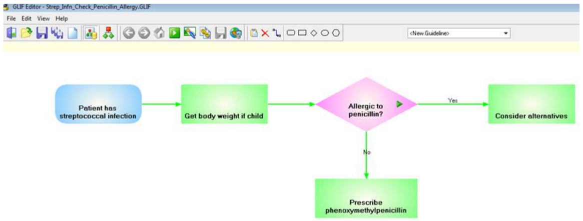
GLIF and GELLO worked example - allergies

Now we will do an example for checking whether a patient is allergic to penicillin.

Set up a simple GLIF file such as the following, remember to click on the the **Allow Modifications** button to enable editing:


GLIF Editor - Strep_Infn_Check_Penicillin_Allergy.GLIF
File Edit View Help
<New Guideline>
Patient has streptococcal infection
Get body weight if child
Allergic to penicillin?
Yes
Consider alternatives
No
Prescribe phenoxymethylpenicillin

Give it a name such as *Strep_Infn_Check_Penicillin_Allergy.GLIF*

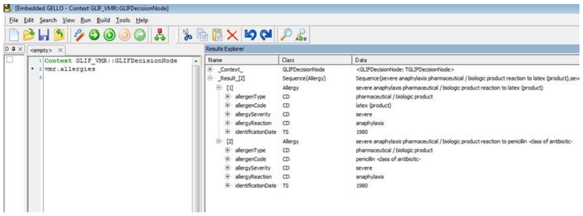
Load the patient data file test.xml using the GLIF editor top menu as in the previous tutorial.

Go to the 'Yes' arrow outflowing from the "Allergic to penicillin?" Decision step, and open the GELLO editor for this decision execution.

Load up the vmr as before, but this time we are interested in patient allergies , so make the code to be:

```
Context GLIF_VMR::GLIFDecisionNode

vmr.allergies
```


[Embedded GELLO - Context GLIF_VMR::GLIFDecisionNode]
File Edit Search View Run Build Tools Help
<empty>
Results Explorer

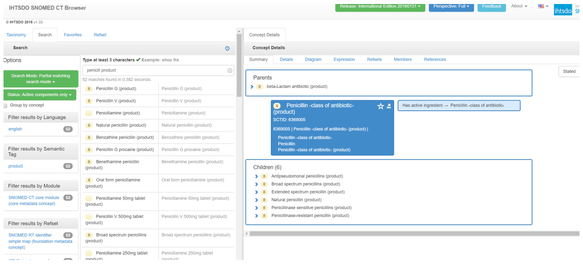
```
Context GLIF_VMR::GLIFDecisionNode
vmr.allergies
```

Name	Class	Data
Context	GLIFDecisionNode	<GLIFDecisionNode: TGLIFDecisionNode>
Result[2]	Sequence(Allergy)	Sequence(severe anaphylaxis pharmaceutical / biologic product reaction to latex (product),sev
[1]	Allergy	severe anaphylaxis pharmaceutical / biologic product reaction to latex (product)
allergenType	CD	pharmaceutical / biologic product
allergenCode	CD	latex (product)
allergySeverity	CD	severe
allergyReaction	CD	anaphylaxis
identificationDate	TS	1980
[2]	Allergy	severe anaphylaxis pharmaceutical / biologic product reaction to penicillin -class of antibiotic-
allergenType	CD	pharmaceutical / biologic product
allergenCode	CD	penicillin -class of antibiotic-
allergySeverity	CD	severe
allergyReaction	CD	anaphylaxis
identificationDate	TS	1980

Ok we can see two allergies. Unfold on the allergenCode attribute of the second of the two listed allergies in Model Explorer. Note the mandatory three properties of a CD datatype again - the code, codeSystem and codeSystemName. In this case they are '6369005' , '2.16.840.1.113883.6.96' and 'SNOMED-CT'.

Set up the local variable for a parent SNOMED CT concept we want to query on. (ie this code will need to cover *all* penicillins in SNOMED CT). Note that in SNOMED CT , medications can be products or substances. Use an online SNOMED CT browser such as that available at **http://browser.ihtsdotools.org/**

Please note to take care to comply with license restrictions of SNOMED International



Search

Options

Search Mode: Partial matching search mode

Status: Active components only

□ Group by concept

Filter results by Language: english 52

Filter results by Semantic Tag: product 52

Filter results by Module: SNOMED CT core module (core metadata concept) 52

Filter results by Refset: SNOMED RT identifier simple map (foundation metadata concept) 52

Type at least 3 characters ✓ Example: *shou fra*

penicill product

52 matches found in 0.382 seconds.

Penicillin G (product)	Penicillin G (product)
Penicillin V (product)	Penicillin V (product)
Penicillamine (product)	Penicillamine (product)
Natural penicillin (product)	Natural penicillin (product)
Benzathine penicillin (product)	Benzathine penicillin (product)
Penicillin G procaine (product)	Penicillin G procaine (product)
Benethamine penicillin (product)	Benethamine penicillin (product)
Oral form penicillamine (product)	Oral form penicillamine (product)
Penicillamine 50mg tablet (product)	Penicillamine 50mg tablet (product)
Penicillin V 500mg tablet (product)	Penicillin V 500mg tablet (product)
Broad spectrum penicillins (product)	Broad spectrum penicillins (product)
Penicillamine 250mg tablet (product)	Penicillamine 250mg tablet (product)

Concept Details

Parents
- beta-Lactam antibiotic (product)

Penicillin -class of antibiotic- (product)
SCTID: 6369005
6369005 | Penicillin -class of antibiotic- (product) |
Penicillin -class of antibiotic-
Penicillin
Penicillin -class of antibiotic- (product)

Has active ingredient → Penicillin -class of antibiotic-

Children (6)
- Antipseudomonal penicillins (product)
- Broad spectrum penicillins (product)
- Extended spectrum penicillin (product)
- Natural penicillin (product)
- Penicillinase sensitive penicillins (product)
- Penicillinase-resistant penicillin (product)

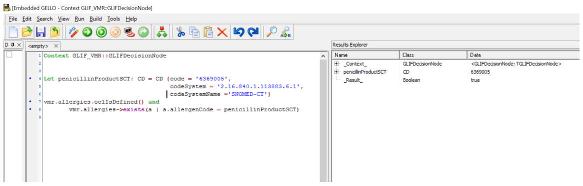
So the code we currently have for the patient is already a high level concept in the Product hierarchy in SNOMED CT. A parent concept for this would be 90614001 | beta-Lactam antibiotic (product) |, but this will subsume cephalosporins as well (while there is a potential cross allergy to this class, many patients can tolerate them). So we will use the code '6369005', and it just happens to be the same as the code in the patient record in this particular case.

Let's just use an 'equals' operator for now in the last line:

```
     Let penicillinProductSCT: CD = CD {code = '6369005',
                                        codeSystem = '2.16.840.1.113883.6.1',
                                        codeSystemName ='SNOMED-CT'}

     vmr.allergies.oclIsDefined() and
       vmr.allergies->exists(a | a.allergenCode = penicillinProductSCT)
```

Here's the result:


[Embedded GELLO - Context GLIF_VMR::GLIFDecisionNode]
File Edit Search View Run Build Tools Help
<empty>
Results Explorer

```
Context GLIF_VMR::GLIFDecisionNode


Let penicillinProductSCT: CD = CD {code = '6369005',
                                   codeSystem = '2.16.840.1.113883.6.1',
                                   codeSystemName ='SNOMED-CT'}
vmr.allergies.oclIsDefined() and
       vmr.allergies->exists(a | a.allergenCode = penicillinProductSCT)
```

Name	Class	Data
Context	GLIFDecisionNode	<GLIFDecisionNode: TGLIFDecisionNode>
penicillinProductSCT	CD	6369005
Result	Boolean	true

The last line can become

```
     vmr.allergies->select(a|a.allergenCode.implies(penicillinProductSCT).
asBoolean())->size()>0
```

or

```
     vmr.allergies->exists(a|a.allergenCode.implies(penicillinProductSCT).
asBoolean())
```

and this is different for a couple of reasons. Firstly and importantly we are now using the *i mplies* method which looks for parent-child subsumption in the SNOMED CT ontology (in this case defaulting to "=" as the codes are the same); and secondly with respect to syntax we are using a select or exists operator on the collection of allergies. The syntax can look a bit daunting the first time, but this is an example of some GELLO code you can cut and paste and then modify for new uses. Also the implies method may not work in your system depending on whether we have hooked our SNOMED CT server up for you or not.

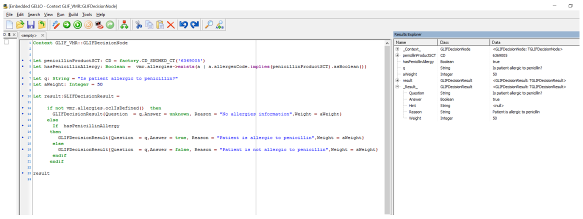
The setting up of the local CD variable can also be changed and shortened if you wish:

```
     Let penicillinProductSCT: CD = factory.CD_SNOMED_CT('6369005')
```

In any case we need to make this a GLIF Decision, so modify the last line by saying

```
     Let hasPenicillinAllergy: Boolean =
```

ahead of what is there and then insert a GLIFDecisionResult-typed result as in this screenshot:


[Embedded GELLO - Context GLIF_VMR::GLIFDecisionNode]
File Edit Search View Run Build Tools Help
<empty>
Results Explorer

```
Context GLIF_VMR::GLIFDecisionNode


Let penicillinProductSCT: CD = factory.CD_SNOMED_CT('6369005')
Let hasPenicillinAllergy: Boolean =  vmr.allergies->exists(a | a.allergenCode.implies(penicillinProductSCT).asBoolean())

Let q: String = "Is patient allergic to penicillin?"
Let aWeight: Integer = 50

Let result:GLIFDecisionResult =

     if not vmr.allergies.oclIsDefined()  then
       GLIFDecisionResult{Question  = q,Answer = unknown, Reason = "No allergies information",Weight = aWeight}
     else
       If  hasPenicillinAllergy
      then
         GLIFDecisionResult{Question  = q,Answer = true, Reason = "Patient is allergic to penicillin",Weight = aWeight}
       else
         GLIFDecisionResult{Question  = q,Answer = false, Reason = "Patient is not allergic to penicillin",Weight = aWeight}
       endif
      endif

result
```

Name	Class	Data
Context	GLIFDecisionNode	<GLIFDecisionNode: TGLIFDecisionNode>
penicillinProductSCT	CD	6369005
hasPenicillinAllergy	Boolean	true
q	String	Is patient allergic to penicillin?
aWeight	Integer	50
result	GLIFDecisionResult	<GLIFDecisionResult: TGLIFDecisionResult>
Result	GLIFDecisionResult	<GLIFDecisionResult: TGLIFDecisionResult>
Question	String	Is patient allergic to penicillin?
Answer	Boolean	true
Hint	String	<null>
Reason	String	Patient is allergic to penicillin
Weight	Integer	50

So now we save all that and then copy this gello into the "no' arrow and modify the GLIF Decision result code so we get a corresponding boolean "no" in that executed decision arrow. This section for the "no" arrow becomes:

```
 Let q: String = "Is patient allergic to penicillin?"
 Let aWeight: Integer = 50

 Let result:GLIFDecisionResult =

     if not vmr.allergies.oclIsDefined()  then
       GLIFDecisionResult{Question  = q,Answer = unknown, Reason = "No
allergies information",Weight = aWeight}
     else
       If not hasPenicillinAllergy
      then
         GLIFDecisionResult{Question  = q,Answer = true, Reason = "Patient is
not allergic to penicillin",Weight = aWeight}
       else
         GLIFDecisionResult{Question  = q,Answer = false, Reason = "Patient
is allergic to penicillin",Weight = aWeight}
       endif
     endif

 result
```