Early Delirium Detection: CUls and the EHR

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• I HAVE NO ACTUAL OR POTENTIAL CONFLICT OF INTEREST IN RELATION TO THIS PROGRAM/PRESENTATION

• I WILL NOT BE DISCUSSING ANY “OFF-LABEL” USE OF DRUGS
DELIRIUM
An acute and fluctuating change in mental status secondary to a medical cause with inattention, confusion, and either hypervigilance or somnolence

DSM-V
Inpatient Delirium

• Increased length of stay
• Increased discharge to long-term care
• Increased readmission rates
• Long-term functional decline
• Increased mortality
Screening and Diagnostic Tools

- Barriers
- Accuracy
- Lack of uniform adoption
DELIRIUM
Can we identify delirium early from the EHR in inpatient older adults?
Theoretical Framework

Loyola’s Clinical Research Database

- Initiated in January, 2007
- More than 2.6 million patients
- More than 84 million clinical documents
- Access to structured, semi-structured and unstructured data
THE UMLS
The Unified Medical Language System
Metathesaurus

# Medical Vocabularies in UMLS

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM_5</td>
<td>Diagnostic</td>
</tr>
<tr>
<td>ICD10CM</td>
<td>International Classification of Disease 10(^{th}) revision, Clinical Modification</td>
</tr>
<tr>
<td>ICD9CM</td>
<td>International Classification of Disease 9(^{th}) revision, Clinical Modification</td>
</tr>
<tr>
<td>RxNorm</td>
<td>Standardized nomenclature for clinical drugs</td>
</tr>
<tr>
<td>LOINC</td>
<td>Logical Observation Identifiers Names and Codes</td>
</tr>
<tr>
<td>MeSH</td>
<td>Medical Subject Heading</td>
</tr>
<tr>
<td>NIC</td>
<td>Nursing Intervention Codes</td>
</tr>
<tr>
<td>NOC</td>
<td>Nursing Outcome Codes</td>
</tr>
<tr>
<td>SNOMEDCT_US</td>
<td>Systemized Nomenclature of Medicine- Clinical Terms</td>
</tr>
</tbody>
</table>
Concept Unique Identifier

Semantic Type Unique Identifier

Atom Unique Identifier
CUIs

[Delirium](#)

**Concept:** [C0011206] Delirium

**Definitions**

Delirium is a condition that features rapidly changing mental states. It causes confusion and changes in behavior. Besides falling in and out of consciousness, there may be problems with

- Attention and awareness
- Thinking and memory
- Emotion
- Muscle control
- Sleeping and waking

Causes of delirium include medications, poisoning, serious illnesses or infections, and severe pain. It can also be part of some mental illnesses or dementia.

Delirium and dementia have similar symptoms, so it can be hard to tell them apart. They can also occur together.
TUIs

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Unified Medical Language System

UMLS Terminology Services
Metathesaurus Browser

UTS Home  About  Browse  Download  APIs  Tools  Help

Search  Tree  Recent Searches

Search Results (298)
:: 1 - 25 ::

Concept: [C0011206] Delirium

Semantic Types

Mental or Behavioral Dysfunction [T048]

Definitions

Delirium is a condition that features rapidly changing mental states. It causes confusion and changes in behavior. Besides falling in and out of consciousness, there may be problems with:

- Attention and awareness
- Thinking and memory
- Emotion
- Muscle control
- Sleeping and waking

Causes of delirium include medications, poisoning, serious illnesses or infections, and severe pain. It can also be part of some mental illnesses or dementia.

Delirium and dementia have similar symptoms, so it can be hard to tell them apart. They can also occur together. Delirium starts suddenly and can cause hallucinations. The symptoms may get better or worse, and can last for hours or weeks. On the other hand, dementia develops slowly and does not cause hallucinations. The symptoms are stable, and may last for months or years.

Delirium tremens is a serious type of alcohol withdrawal syndrome. It usually happens to people who stop after years of alcohol abuse.
AUIs

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Unified Medical Language System®

UMLS Terminology Services
Metathesaurus Browser

Search Term: delirium
Release: 2019AA
Search Type: Word
Source: All Sources

Atoms (189)
- acute delirium [A0472818/ACD/DE/0000006440]
- delirium [A0596034/AOD/DE/0000004328]
- DELIRIUM [A0404314/CCPSS/PT/1017884]
- DELIRIUM ACUTE [A1610453/CCPSS/PT/0010687]
- acute brain syndrome [A18665202/CHV/SY/0000003670]
- acute delirium [A18665203/CHV/SY/0000003670]
- deliria [A18609484/CHV/SY/0000003670]
- delirious [A18609864/CHV/SY/0000003670]
- delirium [A18627994/CHV/PT/0000003670]
- delirious [A2615086/CSP/ET/5003-0016]
- delirium [A0596035/CSP/PT/5003-0016]
- ACUTE BRAIN SYNDROME [A0285601/GST/BT/BRAIN SYND ACUTE]
DELIRIUM

Can CUIs be used to screen EHRs for inpatient older adults with delirium from unstructured data?
CUI Validation

- 150 narrative notes containing CUIs for delirium
- Three coders
- 100 notes for training
- 50 notes for inter-rater reliability
Results

• 98% agreement between three coders
• 98% of CUIs were valid
• 30% of CUIs were temporal in nature
• 2% of CUIs were inaccurate representations
• Insights
Conclusions

• Using CUIs for delirium can be an important screen for retrospectively identifying older adult patients with delirium
• A single narrative note containing a CUI for delirium may not provide definitive information
• Sequential temporal CUI notes may identify fluctuating mental status
Ongoing Research & Next Steps

• Determining PPV and NPV for patient delirium from the unstructured data of 1000 EHRs

• Later adding structured data for modeling and development of a computable phenotype for delirium

• Long term goal to develop an early warning and delirium clinical decision support in the EHR for nurses in collaboration with physicians
Theoretical Framework

THANK YOU!

Questions?
Preparing people to lead extraordinary lives
References

Afshar, M., et al. (2019). Development and application of a high throughput natural language processing architecture to convert all clinical documents in a clinical data warehouse into standardized medical vocabularies. *Journal of the American Medical Informatics Association, 0(0), 1-6.*


