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**Untapped Potential of Clinical Text for Opioid Surveillance**

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Untapped Potential of Clinical Text for Opioid Surveillance

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The Opioid Epidemic

Each day an average of 130 Americans die from overdosing on opioids1. Accurate surveillance is needed to combat the opioid epidemic for effective resource mobilization2. Current surveillance methods are not timely3, and rely on diagnostic codes, which potentially miss overdose encounters as their purpose is for billing; thus, current prevalence numbers may be underestimated4,5.

Related Work

<table>
<thead>
<tr>
<th>Opioid Misuse</th>
<th>Opioid Overdose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazlehur et al19 2019</td>
<td>Green et al13 2019</td>
</tr>
<tr>
<td>Carrell et al10 2015</td>
<td>Palmer et al10 2015</td>
</tr>
<tr>
<td>Hylan et al7 2015</td>
<td>Haller et al7 2017</td>
</tr>
<tr>
<td>Lingeman et al18 2018</td>
<td>Dligach et al18 2019</td>
</tr>
</tbody>
</table>

Methods

NLP Pipeline

Cohort

- Emergency Department (ED) visits.
- Admit date between 9/1/16 and 9/1/17.
- Age 18 years or older.
- Records were collected from both VCU and LU.

Classification Methods

- Diagnostic Codes (ICD): Encounter is associated with at least one opioid poisoning-related ICD-10-CM code.
- Natural Language Processing (NLP): Rule-based classifier built in CLAMP14 was run on first 24 hours of ED notes. Select modules were modified to identify opioid-specific terms and phrases.

Evaluation

Due to a lack of access to a data set annotated for opioid overdose, we randomly chose a subset of 100 encounters from the VCU cohort to manually annotate for evaluation. The clinical impression for the medical expert annotators was used as the gold standard.

<table>
<thead>
<tr>
<th>VCU</th>
<th>Related Work*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLP</td>
<td>ICD</td>
</tr>
<tr>
<td>Precision (PPV)</td>
<td>0.66</td>
</tr>
<tr>
<td>Recall (Sensitivity)</td>
<td>0.79</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.71</td>
</tr>
<tr>
<td>F1</td>
<td>0.72</td>
</tr>
</tbody>
</table>

* Related work metrics were chosen based on the most similar cohort to the VCU data set (i.e. ED encounters with any type of opioid overdose).

To be continued...

- NLP has the potential to identify OODs missed by current surveillance methods.
- Need to refine our definition of OOD to consider other overdose-related concepts, such as a patient’s physical symptoms.
- Future pipeline needs to consider context of statements.

Demographics

VCU

Loyola

African American

- 82% (VCU)
- 73% (Loyola)

Caucasian

- 20% (VCU)
- 25% (Loyola)

Other

- 8% (VCU)
- 7% (Loyola)

ICD

VCU

Loyola

NLP

ICD

NLP and ICD

VCU

Loyola

NLP

ICD

NLP and ICD

Results

NLP Identifies Additional Opioid Overdose Encounters

True Positives: Diverse ICD codes related to pneumonitis, syncope and collapse, altered mental status, poisoning of other drugs, opioid misuse, adverse effects, etc.

False Positives: Narcan/naloxone or prescription narcotic drug mention tagged with context not considered (e.g. allergies, current prescriptions).

ICD Coding Errors: Encounters related to pain conditions (e.g. joint pain or sickle cell patient) had secondary ICD codes such as T40.2XA (underdosing of other opioids) and T40.1X1A (accidental poisoning by heroin); however, encounters made no mention of a possible overdose nor was Narcan administered; thus, the encounter was not flagged by NLP.

ICD

VCU

Loyola

403 (43%)

348 (38%)

218 (22%)

2500 (100%)

28 (1%)

References:


3. Hazlehur et al., 2019

4. Green et al., 2018

5. Dligach et al., 2018

6. Kam et al., 2016


10. Loyola University, Chicago, IL; 3Loyola University, Chicago, IL; 4Rush University, Chicago, IL; 5University of Chicago, Chicago, IL; 6Northwestern Medicine, Chicago, IL; 7Virginia Commonwealth University Health System, Richmond, VA