A Pragmatic Multi-system Opioid Use Disorder Computable Phenotype for the Emergency Department

Oral Presentations – The Opioid Epidemic
S104

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Disclosure

I have no relevant relationships with commercial interests to disclose.
Learning Objectives

After participating in this session the learner should be better able to:

• Understand how computable phenotyping is influenced by gold standards of diagnosis when using structured data
  • Understand the concept of “computable phenotype” for Opioid Use Disorder
  • Recognize how computable phenotypes can be created from structured clinical data in the Electronic Medical Record
  • Describe how computable phenotypes can be used to identify patients eligible for interventions
Problem Definition

1. For the purposes of a pragmatic trial:

   Define a computable phenotype to identify Opioid Use Disorder (OUD) in the clinical setting of the emergency department

2. For the purposes of classifying disease:

   Define criteria which to perform triage classification of OUD for Medication-Assisted Treatment (MAT)
What is a computable phenotype?
A defined set of data elements and logical expressions used to identify individuals or populations (i.e. cohorts) with particular diagnoses or medical conditions via clinical characteristics, events, and service patterns that are ascertained using a computerized query of an EMR system or data repository.

Primarily, this task is to identify patients for the pragmatic trial given an EMR query.

Secondarily, this task is to identify patients who have particular diagnoses or medical conditions based on information within the EMR (characteristics, events, service patterns).
Triage vs. Diagnostic Classification

- Triage is upstream of diagnosis, yet serves to be prognostic of diagnosis.
- In a diagnostic decision tree, this means it is not comparable against expected value of perfect information, rather solely expected value of sample information.
- Evaluation of the implementation therefore requires an understanding of information gain post-triage for diagnosis.
  - This can only be performed retrospectively.

- Diagnostic classification is definitional.
- Framed as a prediction task, solvable by heuristics and statistical machinery. 
- Requires an understanding of definitional elements of disease (such as chronicity) which require diagnosis to differ from triage.
  - E.g. psychiatric diagnoses which require a pattern of affect which results in dysfunction over a long period (such as 12-months for OUD).
A problematic pattern of opioid use leading to clinically significant impairment or distress, as manifested by at least two of the following 12 criteria, occurring within a 12-month period. (DSM 5)

- OUD is defined by a pattern of use within a 12-month period

- Impairment or distress must be clinically significant and manifested through a set of psychiatric criteria
  - These criteria are not easily identifiable from (structured) data within the EMR

- How can the ED screen for such a disorder? Is this screening “diagnostic”?
  - Prescription Drug Monitoring Programs
  - Indication through medications (buprenorphine, methylphenidate, long acting/extended release opioids)
  - Explicit inquiry as to substance use
Phenotype Algorithm

1. Codes entered for OUD (post-encounter)

2. Chief complaint or diagnosis containing phraseology
   - Reference standard of chart review by EM physicians
     - Inferred DSM criteria within the reviewed chart
   - Epidemiologic 2x2 table was constructed: reference standard of adjudicated diagnosis vs. test of phenotype result
     - Algorithm 1: PPV of 0.96 (0.863-0.995 95% CI), NPV of 0.98 (0.893-0.999 95% CI)
     - Algorithm 2: PPV of 0.8 (0.593-0.932 95% CI), NPV of 1.0 (0.863-1 one-sided 97.5% CI)
DSM Criteria Inferred On Chart Review

- Greatest discrepancy in chart inference between reviewers: “A great deal of time is spent in activities necessary to obtain the opioid, use the opioid, or recover from its effects”
  - Assessment of psychological characteristics of OUD: desire, craving, hazard

- Least discrepancy in chart inference between reviewers: “Recurrent opioid use resulting in a failure to fulfill major role obligations at work, school, or home”
  - Amount of use, withdrawal, misuse following prescription

- Suggests that the record is more of a source of information for objective rather than subjective diagnostic information used by reviewers
  - Is this a characteristic of emergency medicine compared to psychiatry?
Clinical Context of Opioid Use Disorder and its DSM 5 Affect – Chart Review

• Gold standard of chart review did not find the sociologic context of OUD

• Performance of the phenotype as a diagnostic device?
  • Rather, there is a focus on clinical trials recruitment (i.e. pragmatic clinical trial purpose)

• DSM is not rule-based arbiter, rather is psychiatric evaluation (performed by physician) using the DSM as a guide

• Can this be performed retrospectively, given inferences from notes?
  • Inference from notes is demonstrably error-prone

Conclusions

• We can identify a phenotype that performs well against known patients with OUD upon chart review for cohort identification
  • Algorithm 1: PPV of 0.96 (0.863-0.995 95% CI), NPV of 0.98 (0.893-0.999 95% CI)
  • Algorithm 2: PPV of 0.8 (0.593-0.932 95% CI), NPV of 1.0 (0.863-1 one-sided 97.5% CI)

• When adjudicated by chart reviewers (especially physicians) we must take into account an understanding of the clinical gold standard and inference made upon the task of reviewing
  • Applying diagnostic guidelines as a gold standard requires the clinical encounter, and therefore error is introduced upon retrospective evaluation
  • Information collected during the encounter that is not written into the medical record
Thank you!

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