USING BPMN TO OPERATIONALIZE CLINICAL KNOWLEDGE
ROB REYNOLDS
Who am I?

Name: Rob Reynolds

Company: HarmonIQ Health Systems

Background:

- Research spike on using BPMN as part of a system to operationalize clinical knowledge
- A team at HarmonIQ (led by Bryn Rhodes) is working with the ONC to use the HL7 FHIR Clinical Reasoning Module resources to describe a simplified version of the CDC Zika Virus Management Guideline
Artifact representation

As part of that effort, they built a computable representation of the Zika Virus Workflow, All Hazards approach, focusing on “L3”* and “L4”* artifact representation:

<table>
<thead>
<tr>
<th>Format</th>
<th>Narrative</th>
<th>Semi-structured</th>
<th>Structured</th>
<th>Executable</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Narrative text</td>
<td>Organized text</td>
<td>Coded and interpretable by computer</td>
<td>Coded and interpretable by CDS systems; variety of formats</td>
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<td>Broad</td>
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Zika virus workflow

CDC Zika Virus Management Guideline

Petri net (ish) process model
Zika virus artifacts

Simplified, showing only part 1 of branch for all pregnant patients

PlanDefinition

Questionnaire

Conditions (CQL)

Actions
Condition logic

Responses are captured as “Observation” resources to decouple from the Workflow and UI
PlanDefinition

Example of artifacts represented in the PlanDefinition

```xml
<library>
  <reference value="Library/zika-virus-intervention-logic"/>
</library>
<actionDefinition>
  <title value="Zika Virus Assessment"/>
  <triggerDefinition>
    <type value="named-event"/>
    <eventName value="patient-view"/>
  </triggerDefinition>
  <condition>
    <kind value="applicability"/>
    <expression value="Is Patient Pregnant"/>
  </condition>
  <actionDefinition>
    <condition>
      <kind value="applicability"/>
      <expression value="Should Administer Zika Virus Exposure Assessment"/>
    </condition>
    <activityDefinition>
    </activityDefinition>
  </actionDefinition>
</actionDefinition>
```

References the logic library

Applicability conditions referenced in the library

Action to perform if the condition evaluates to true
Running the workflow

Simplified, showing only part 1 of branch for all pregnant patients

1. CDS:
   Is Patient Pregnant: True
   Should Administer Zika Assessment: True
   Result: ProcedureRequest – Administer Zika Travel Assessment

2. Orchestrations layer coordinates user interaction:
   - Zika Travel?

3. CDS:
   Is Patient Pregnant: True
   Should Administer Zika Assessment: False
   ...

*Serum + Urine rRT-PCR Test (P5)
*Serum Zika virus IgM + dengue virus IgM (P7)
IgM antibody testing might be considered. Consult with local Health Department
Objective - BPMN spike

Explore the use of BPMN as a candidate for “L3”* artifact representation

- Enable authoring with existing, more accessible tools
- Use those artifacts to automate the production of “L4”* artifacts

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First pass
Simplified, showing only part 1 of branch for non-pregnant women and all men

Modeled the workflow, as is:
- Capability?
- Issues/stumbling blocks?
Discovery
Simplified, showing only part 1 of branch for non-pregnant women and all men

1. Parallel path – unnecessary complexity
2. Short circuit
Updated diagram
Simplified, showing only part 1 of branch for non-pregnant women and all men

Aesthetic sense of correctness
- No “smells”

Validation of the model
- BPMN tools
Takeaways

◦ BPMN is relatively easy to work with
  ◦ Lot’s of tools
  ◦ Lot’s of support
  ◦ Accessible for the users we’re considering
  ◦ In this anecdotal case, the process was within BPMN’s capability
  ◦ A more formal modeling language seems to encourage more formal reasoning over the model
    ◦ No silver bullets

Potential next steps

◦ Have a representative from the target users actually model in BPMN
◦ Would be interesting to see a real-world example of a medical process that is outside BPMN’s capability
◦ Would be interesting to see a declarative version
Questions/comments

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