

Leveraging SNOMED CT to Drive Actionable Clinical Insights

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Clinical Architecture[®]

Agenda

- Clinical Insights
- Building Blocks
- Moving Parts
- Making it Work
- Q&A





Clinical Insights (Clinical Awareness / Inferencing)

Leveraging SNOMED CT to Drive Actionable Clinical Insights

Assertion: *“SNOMED CT based clinical information benefits individual patients and clinicians as well as populations and it supports evidence based care ”**

- Enabling guideline and decision support systems to provide real-time advice
- Enhancing audits of care delivery
- Allowing accurate and comprehensive searches that identify patients
- Enhancing audits of care delivery
- Reducing costs of inappropriate and duplicative testing and treatment
- Raising the cost-effectiveness and quality of care

*SNOMED International website

Inferencing

- What: A way of taking structured clinical data and using rules-based, automated reasoning to draw a clinically reasonable conclusion and give feedback to the user
- Requirement: Ability to collect together all available, relevant information into a clear clinical picture and organise it in such a way as to allow it to be reasoned over
- Objective: To create an environment where Clinical Insights can be built without the need for a software engineer to author, test, and deploy

Clinical Awareness - Real world Examples

- Cohort - Clinical Trial Recruitment
- Detection - Undocumented DM1, DM2, Gestational DM
- Genomics - Clopidogrel Metabolism and CYP2C19 Gene
- Quality - Heart Failure - Aldosterone Antagonists
- Calculation - CAP - Pneumonia Severity Index
- Monitoring - Diabetes Mellitus - HbA1c
- Safety - Beers Criteria
- Unnecessary Care - Avoiding CK-MB (heart muscle damage test) Testing for Acute Coronary Syndrome
- And Countless Others...

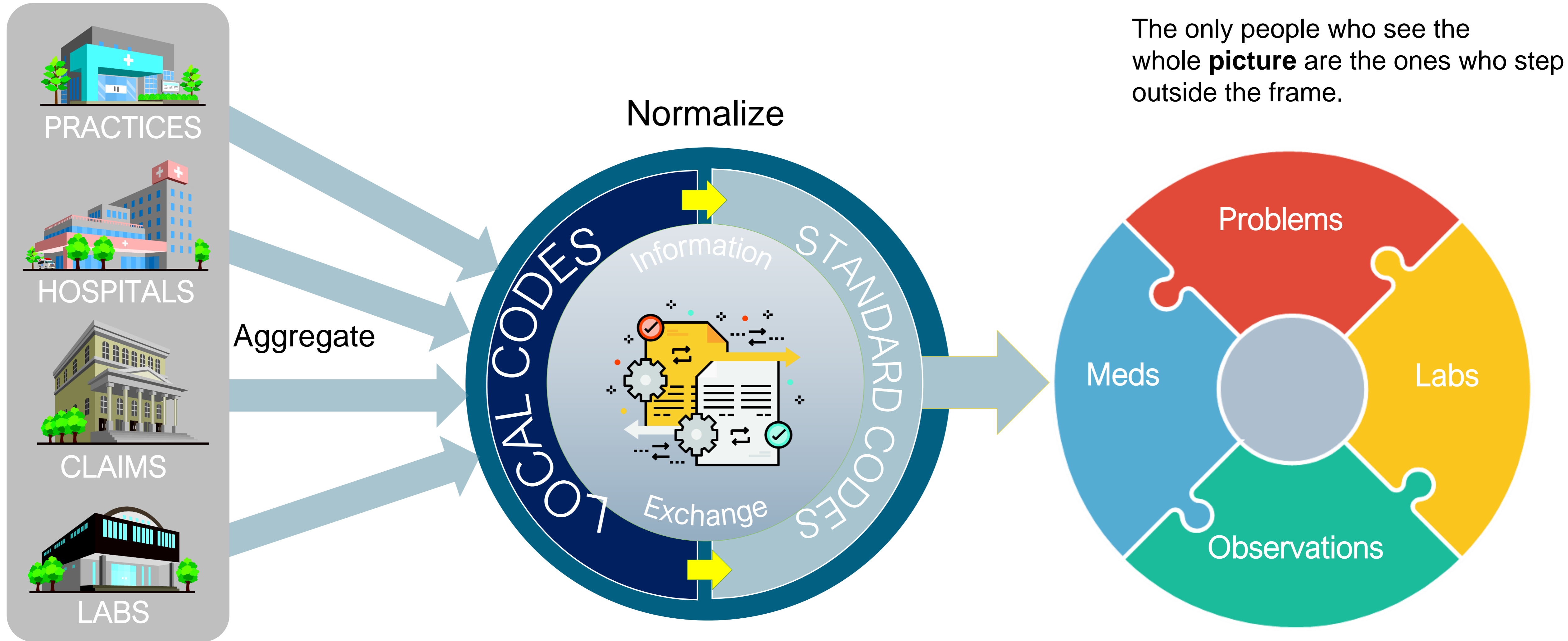




Clinical Insights (Building Blocks)

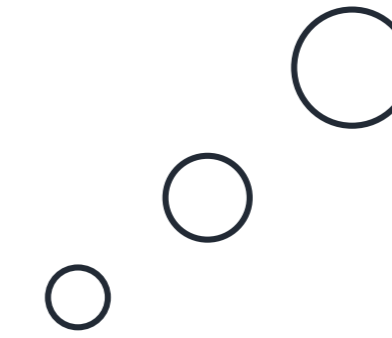
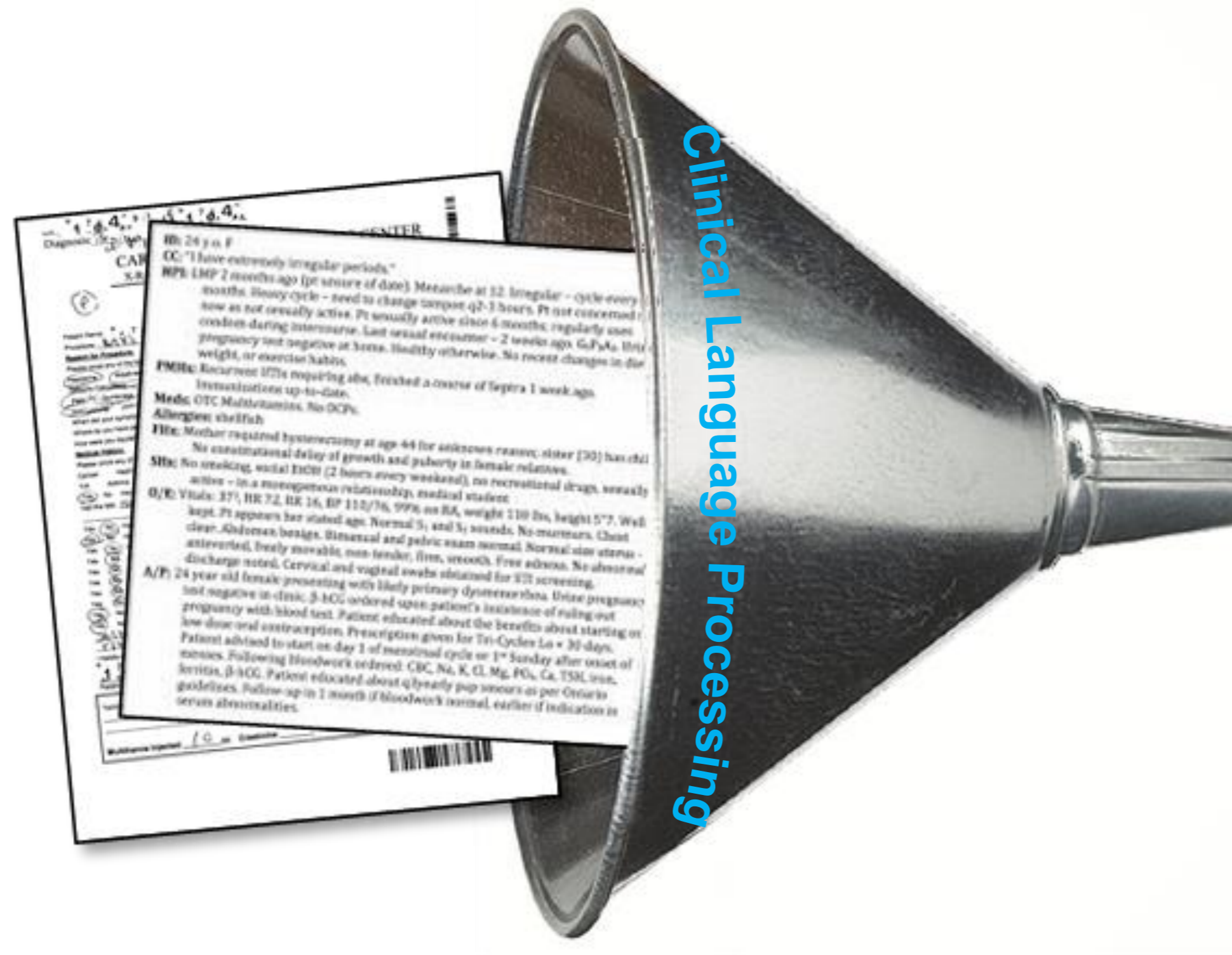
Aggregation and Normalization

First, build a solid **information foundation**



Unstructured Information

Second, See what **other information sources** you can use



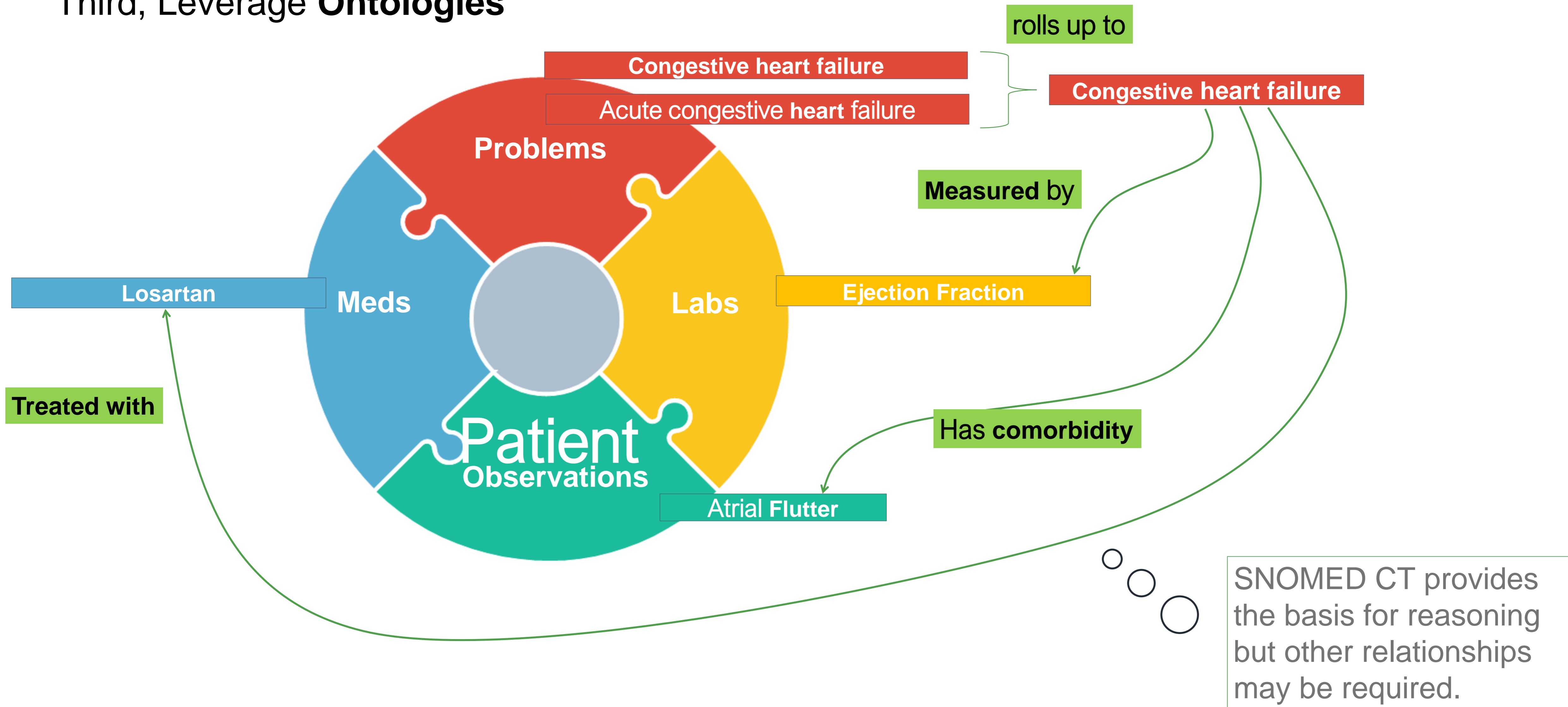
For completeness it may be necessary to identify information stored in free text and turn it into actionable data.

Observation

Code System:	SNOMED CT
Code :	250908004
Term:	Left Ventricle Ejection Fraction
Result Value:	55
Result Unit:	%

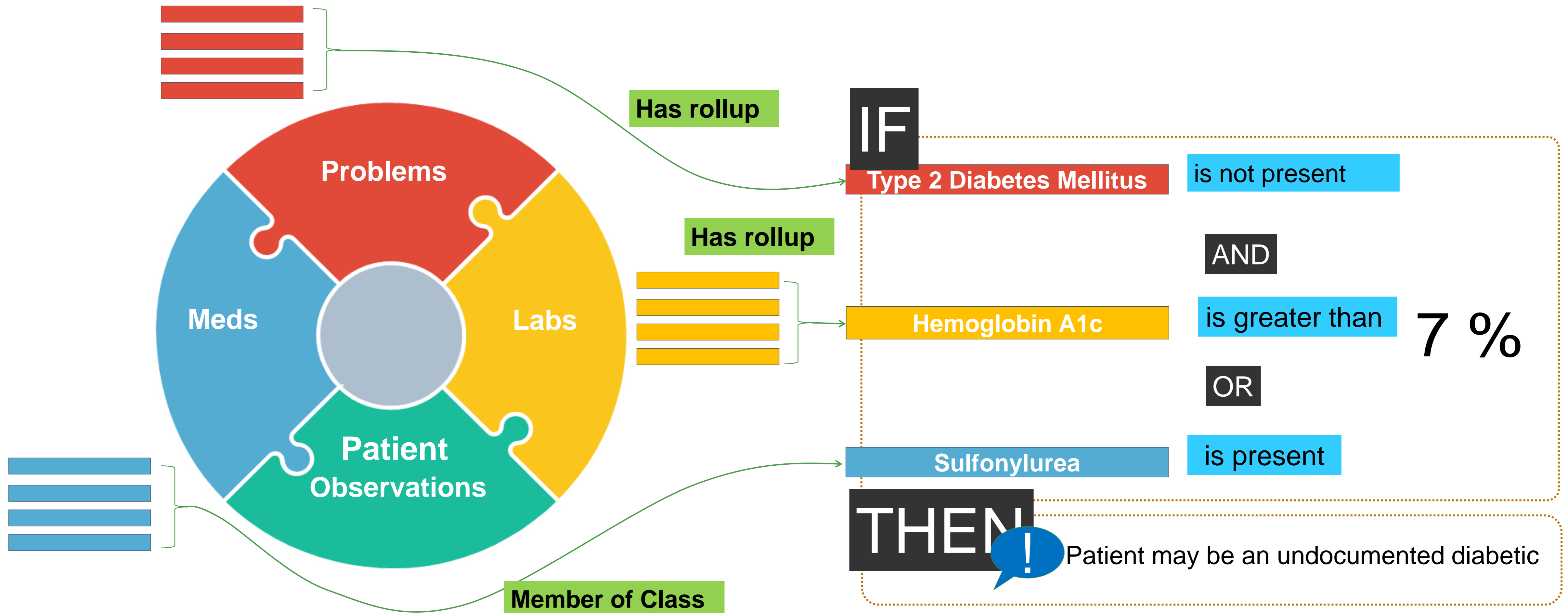
Ontological Reasoning

Third, Leverage Ontologies

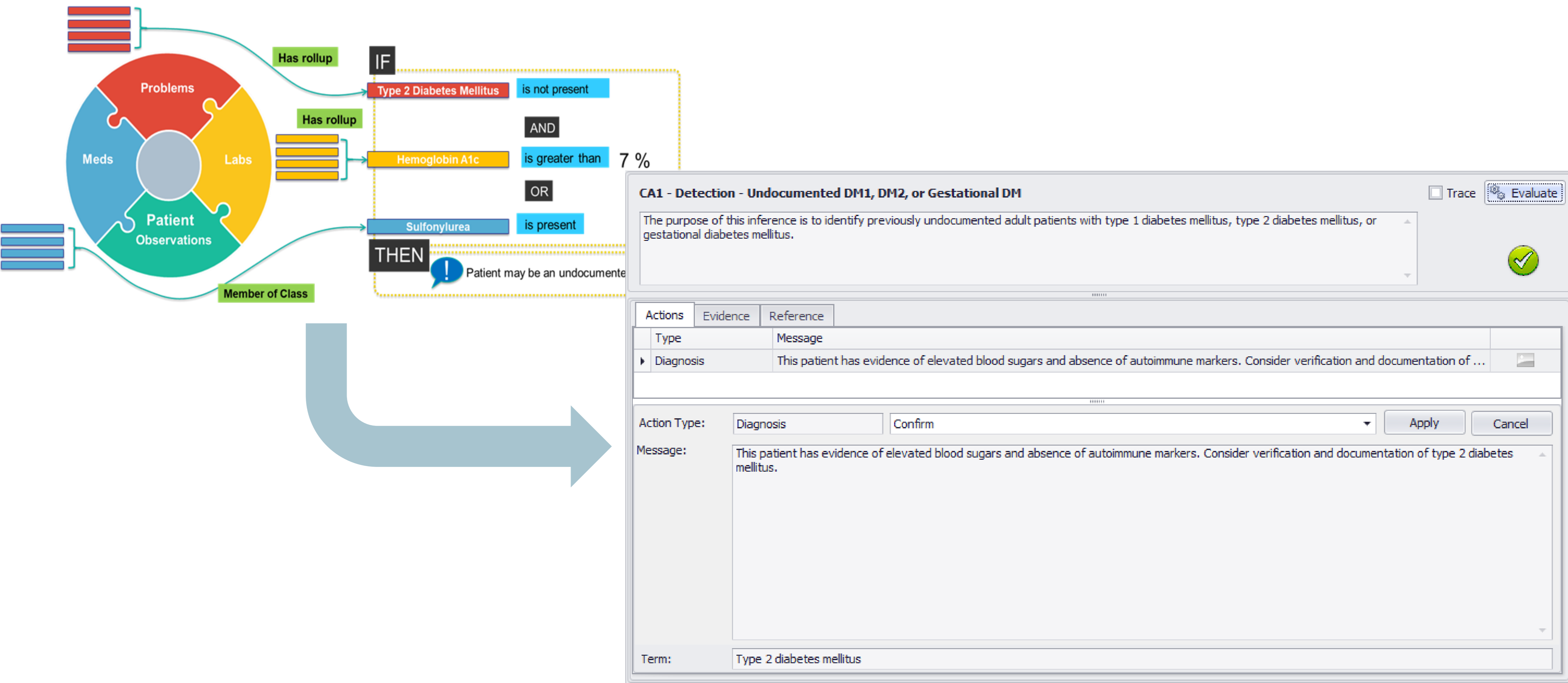


Logical Reasoning

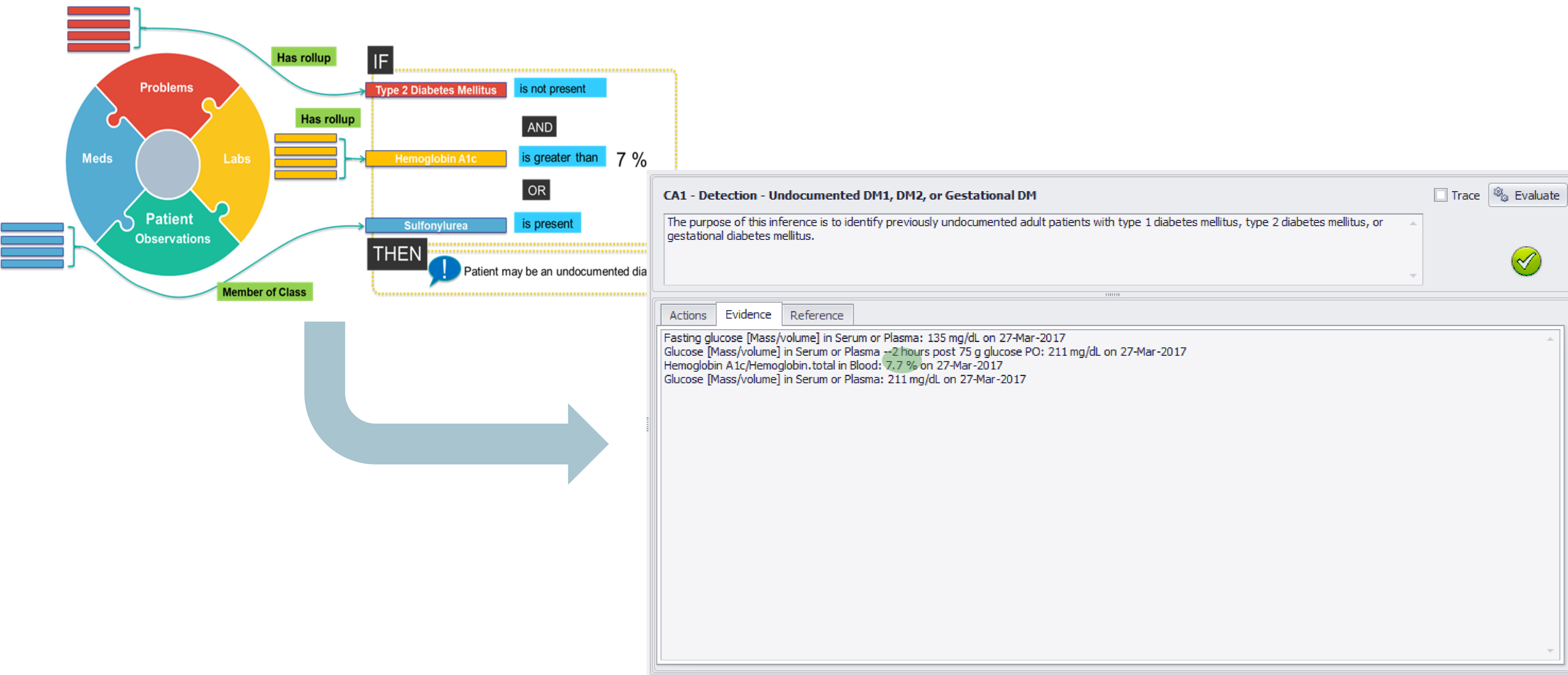
Fourth, Build the Rules



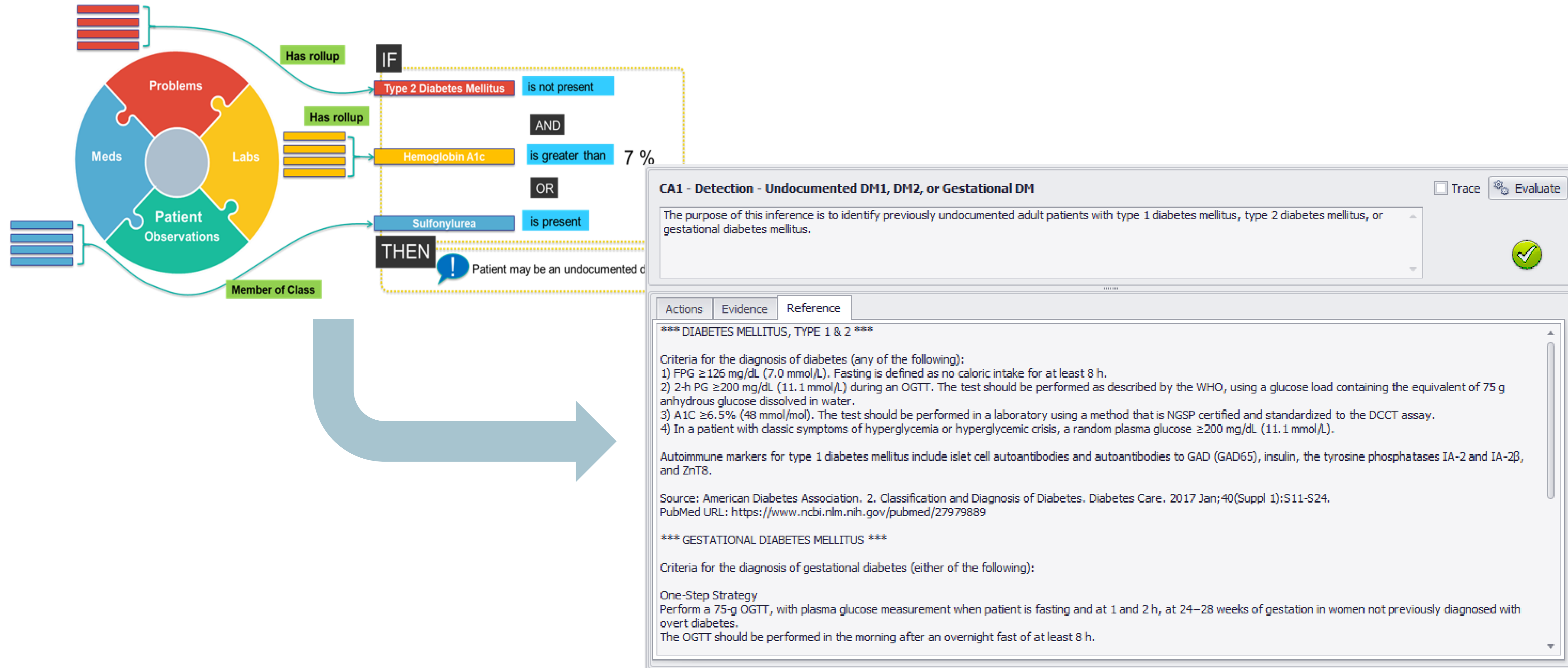
Share Results - Action



Share Results - Evidence



Share Results - Reference





Clinical Insights (Moving Parts)

Inferencing: The Moving Parts

○ Patient Data

- = *Structured input from a patient record*

○ Terminology

- = *A specialized Model that defines the concepts (Elements) for one or more Inferences*

○ Inference Sequencing

- = *The rules and logic that make it all work*

Inferencing Component: Patient Data

```
HIMSS_SampleCCDDocument-QSG-level-3.xml — Visual Studio Code
File Edit Selection View Go Debug Help
HIMSS_SampleCCDDocument-QSG-level-3.xml x
1 <?xml version="1.0"?>
2 <?xml-stylesheet type="text/xsl" href="CCD.xsl"?>
3 <!-- The following sample document depicts a fictional character's health summary. Any resemblance to a real person is coincidental. -->
4 <ClinicalDocument xmlns="urn:h17-org:v3" xmlns:voc="urn:h17-org:v3/voc" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLoc...
5 <!--
6 *****
7 CDA Header
8 *****
9 -->
10 <typeId root="2.16.840.1.113883.1.3" extension="POCD_HD000040"/>
11 <templateId root="2.16.840.1.113883.10.20.1"/>
12 <!-- CCD v1.0 Templates Root -->
13 <id root="db734647-fc99-424c-a864-7e3cda82e703"/>
14 <code code="34133-9" codeSystem="2.16.840.1.113883.6.1" displayName="Summarization of episode note"/>
15 <title>Good Health Clinic Continuity of Care Document</title>
16 <effectiveTime value="20000407130000+0500"/>
17 <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25"/>
18 <languageCode code="en-US"/>
19 <recordTarget>
20 <patientRole>
21 <id extension="996-756-495" root="2.16.840.1.113883.19.5"/>
22 <patient>
23 <name>
24 <given>Henry</given>
25 <family>Levin</family>
26 <suffix>the 7th</suffix>
27 </name>
28 <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
29 <birthTime value="19320924"/>
30 </patient>
31 <providerOrganization>
32 <id root="2.16.840.1.113883.19.5"/>
33 <name>Good Health Clinic</name>
34 </providerOrganization>
35 </patientRole>
36 </recordTarget>
37 <author>
38 <time value="20000407130000+0500"/>
39 <assignedAuthor>
40 <id root="20cf14fb-b65c-4c8c-a54d-b0cca834c18c"/>
41 <assignedPerson>
42 <name>
43 <prefix>Dr.</prefix>
44 <given>Robert</given>
45 <family>Dolin</family>
46 </name>
47 </assignedPerson>
```

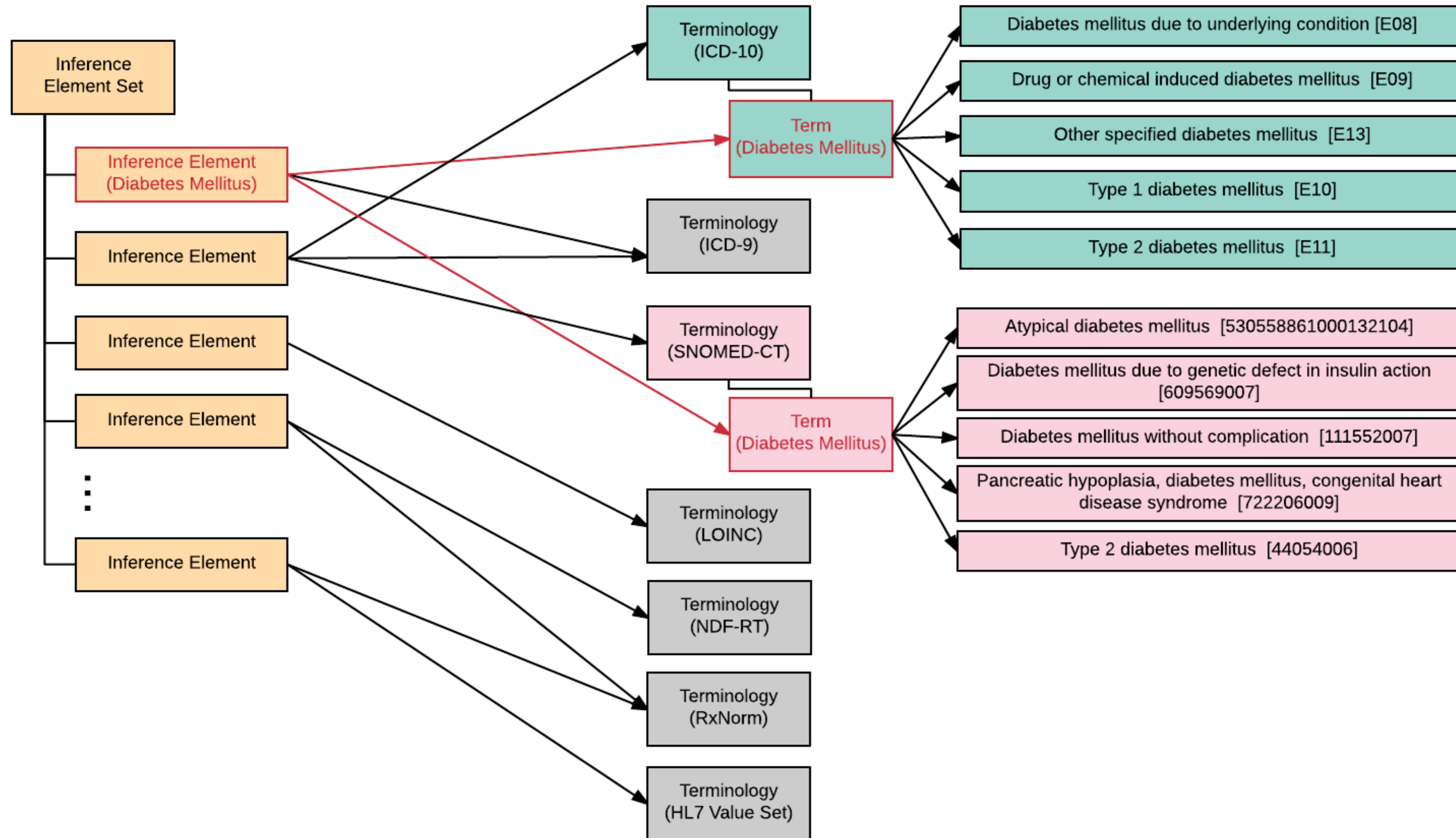
CCCD



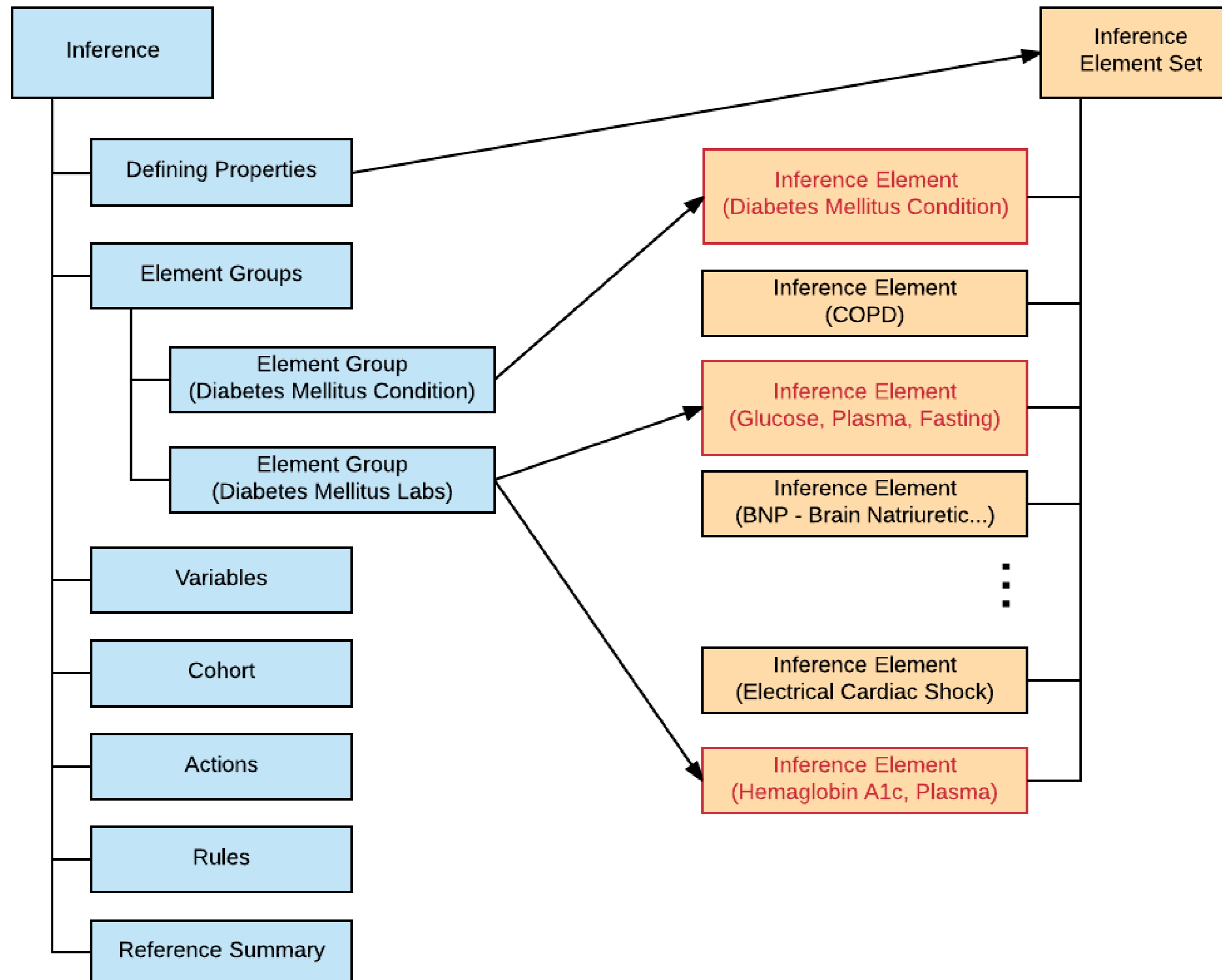
```
patient-1157764.fhir-bundle.xml — Visual Studio Code
File Edit Selection View Go Debug Help
patient-1157764.fhir-bundle.xml x
1 <?xml version="1.0" encoding="UTF-8"?>
2 <feed xmlns="http://www.w3.org/2005/Atom">
3 <title>SMART patient bundle for transactional posting</title>
4 <id>urn:uuid:52</id>
5 <updated>2015-07-07T20:00:55.398000</updated>
6
7 <entry xmlns="http://www.w3.org/2005/Atom">
8 <title>SMART Patient-level resource</title>
9 <id>Patient/1157764</id>
10 <updated>2015-07-07T20:00:55.398000</updated>
11 <published>2015-07-07T20:00:55.398000</published>
12 <author>
13 <name>https://github.com/smart-on-fhir/sample-patients</name>
14 </author>
15 <content type="text/xml">
16
17 <Patient xmlns="http://hl7.org/fhir">
18 <text>
19 <status value="generated"/>
20 <div xmlns="http://www.w3.org/1999/xhtml">
21 <p>Carol Hughes</p>
22 </div>
23 </text>
24 <identifier>
25 <use value="usual"/>
26 <label value="SMART Hospital MRN"/>
27 <system value="urn:oid:0.1.2.3.4.5.6.7"/>
28 <value value="1157764"/>
29 </identifier>
30 <name>
31 <use value="official"/>
32 <family value="Hughes"/>
33 <given value="Carol"/>
34 <given value="U."/>
```

FHIR

Terminology: Inference Element Sets



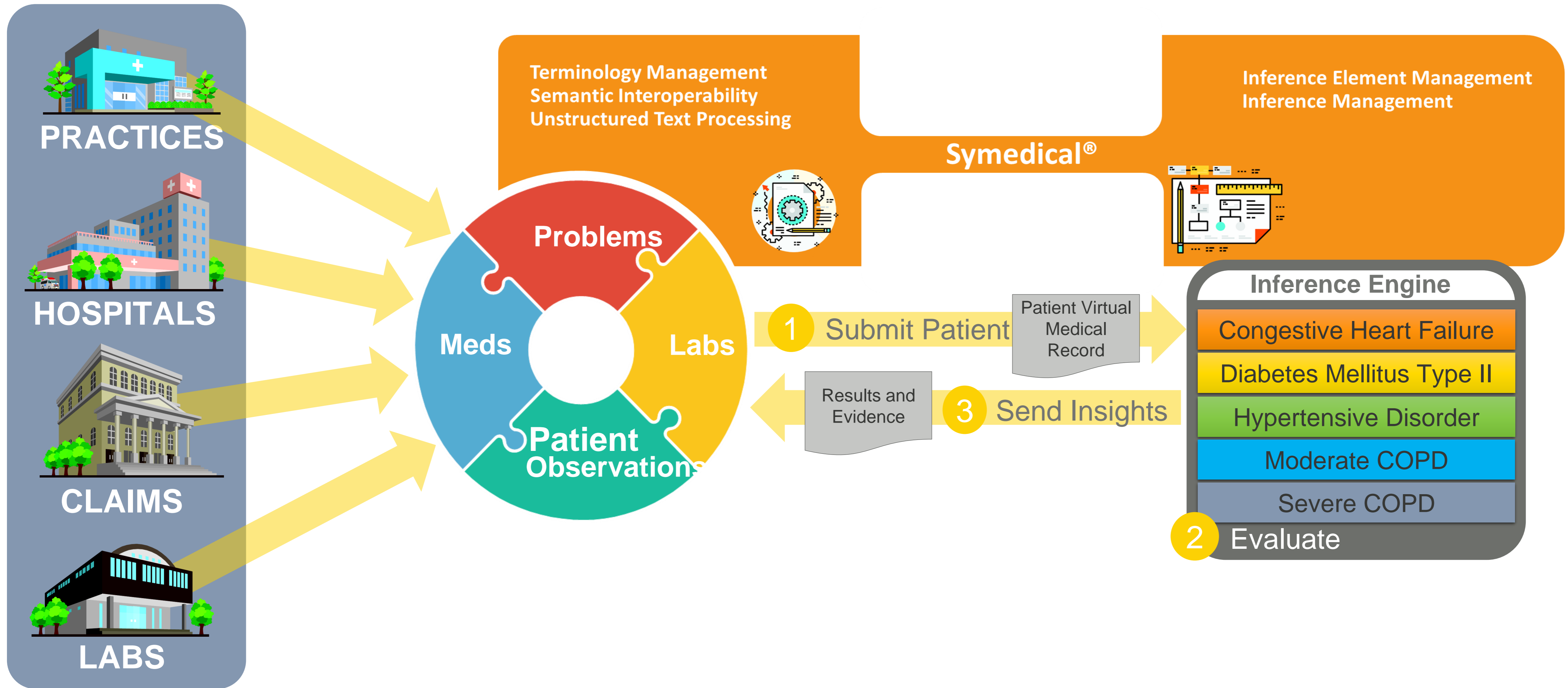
Inferencing Component: The Inference





Clinical Insights (Making it Work)

Example Deployment



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Q&A



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