Take home points for the current PDDI CDS IG

• Terminology - enables a full range of value sets at international scope using three components
  • Composite ValueSet, Element ValueSet, Element ValueSet-exclude
  • Examples with NSAIDS, PPIs, Loop Diuretics
Take home points ...

• Employs CDS Hooks ability to return multiple cards at once
  • All responses will have a purely informational card
    • Concordant with the W3C PDDI Min Info Model
      • Drugs involved
      • Clinical consequences
      • Serious?
      • Mechanism of interaction
        • evidence
      • Contextual information
        • Recommended actions and evidence
  • Some responses will have action cards for create, update, delete
Use of multiple cards example....

Potential Drug-Drug Interaction between naproxen 500mg and warfarin 10mg

- Increased risk of bleeding
- Bleeding is a serious potential clinical consequence because it can result in death, life-threatening hospitalization, or disability.
- Non-steroidal anti-inflammatory drugs (NSAIDs) have antiplatelet effects which increase the bleeding risk when combined with oral anticoagulants such as warfarin. The antiplatelet effect of NSAIDs lasts as long as the NSAID is present in the circulation, unlike aspirin's antiplatelet effect, which lasts for up to 2 weeks after aspirin is discontinued. NSAIDs also can cause peptic ulcers and most of the evidence for increased bleeding risk with NSAIDs plus warfarin is due to upper gastrointestinal bleeding (UGIB).

Contextual Information, Recommended Actions, and Evidence:

Patient received warfarin 10 mg 90 days ago.
- Cancel naproxen 500mg order
  - Accept
  - Decline
  - Reference

Concurrent proton pump inhibitor therapy may reduce risk of UGIB in patients receiving naproxen and warfarin.
- Add Pantoprazole 40mg – 1 tablet 30 minutes before first meal of the day
  - Accept
  - Decline
  - Reference

Patient received prednisone 5 mg 90 days ago, which may increase risk of UGIB.
- Discontinue prednisone 5mg daily
  - Accept
  - Reference

Action: Added proton pump inhibitor
Take home points ....

• Two levels of CDS implementation
  • Level 1 : at time of medication order signature
    • Currently using CDS Hook ‘medication-prescribe’
  • Level 2 : at time of medication order selection
    • Adding support for a new CDS Hook ‘medication-select’
Take home points ...

- Shows how to use CQL with FHIR Library and PlanDefinition resources to implement PDDI CDS as a service using CDS Hooks
  - Functioning example using FHIR STU3, Hooks 1.0, and DBCG CQF-Ruler
    - [http://dbmi-icode-01.dbmi.pitt.edu:8080/cds-services](http://dbmi-icode-01.dbmi.pitt.edu:8080/cds-services)
  - Two exemplar interactions: warfarin – NSAIDS and digoxin – cyclosporine
IG STU Ballot 1 – summary

• Total reviewers = 3
• Total comments = 11
• Technical fixes = 10
IG STU Ballot 1 – comments

https://gforge.hl7.org/gf/project/fhir/tracker/?action=TrackerItemEdit&tracker_item_id=

• 18804 : IG authors to assess the status of response artifacts and relationship to DetectedIssue.

• Minor word changes, spelling, and link fixes
  • 18805 : Fix link
  • 18806 : All artifacts links need to point to the correct artifacts. IG authors to accomplish this
  • 18807 : Fix links
  • 18056 : Get more information from the comment submitter about the pages in question
  • 18057 : To be fixed as part of document Q/A
  • 18078 : Choose an option and revise the IG to include
  • 18079 : Move statement from 6.1.0 to 6.0.0
  • 18072 : Fix issue as suggested
  • 18073 : Fix issue as suggested
  • 18074 : To be fixed as part of document Q/A
IG discussion topics

1. Define trigger event(s) in medication order entry workflow

2. Passing resources (e.g., DetectedIssue) in card response

3. Card response covering core data elements for Minimum Information Model
IG discussion – trigger events

• Define trigger event(s) in medication order entry workflow
  • medication-prescribe (product selection vs. order accept/sign)
  • order-review (e.g., accept/sign for batch or individual order)
  • Multiple service coordination per task
Order entry workflow
IG discussion – DetectedIssue in card response

• Passing resources (e.g., DetectedIssue) in card response
  • Options to pass resources (object) without extension:
    1. card.source
    2. card.suggestion.action.resource
Advanced PDDI CDS Service

Electronic Health Record

CDS Discovery

medication-select

Send CDS Hooks Request

PDDI CDS Medication Select Service

Parse and pre-process Request

Send CDS Hooks Request

Parse and pre-process Request

Process data with Clinical Reasoning module

Send CDS Hooks Request

Process data with Clinical Reasoning module

Clinician action

Document mitigation actions in response to Card(s) suggested action

Medication-prescribe

DetectDetectedIssue and response, and present Card(s)

Card Array

DetectDetectedIssue

CarePlan Request

DetectedIssue

CarePlan Request

DetectedIssue

CarePlan Request

DetectedIssue

CarePlan Request

DetectedIssue

CLinician action

Present Card(s)
IG discussion – multiple card responses

• Card response covering core data elements for Minimum Information Model
  • detail element (markdown) as “catch-all” vs. extension
  • Multiple card response for more control on displaying content
Use case

Potential Drug-Drug Interaction between naproxen 500mg and warfarin 10mg

Increased risk of bleeding

Thrombosis is a serious potential clinical consequence because it can result in death.

Mechanism of interaction and evidence

Drugs Involved:

Clinical Consequences:

Seriousness:

Consequential information, recommended actions, and evidence

Patient received warfarin 10 mg PO 35 days ago.
Cancel naproxen 500mg order
Accept Reject Reference

Concurrent proton pump inhibitor therapy may reduce risk of USG in patients receiving naproxen and warfarin.
Add Pantoprazole 40mg – 1 tablet 30 minutes before first meal of the day
Accept Reject Reference

Patient received prednisone 5 mg PO 35 days ago, which may increase risk of USG
Discontinue prednisone 5mg daily
Accept Reject Reference

Patient is > 65 years old and had an USG 5 years ago, which may increase risk of bleeding
Cancel naproxen 500mg order
Accept Reference
Minimum Information Model

1.4.1 W3C Effort

This implementation guide builds on the the W3C Community Group Note, "A Minimum Representation of Potential Drug-Drug Interaction Knowledge and Evidence - Technical and User-centered Foundation." This Note provides a technical and user-centered foundation for a PDDI minimum information model. The overarching goal of this project was to support effective PDDI CDS. The principal contributions of the Note include:

1. definitions for the model's core information items, examples of using these definitions to represent two PDDIs, and a set of additional PDDIs selected as case studies for future work using the information model;
2. clarification of model users, use cases, and specific information needs;
3. statement on the appropriate scope of knowledge representation for the information model;
4. potential applications of the minimum information model that could lead to improved patient safety.

This Community Group Note provides motivation and a detailed domain analysis for structuring PDDI knowledge with the minimum information model. The model elements include:

- Clinical consequences
- Contextual information/modifying factors
- Drugs involved
- Evidence
- Frequency of exposure to the interacting drug pair
- Frequency of harm for persons who have been exposed to the interacting drug pair
- Mechanism of the interaction
- Recommended actions
- Seriousness rating
Warfarin + NSAIDs (Draft 1)

Non-steroidal anti-inflammatory drugs (NSAIDs) have antiplatelet effects which increase the bleeding risk when combined with oral anticoagulants such as warfarin. The antiplatelet effect of NSAIDs lasts only as long as the NSAID is present in the circulation, unlike aspirin’s antiplatelet effect, which lasts for up to 2 weeks after aspirin is discontinued. NSAIDs also can cause peptic ulcers and most of the evidence for increased bleeding risk with NSAIDs plus warfarin is due to upper gastrointestinal bleeding (UGIB).

<table>
<thead>
<tr>
<th>Is NSAID topical diclofenac?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a suitable alternative to the NSAID in this patient?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is patient on proton pump inhibitor or misoprostol?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Does the patient have one or more of the following risk factors:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>- history of UGIB or peptic ulcer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- &gt; 65 years old</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is patient also taking:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>- systemic corticosteroids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- aldosterone antagonist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- high dose or multiple NSAIDs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not likely to increase risk of UGIB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use alternative to NSAID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible increased risk of UGIB or other bleeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantially increased risk of UGIB or other bleeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased risk of UGIB or other bleeding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

○ = No special precautions. ■ = Assess risk and take action if necessary. ◆ = Use only if benefit outweighs risk

1 2 3 4 5
# Card Attributes

Each Card is described by the following attributes:

<table>
<thead>
<tr>
<th>Field</th>
<th>Optionality</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>summary</td>
<td>REQUIRED</td>
<td>string</td>
<td>One-sentence, &lt;14 words, display to the user</td>
</tr>
<tr>
<td>detail</td>
<td>OPTIONAL</td>
<td>string</td>
<td>Optional detailed information to be represented in the EHR</td>
</tr>
<tr>
<td>indicator</td>
<td>REQUIRED</td>
<td>string</td>
<td>Urgency/Importance levels, e.g., emergency, urgent, critical. The EHR MAY use this field to help make UI display decisions such as sort order or coloring.</td>
</tr>
<tr>
<td>source</td>
<td>REQUIRED</td>
<td>object</td>
<td>Grouping structure for the Source of the information displayed on this card. The source should be the primary source of guidance for the decision support the card represents.</td>
</tr>
</tbody>
</table>

# Suggestion

Each Suggestion is described by the following attributes:

<table>
<thead>
<tr>
<th>Field</th>
<th>Optionality</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>label</td>
<td>REQUIRED</td>
<td>string</td>
<td>Human-readable label to display for this suggestion (e.g., the EHR might render this as the text on a button tied to this suggestion).</td>
</tr>
<tr>
<td>uuid</td>
<td>OPTIONAL</td>
<td>string</td>
<td>Unique identifier, used for auditing and logging suggestions.</td>
</tr>
<tr>
<td>actions</td>
<td>OPTIONAL</td>
<td>array</td>
<td>Array of objects, each defining a suggested action. Within a single suggestion, all actions are logically AND'd together, such that a user selecting a suggestion selects all of the actions within it.</td>
</tr>
</tbody>
</table>