

Comment gello

GELLO can have the context of an IncomingObservation, for example a pathology result. Metadata within the GELLO can be set to specify LOINC codes for a host system to watch for and if present, run the GELLO.

This worked example will demonstrate using screen shots from the Medical Objects Explorer software. It will show some GELLO that looks for archetyped clinical patient data of height , weight, waist circumference and Blood pressure, such as might be obtained when a patient presents to a medical clinic. The code will take this data, and also look for recent blood tests results; and run its logic as to whether certain conditions are present such as being overweight or having abnormal metabolic profiles. We will use BMI and Triglyceride/HDL ratio. The result of the GELLO is another observation that presents in the UI as System Generated information, below the displayed Observation that has triggered the Comment GELLO.

The context is:

```
Context HL7_v2_VMR_V1::IncomingObservation
```

Metadata is a tuple we create as a local variable and is customisable. MO Explorer knows to look for this when the GELLO is uploaded to the server it uses and stores the Comment GELLO for clinical use.

Here's some metadata:

```
Let metadata = Tuple {
  title = 'calculate metabolic comments on admission vitals and recent pathology',
  keywords = Sequence{'BMI','Weight','Metabolic'},
  version = 1,
  revision = 16,
  date = '20180227',
  author = 'Medical-Objects',
  identifier = 'COMMENT_GELLO:CALCULATE_Metabolic_Comments',
  purpose = 'For metabolic calculation after basic admission and registration vitals
taken by nursing staff',
  includesList = Sequence{'29463-7^^LN','8302-2^^LN','8280-0^^LN','8480-6^^LN','8462-
4^^LN'},
  excludesList = Sequence{}
}
```

Now we can set up some codes for the retrievable data:

```
Let measured_weight_LN: CD = CD{code = '29463-7', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
Let measured_height_LN: CD = CD{code = '8302-2', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
Let measured_waist_LN: CD = CD{code = '8280-0', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
Let sys_BP_LN: CD = CD{code = '8480-6', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
Let diast_BP_LN: CD = CD{code = '8462-4', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
```

These will be the codes that the archetyped data is mapped to.

Add the required lab data LOINC codes:

```
Let trig_LN: CD = CD{code = '14927-8',codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
Let hdl_LN: CD = CD{code = '14646-4',codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN'}
```

Now we get the observation data and the vmr data:

```
-- get the observations and vmr data
Let currentWeight:PQ = observations->select(o| o.observationCode.implies(measured_weight_LN).value)->sortedBy
(dateTime)->last().value.oclAsType(PQ)
Let currentHeight:PQ = observations->select(o| o.observationCode.implies(measured_height_LN).value)->sortedBy
(dateTime)->last().value.oclAsType(PQ)
Let currentWaist:PQ = observations->select(o| o.observationCode.implies(measured_waist_LN).value)->sortedBy
(dateTime)->last().value.oclAsType(PQ)
Let last_trigObservation: Observation = If vmr.observations->select(o| o.observationCode.implies(trig_LN).
value)->sortedBy(dateTime)->last().oclIsDefined() then
  vmr.observations->select(o| o.observationCode.implies(trig_LN).value)->sortedBy(dateTime)->last() else
null endif
Let last_hdlObservation: Observation = If vmr.observations->select(o| o.observationCode.implies(hdl_LN).
value)->sortedBy(dateTime)->last().oclIsDefined() then
  vmr.observations->select(o| o.observationCode.implies(hdl_LN).value)->sortedBy(dateTime)->last() else null
endif
Let last_sysBPObservation: Observation = If observations->select(o| o.observationCode.implies(sys_BP_LN).
value)->sortedBy(dateTime)->last().oclIsDefined() then
  observations->select(o| o.observationCode.implies(sys_BP_LN).value)->sortedBy(dateTime)->last() else null
endif
Let last_diastBPObservation: Observation = If observations->select(o| o.observationCode.implies(diast_BP_LN).
value)->sortedBy(dateTime)->last().oclIsDefined() then
  observations->select(o| o.observationCode.implies(diast_BP_LN).value)->sortedBy(dateTime)->last() else
null endif
```

Notice that for the data obtained from the IncomingObservation ie the measured height, weight, waist circumference, systolic blood pressure and diastolic blood pressure; we don't need to say 'vmr.observations', but when we are looking outside the context of the incoming observation, we do- e.g. for recent pathology. This code keeps the convention of searching for Observations, then ordering them by dateTime, then getting the last Observation. This is probably unnecessary for the archetyped clinical data, but it is possible to repeat a blood pressure reading if high ; so it is retained.

Do a BMI calculation: (we know the units will be cm for height and kg for weight.

```
-- do BMI calculation
Let currentHeightInMeters: PQ = currentHeight/100
Let bmi: Real = currentWeight.value/currentHeightInMeters.value.power(2)
Let bmi_Rounded: Real = bmi.round()
Let bmi_AsString: String = If bmi_Rounded.ocIsDefined() then bmi_Rounded.toChar() else '' endif
```

Do a triglyceride / HDL ratio:

```
--TG HDL ratio
Let trig_HDL_Ratio : Real = If last_trigObservation.ocIsDefined() and last_hdlObservation.ocIsDefined()
then
  last_trigObservation.value.ocAsType(PQ).value / last_hdlObservation.value.ocAsType(PQ).value
  else null endif
Let trig_HDL_Ratio_raised: Boolean = If last_trigObservation.ocIsDefined() and last_hdlObservation.
ocIsDefined() then
  If last_trigObservation.value.ocAsType(PQ).value / last_hdlObservation.value.ocAsType(PQ).value > 2
  then True
  else False endif
else False endif
```

Prepare comments:

```
-- prepare comments
Let commentCode:CD =CD{code = '8251-1', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN',
displayName = ST{value='Comment'}}
Let bmiString: String = 'BMI is '
Let additionalBMIComment: String = If bmi.ocIsDefined() then
  If bmi <18.6 then '. Patient is considered to be Underweight.' else
  If bmi >25 and bmi < 30 then '. Patient is considered to be Overweight.' else
  If bmi >29.9 then '. Patient is considered to be Obese.' else
  ''
  endif endif endif else '' endif
Let trig_HDL_ratio_asChar: String = If trig_HDL_Ratio.ocIsDefined() then trig_HDL_Ratio.toChar() else ''
endif

Let trig_HDL_ratio_comment1: String = If trig_HDL_Ratio_raised then
  '\nTriglyceride-HDL ratio is ' else '' endif
Let trig_HDL_ratio_comment2: String = If trig_HDL_Ratio_raised then trig_HDL_ratio_asChar.concat('. Levels
above 2 are significant.')
else '' endif
Let trig_HDL_ratio_comment: String = trig_HDL_ratio_comment1.concat(trig_HDL_ratio_comment2)

Let comment: String = bmiString.concat(bmi_AsString).concat(additionalBMIComment).concat
(trig_HDL_ratio_comment)
```

Produce the result:

```
-- result
Let result_comment:ST = ST{value=comment}
Let result:Sequence(Observation)
  = Sequence{Observation{
    value = result_comment,
    observationCode = commentCode
  }}
result
```

OK! So here's the input screen in MO Explorer, for the archetype that becomes the Incoming Observation that the GELLO is watching for the LOINC codes for (Comment GELLO just as easily runs against HL7 lab data Observations):

Mrs Samantha PATIENT Born 13-Aug-1981 (36y) Gender Female

Address		Phone Not recorded	Medicare No
Specimen	Lab No 8C425D7E-89B2-4CD2-81FE-B05F21DD987D	Request Date 5/02/2018	Effective Date 5/02/2018
Requested By PETER SCOTT		Generated Date 5/02/2018 11:27 AM	
		CC	

Cumulative Results
Park Result
Request Chart
Path Request
Create Response
Provider Note
Result History
Edit Report

Creating CEN.Basic_Admission_Registration_Obs.v1 Lab No: "" for Mrs Samantha Patient

Height	<input type="text"/>	Units	cm
Weight	<input type="text"/>	Units	kg
Waist circumference	<input type="text"/>	Units	cm
Blood pressure			
Systolic BP	<input type="text"/>	Units	mmHg
Diastolic BP	<input type="text"/>	Units	mmHg

Here's what happens when we run the gello explicitly against this patient's data:

Medical-Objects GELLO IDE (Mowgli)

```

1 Context HL7_v2_VMR_V1:IncomingObservation
2 Let metadata = Tuple {
3   title = 'calculate metabolic comments on admission vitals and recent pathology',
4   keywords = Sequence('BMI','Weight','Metabolic'),
5   version = 1,
6   revision = 1,
7   date = '20180227',
8   author = 'Medical-Objects',
9   identifier = 'COMMENT_GELLO:Test',
10  purpose = 'For metabolic calculation after basic admission and registration vitals taken by
11  includesList = Sequence('29463-7^LN','8302-2^LN','8280-0^LN','8480-6^LN','8462-4^LN'
12  excludesList = Sequence()
13 }
14 Let measured_weight_LN: CD = CD(code = '29463-7', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
15 Let measured_height_LN: CD = CD(code = '8302-2', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
16 Let measured_waist_LN: CD = CD(code = '8280-0', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
17 Let sys_BP_LN: CD = CD(code = '8480-6', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
18 Let diast_BP_LN: CD = CD(code = '8462-4', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
19 Let trig_LN: CD = CD(code = '14927-8', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
20 Let hdl_LN: CD = CD(code = '14646-4', codeSystem = '2.16.840.1.113883.6.1', codeSystemName = 'LN')
21
22 -- get the observations and vmr data
23 Let currentWeight:PQ = observations->select(o | o.observationCode.implies(measured_weight_LN.value)->sortedBy(date)
24 Let currentHeight:PQ = observations->select(o | o.observationCode.implies(measured_height_LN.value)->sortedBy(date)
25 Let currentWaist:PQ = observations->select(o | o.observationCode.implies(measured_waist_LN.value)->sortedBy(date)
26 Let last_trigObservation: Observation = If vmr.observations->select(o | o.observationCode.implies(trig_LN.value)->
27   vmr.observations->select(o | o.observationCode.implies(trig_LN.value)->sortedBy(dateTime)->last() else null endif
28 Let last_hdlObservation: Observation = If vmr.observations->select(o | o.observationCode.implies(hdl_LN.value)->
29   vmr.observations->select(o | o.observationCode.implies(hdl_LN.value)->sortedBy(dateTime)->last() else null endif
30 Let last_sysBPObservation: Observation = If observations->select(o | o.observationCode.implies(sys_BP_LN.value)->
31   observations->select(o | o.observationCode.implies(sys_BP_LN.value)->sortedBy(dateTime)->last() else null endif
32 Let last_diaastBPObservation: Observation = If observations->select(o | o.observationCode.implies(diast_BP_LN.value)
33   observations->select(o | o.observationCode.implies(diast_BP_LN.value)->sortedBy(dateTime)->last() else null endif
34
35 -- do BMI calculation
36 Let currentHeightInMeters: Real = currentHeight/100
37 Let bmi: Real = currentWeight.value/currentHeightInMeters.value.power(2)
38 Let bmi_Rounded: Real = bmi.round()
39 Let bmi_AsString: String = If bmi_Rounded.oclIsDefined() then bmi_Rounded.toChar() else '' endif
40
41 --TG HDL Ratio
42 Let trig_HDL_Ratio : Real = If last_trigObservation.oclIsDefined() and last_hdlObservation.oclIsDefined() then
43   last_trigObservation.value.oclAsType(PQ).value / last_hdlObservation.value.oclAsType(PQ).value
44 else null endif
45 Let trig_HDL_Ratio_raised: Boolean = If last_trigObservation.oclIsDefined() and last_hdlObservation.oclIsDefined()
46   If last_trigObservation.value.oclAsType(PQ).value / last_hdlObservation.value.oclAsType(PQ).value > 2
47 then True
48 else False endif

```

Results Explorer

Name	Class	Data
currentHeight	PQ	157 cm
currentWaist	PQ	100 cm
last_trigObservation	Observation	<Observation: TObservation>
last_hdlObservation	Observation	<Observation: TObservation>
last_sysBPObservation	Observation	<Observation: TObservation>
last_diaastBPObservation	Observation	<Observation: TObservation>
currentHeightInMeters	PQ	1.57 cm
bmi	Real	31.92223457271
bmi_Rounded	Integer	32
bmi_AsString	String	32
trig_HDL_Ratio	Real	5
trig_HDL_Ratio_raised	Boolean	true
commentCode	CD	
bmiString	String	BMI is
addionalBmiComment	String	. Patient is considered to be Obese.
trig_HDL_ratio_asChar	String	5
trig_HDL_ratio_comment1	String	Triglyceride:HDL ratio is
trig_HDL_ratio_comment2	String	5. Levels above 2 are significant.
trig_HDL_ratio_comment	String	Triglyceride:HDL ratio is 5. Levels above 2 are significant.
comment	String	BMI is 32. Patient is considered to be Obese.Triglyceride:HD...
result_comment	ST	BMI is 32. Patient is considered to be Obese.Triglyceride:HD...
result[1]	Sequence(Observation)	Sequence(<Observation: TObservation>)
result[1]	Sequence(Observation)	Sequence(<Observation: TObservation>)
[1]	Observation	<Observation: TObservation>
id	String	<null>
encounter	Encounter	<null>
observationCode	CD	Comment
components	Sequence(Observation)	<null>
identifier	II	<null>
si value	ST	BMI is 32. Patient is considered to be Obese.Triglyceride:HD...
referenceRange	DL_QTY	<null>
abnormalFlag	CD	<null>
dateTime	TS	<null>
diagnosticServiceSectionId	CD	<null>
specimenCode	CD	<null>
templateID	String	<null>

Here's the UI of the Observation showing the comment as a string under 'System Generated information':

Patients

Query	1
PATIENT: SAMANTHA	
Unreviewed Results	0
Further Review	0
Requested Charts	0
Decision Support	0
Reports created	0

Mrs Samantha PATIENT Born 13-Aug-1981 (36y) Gender Female

Address		Phone	Not recorded	Medicare No
Specimen	Lab No	Request Date	Effective Date	Generated Date
	16045313-97BA-401F-A04D-3165142CFDCD	20/02/2018	20/02/2018	20/02/2018 9:30 AM
Requested By		CC		
DR PETER SCOTT				

--	--	--	--	--	--	--	--

Available Results

Disease	Groups	Graphs
2.02.2018	CEN-ELFTS.v1	
20.02.2018	CEN Basic Admission Registra	
5.02.2018	CEN Basic Admission Registra	
1.10.2017	Diet followup	
5.10.2017	Lipid Measurement	
4.10.2017	Lipid Measurement	
3.10.2017	Diet followup	
5.10.2016	Iron measurement	
5.09.2016	Update Health Record	
3.07.2016	Full Blood Count	
5.05.2016	Electrolytes and LFTs	
5.05.2016	osmolality - urine	
5.05.2016	Thyroid panel	
5.05.2016	Electrolytes and LFTs	
4.05.2016	Patient Registration	
4.05.2016	Patient Registration	

CEN.Basic_Admission_Registration_Obs.v1 Basic view active:

		Units	Time
Height	167	cm	20.2.2018
Weight	90.0	kg	20.2.2018
Waist circumference	100	cm	20.2.2018
BLOOD PRESSURE	20.2.2018		
Systolic BP	150	mmHg	20.2.2018
Diastolic BP	100	mmHg	20.2.2018

System Generated information

BMI is 32. Patient is considered to be Obese.
 Triglyceride-HDL ratio is 5. Levels above 2 are significant.

Report Author: Dr. PETER SCOTT Service Provider: Peter Scott Demo Equator
 From Peter Scott Demo Equator "MOE02200930544-4839" 20.02.2018