panel* of labs.
- Time is a factor (i.e., time between specimen collection and result).

Things happen during visits: Medications

- Medications prescribed at an outpatient visit:
 - Generally sent to a pharmacy for patient pick-up
 - Hard to know if the order was picked up, or if the patient took the drug.
 - Older data (early 2010s and before) is harder to trust because of paper prescriptions.
 - “Stop” dates are often not reliable.
- Medications administered in hospital/clinic:
 - Not necessarily inpatient—there are outpatient infusions, vaccines, etc.
 - More assurance that the drug made it in to the patient.
- Time is a factor in both cases (days supply, number of refills, start/stop date times.)

Things happen during visits: Procedures

- Procedures *sometimes* have results.
 - With results: CT scan, biopsy, stress test
 - Without results: delivering a baby, removing an appendix
- Two methods of coding: ICD-10-PCS (facility) and CPT (physician).
 - Facility charges are things that the hospital gets paid for; physician charges are things that the physician gets paid for.
 - When searching through procedures, always check both.



scanning from liver dome to the pelvis at 10mm intervals is performed. The result showed:

- 1. The liver is normally positioned and has normal size and smooth border. Its internal structure and attenuation values are normal. The intrahepatic and extrahepatic bile ducts and gallbladder are unremarkable.*
- 2. The spleen is orthotopic and of normal size. .*
- 3. The pancreas is normal in size, position, and internal structure with smooth, lobulated outer contours. The pancreatic duct is unobstructed.*
- 4. Both kidneys show normal size and position. The renal parenchyma show normal width and structure. The renal pelvis and calyces show a normal configuration. The urinary tract is unobstructed.*
- 5. The adrenal glands are unremarkable.*
- 6. Major blood vessels appear normal, and there is no evidence of lymphadenopathy.*
- 7. There are no ascites or pleural effusion.*

Sample from https://www.researchgate.net/figure/An-example-of-abdomen-CT-scan-report_fig1_220923374

Visits of all types have notes & summaries.

- Inpatient: progress notes, discharge summaries, social worker assessments, etc.
- Outpatient: After-Visit Summary, SOAP note
- Challenging to analyze, and not a good source for inclusion/exclusion criteria.

01/01/201X - Pod 1 AM		 	
Room #: 01			
Enc. #: 01			
Routing #: 1			
NBOME ID #: 111111		SOAP Note	0:06
S			
<p>George Payne is a 45-year-old Caucasian right handed male who presents to the Family Medicine office with a complaint of right-sided chest discomfort for one week. The pain began after moving into a new house. He denies any injury to his chest. The pain is sharp like a knife and constant, and he rates it 3-4/10. The pain radiates through to the back intermittently. It is relieved with a hot shower, ibuprofen, or lying on his left side, but made worse with lifting boxes and taking deep breaths. He has had heartburn in the past, but says that this pain is different and never had anything like this previously. He is concerned that this could be related to his heart.</p> <p>ROS: No palpitations, shortness of breath, diaphoresis, nausea, or vomiting</p> <p>Pmhx: heartburn occasionally</p> <p>Surghx: tonsillectomy</p> <p>Meds: Ibuprofen three times a day</p> <p>ALL: NKDA</p> <p>Fam Hx: Mother living and in good health, Father died of heart attack at age 60</p> <p>SocHx: Married with 3 children. No tobacco, 6-pack of beer on weekends occasionally, marijuana in high school. Occupation is a roofer.</p>			
O			
<p>Vitals: 70 inches 190 lbs 27.3 kg/m2 BMI 132/80 BP 98.4 Temp 80 HR 16 RR</p> <p>Gen: mildly anxious male in mild distress, occasionally touching R chest wall</p> <p>Heart: regular, no murmurs, S3 or S4</p> <p>Lung: clear bilateral anterior and posterior, slight increase in pain with deep breath</p> <p>T spine: Paravertebral tenderness R T4-8 tenderness</p> <p>Chest wall: Tenderness with palpation anterior chest wall mid-clavicular line at rib 4</p>			
A		P	
<ol style="list-style-type: none">1. Thoracic somatic dysfunction2. Costochondritis3. Rib fracture-unlikely4. Anginal equivalent-doubt5. Family history of heart disease		<ol style="list-style-type: none">1. OMT: Balanced ligamentous tension technique. Schedule for additional OMT if pain does not resolve2. NSAIDS/ moist heat3. X-ray-rib films r/o fracture4. EKG r/o acute coronary syndrome vs. prior event	

Sample from <https://www.nbome.org/resources/completed-esoap-note-sample/>

Insurance

- Insurance coverage is at the visit level, and can change over time.
- May be multiple insurers per visit.
- Plan specifics are rarely used in EHR data—roll-ups are common.
- Guarantor of the account is not necessarily the patient.
- Medicaid enrollment often used as a proxy for SES.
- Insurance data, called “claims” data, is a data source separate from EHR that may be used in research with special permission.
- Some states have an “all-payer claims database” available. (NC does not.)

Death

- EHRs reliably record deaths that occur inside the hospital.
- For an inpatient visit, a death date and a discharge date with a *disposition* of “Expired” are generally recorded.
- State death data may also be available, but usually lags in time by a few (or several) months.
- Death cause, if available, is encoded in ICD-10. (Often not available.)
- A patient’s family may also self-report a death, in which case a date will be available (but may be inaccurate).

Social History and Social Determinants

Social History

- Smoking status
- Alcohol use
- Sexual behaviors



Social Determinants of Health (SDoH)

- Food insecurity
- Housing insecurity
- Unemployment
- May be at patient level or area level, structured or unstructured.

Pulling it all together

- This is not a comprehensive list of all data collected in the EHR.
- Most important: the EHR does not provide a full picture of the patient. It's a useful snapshot.

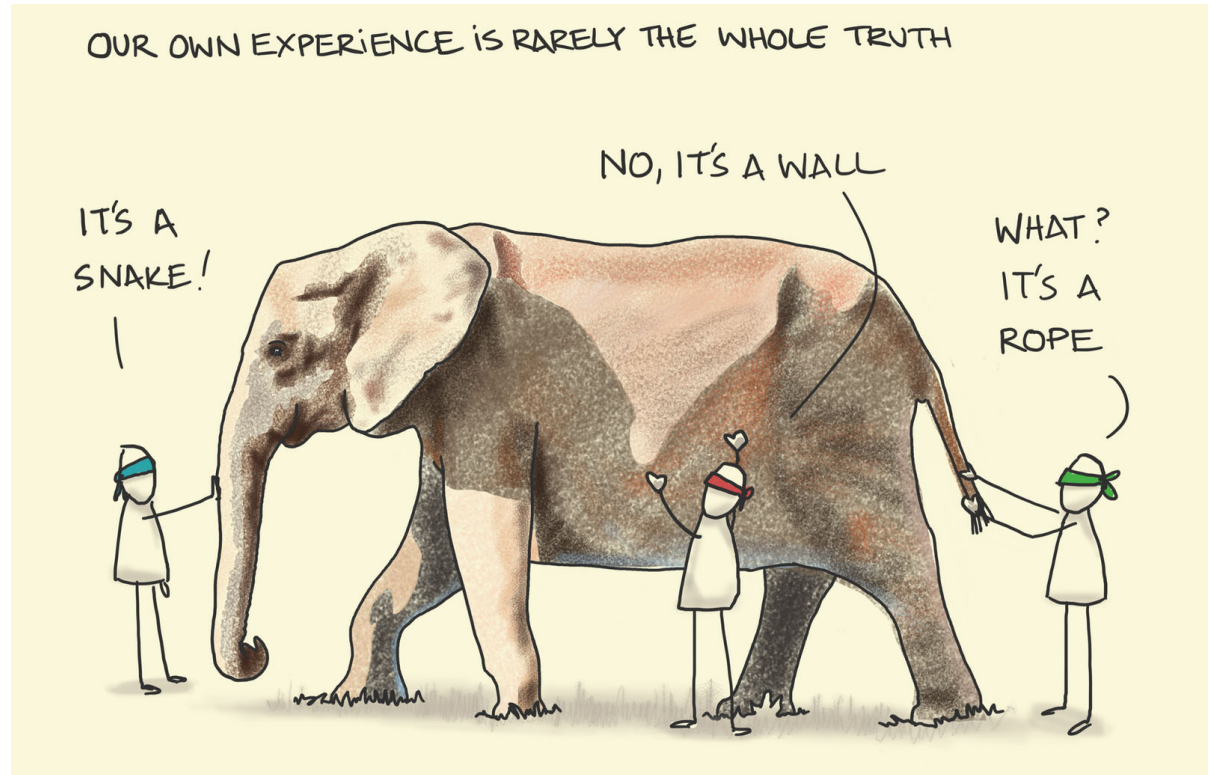
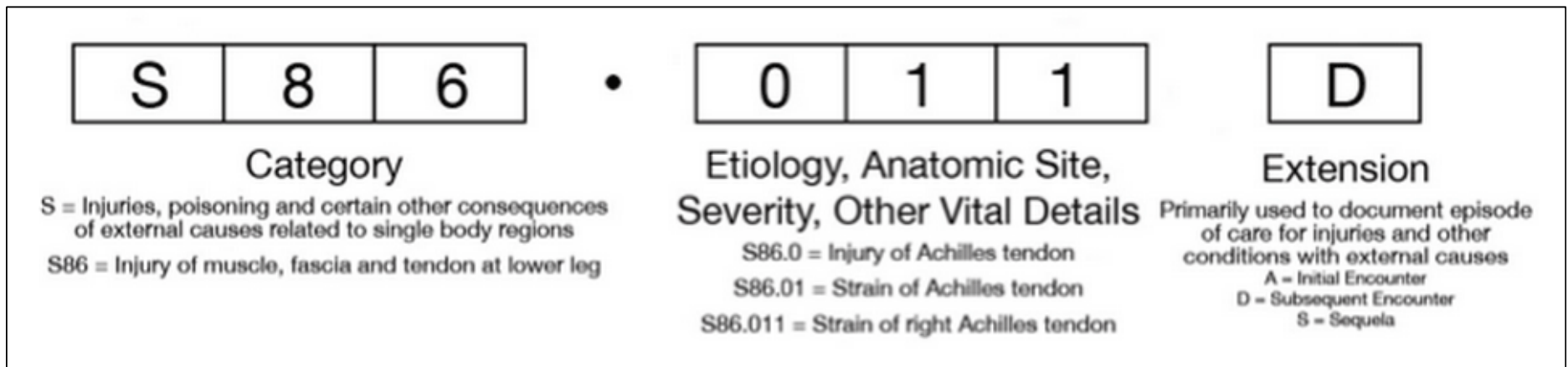


Image from <https://sketchplanations.com/the-blind-and-the-elephant>

Part II: Optimal Strategies for Requesting CDWH Data

Interlude: Finding the Right Codes

Diagnoses: Anatomy of an ICD-10-CM code



Source: <https://www.webpt.com/blog/understanding-icd-10-code-structure/>

Note: [UNC's i2b2 instance](#) is a great place to explore the ICD-10-CM hierarchy.

Procedures: ICD-10-PCS and HCPCS/CPT

- Facility-billed procedures are generally coded with ICD-10-PCS. Provider-billed procedures are generally coded with HCPCS/CPT.
- CPT: Current Procedural Terminology. Requires a license to use.
 - Tip: Due to the license restrictions, [use UNC's i2b2 to browse the codes](#).
- CPT is a subset of HCPCS (Healthcare Common Procedure Coding System).
- Good idea to use both terminologies when searching for procedures.

CPT Code

78608

Brain PET/CT

ICD-10-PCS Code

C030MZZ

Brain PET

Medications: RxNorm and NDC

- There are many, many codes for each drug in both RxNorm and NDC.
- RxNorm and NDC can be *very* confusing to work with. We do not expect requesters to look up these codes themselves.

RxNorm
26225
Ondansetron
(ingredient)

NDC
00409112011
2 ML ondansetron 2 MG/ML
Prefilled Syringe

- We prefer a list of *generic* medication names of interest.
- We cannot easily work with categories of medications, like “all diabetes drugs” or “any antibiotic.”

Labs: LOINC

- Logical Observation Identifiers Names and Codes.
- LOINC is also a complex coding system—we do not expect you to look up individual LOINC codes for your labs of interest.
- The names of labs you're interested in will suffice—the more specific the better. (E.g., “urine creatinine” is much better than “creatinine.”)

Reminder: All coding systems have the same flaw—human error

Coding Guidance



ICD-10 coding guidance specifies that a code for pre-existing diabetes in pregnancy (O24) should be accompanied by a diabetes code from the E08-E13 range.

Physician Judgment



Jane is pregnant and has Type I diabetes. When she sees her OB for the first time, her OB applies the code O24.019 (Pre-existing type 1 diabetes mellitus, in pregnancy), but does not think to add an E08-E13 code.*

Downstream Researcher



Dr. Felton is running a study on Type I diabetes, and wants to identify all potentially qualifying patients using the EHR. She does a Google search for "Type I diabetes ICD-10," and comes up with E10, which she uses in her search.