

Extending the model

Often the schema of a clinical domain will be a superset of the VMR. For example, this tutorial considers the situation of a diabetic foot clinic where additional information along with standard observations is recorded in the EHR and presentable through an extended VMR. The VMR extension can be captured in a Package (in a similar way to the way we did a Library). Its also possible to import the new extended model as a 'hardwired' internal package. Another way to customise an extended data model is to use an archetype.

A diabetic clinic exam will look at the things like the ankle brachial index (a measure of blood flow), the pulses, and abnormalities that may be present. Compile and then save the following as *ExtendedDiabeticFoot.gello_model*:

```
Package ExtendedDiabeticFoot

imports
  iso_21090_datatypes,
  HL7_v2_VMR_V1

class DiabeticFootObservations extends Any
  diabeticFootExamDate: TS
  leftDorsalisPedisPulseFull: Boolean
  rightDorsalisPedisPulseFull: Boolean
  leftPosteriorTibialPulseFull: Boolean
  rightPosteriorTibialPulseFull: Boolean
  leftAnkleBrachialIndex: Real
  rightAnkleBrachialIndex: Real
  anyFootDeformity: Boolean
  anyNeurologicalChanges: Boolean
  anyUlcerPresent: Boolean

class ExtendedDiabeticFootExample_SinglePatient extends SinglePatient
  diabeticFootObservations: Sequence(DiabeticFootObservations)

class InfrastructureRoot extends Any
  singlePatient: ExtendedDiabeticFootExample_SinglePatient

EndPackage
```

As before with a Library, this file needs to be saved to the same folder as any GELLO files that use it.

Now lets add some more clinical data to *fifthTest.xml* and save it as *SeventhTuteTest.xml*.

Add it between `</vitals>` and `</singlePatient>` at the end:

```
<observations>
  <observationCode code="43396009"
    codeSystem="2.16.840.1.113883.6.96"
    codeSystemName="SNOMED-CT">
    <displayName value = "Hemoglobin Alc measurement " />
    <translation code="4548-4"
      codeSystem="2.16.840.1.113883.6.1"
      codeSystemName="LN">
      <displayName value = "Hemoglobin Alc/Hemoglobin.Total In Blood" />
    </translation>
  </observationCode>
  <dateTime value = "20160616" />
  <value xsi:type = "PQ" value = "9.0" unit = "%"/>
</observations>
<diabeticFootObservations>
  <diabeticFootExamDate value = "20160616" />
  <leftDorsalisPedisPulseFull value = "false" />
  <rightDorsalisPedisPulseFull value = "true" />
  <leftPosteriorTibialPulseFull value = "true" />
  <rightPosteriorTibialPulseFull value = "true" />
  <leftAnkleBrachialIndex value = "0.7" />
  <rightAnkleBrachialIndex value = "0.9" />
  <anyFootDeformity value = "false" />
  <anyNeurologicalChanges value = "false" />
  <anyUlcerPresent value = "false" />
</diabeticFootObservations>
```

Cut and paste the following GELLO into a new workspace:

```
Imports ExtendedDiabeticFoot
Context ExtendedDiabeticFootExample_SinglePatient

Let lastFootExam: DiabeticFootObservations = diabeticFootObservations->
  sortedBy(diabeticFootExamDate)->last()

Let lastHBAIc: PQ = observations->
  select(o|o.observationCode.code='43396009')
  ->sortedBy(dateTime)->last().value.oclAsType(PQ)
```

```

--flag a high risk situation

Let highRiskDiabeticFoot: Boolean =
  (lastFootExam.leftAnkleBrachialIndex < 0.9 or
   lastFootExam.rightAnkleBrachialIndex < 0.9) or
  (lastFootExam.leftDorsalisPedisPulseFull = false or
   lastFootExam.rightDorsalisPedisPulseFull = false) or
  lastFootExam.anyFootDeformity = true or
  lastFootExam.anyNeurologicalChanges = true or
  lastFootExam.anyUlcerPresent= true
  and
  lastHBA1c > factory.PQ(7.5, '%')

If highRiskDiabeticFoot then 'High Risk DiabeticFoot - consider referral'
else
  ''
endif

```

And after compiling and saving it say as *tuteSeven.gello* , run:

The screenshot shows the Medical-Objects GELLO IDE interface. The main editor displays a GELLO script with the following content:

```

1 Import ExtendedDiabeticFoot
2 Context ExtendedDiabeticFootExample_SinglePatient
3
4 Let lastFootExam: DiabeticFootObservations = diabeticFootObservations->
5   sortedBy(diabeticFootExamDate)->last()
6
7 Let lastHBA1c: PQ = observations->
8   select(o.o.observationCode.code='43396009')
9   ->sortedBy(dateTime)->last().value.oclAsType(PQ)
10
11 --flag a high risk situation
12
13 Let highRiskDiabeticFoot: Boolean =
14 (lastFootExam.leftAnkleBrachialIndex < 0.9 or
15  lastFootExam.rightAnkleBrachialIndex < 0.9) or
16 (lastFootExam.leftDorsalisPedisPulseFull = false or
17  lastFootExam.rightDorsalisPedisPulseFull = false) or
18 lastFootExam.anyFootDeformity = true or
19 lastFootExam.anyNeurologicalChanges = true or
20 lastFootExam.anyUlcerPresent= true
21 and
22 lastHBA1c > factory.PQ(7.5, '%')
23
24 If highRiskDiabeticFoot then 'High Risk DiabeticFoot - consider referral'
25 else
26 ''
27 endif

```

The Results Explorer on the right shows the following data:

Name	Class	Data
Context	ExtendedDiabeticF...	<ExtendedDiabeticFootExample_SingleP
lastFootExam	DiabeticFootObser...	<DiabeticFootObservations: TRTTIClone
lastHBA1c	PQ	9 %
highRiskDiabeticFoot	Boolean	true
Result	String	High Risk DiabeticFoot - consider referral