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**SNOMED CT**

The global language of healthcare

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## Presentation Overview


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- SNOMED CT binding objectives
- SNOMED CT binding types
  - Value set
  - Attribute
  - Concept domain
  - Expression template
- Binding example






# SNOMED CT Binding Objectives

## FHIR Priority Use Cases for SNOMED CT Binding

1. Quality checking FHIR models
  - Checking for missing qualifiers or inappropriate qualifiers
2. Semantic checking of data instances
  - E.g. Code = |Fracture of femur|, Body site = |Humerus|
3. Composing/decomposing expressions
  - Composing postcoordinated expressions from values
  - Decomposing precoordinated expressions




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## Example – Suspected Lung Cancer



Hospital A	Hospital B	Hospital C
<b>Condition</b> Problem/Dx Cancer Body site Lung Status <input checked="" type="radio"/> Suspected <input type="radio"/> Confirmed <input type="radio"/> Not found OK Cancel	<b>Problem</b> Problem/Dx Name Lung cancer Status Suspected OK Cancel	<b>Diagnosis</b> Name Suspected lung cancer OK Cancel

## Example – Suspected Lung Cancer

	Hospital A	Hospital B	Hospital C
<b>Condition</b>			
code	Cancer	Suspected cancer	Suspected lung cancer
bodySite	Lung	Lung	
status	Suspected		



# SNOMED CT Binding Types

## SNOMED CT Binding Types

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- Value set binding
  - Links a coded data element to a set of possible values
- Attribute binding
  - Links a coded data element to a corresponding attribute in the SNOMED CT concept model.
- Concept domain binding
  - Links a element, group or resource to a set of SNOMED CT concepts that represents intended semantics of instances
    - Whether or not SNOMED CT is used for the values
- Template binding
  - Links a resource (or group) to a SNOMED CT expression template that enables an instance to be composed or decomposed using the SNOMED CT concept model.

Model Meaning Binding

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## SNOMED CT Value Set Binding - Condition

### Terminology Binding

Path	Definition	Type	Reference
Condition.severity	A subjective assessment of the severity of the condition as evaluated by the clinician.	Preferred	Condition/Diagnosis Severity
Condition.code	Identification of the condition or diagnosis.	Example	Condition/Problem/ Diagnosis Codes
Condition.bodySite	Codes describing anatomical locations. May include laterality.	Example	SNOMED CT Body Structures
Condition.stage.summary	Codes describing condition stages (e.g. Cancer stages).	Example	Condition Stage
Condition.evidence.code	Codes that describe the manifestation or symptoms of a condition.	Example	Manifestation and Symptom Codes

<http://hl7.org/fhir/ValueSet/condition-severity>

### Content Logical Definition

Include these codes as defined in <http://snomed.info/sct>

Code	Display
24484000	Severe
6736007	Moderate
255604002	Mild



## SNOMED CT Value Set Binding - Condition

### Terminology Binding

Path	Definition	Type	Reference
Condition.severity	A subjective assessment of the severity of the condition as evaluated by the clinician.	Preferred	Condition/Diagnosis Severity
Condition.code	Identification of the condition or diagnosis.	Example	Condition/Problem/ Diagnosis Codes
Condition.bodySite	Codes describing anatomical locations. May include laterality.	Example	SNOMED CT Body Structures
Condition.stage.summary	Codes describing condition stages (e.g. Cancer stages).	Example	Condition Stage
Condition.evidence.code	Codes that describe the manifestation or symptoms of a condition.	Example	Manifestation and Symptom Codes

<http://hl7.org/fhir/ValueSet/condition-code>

### Content Logical Definition

1. Include codes from <http://snomed.info/sct> where concept is-a 404684003 (Clinical finding (finding))
2. Include these codes as defined in <http://snomed.info/sct>

Code	Display
160245001	No current problems or disability

### Expansion

This expansion was generated 20 Oct 2016

Code	Display
160245001	No current problems or disability
195967001	Asthma
32398004	Bronchitis
41652007	Pain in eye



## SNOMED CT Value Set Binding – Review Process

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1. Valid display text
  - Display text is an acceptable synonym for the given 'code' (en-US)
2. Active concepts
  - All concepts in international value sets are active in international edition of SNOMED CT (unless specified and optional)
3. Appropriate concepts
  - All concepts are consistent and appropriate for the intended use
4. No content gaps
  - No obvious gaps in the content of the value set (for intended use)
5. Clear context and meaning
  - Context and qualifying information is represented consistently with no ambiguity, either in the terminology or in other data elements

A value set version management strategy is also required

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## SNOMED CT Attribute Binding

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*Links a coded data element to a corresponding attribute in the SNOMED CT concept model*


- Only applied to data elements whose meaning can be represented using the SNOMED CT concept model
- Objectives
  1. Quality checking models
    - Checking for missing or inappropriate qualifiers
  3. Composing/decomposing expressions
    - Decomposing precoordinated expressions into structure
- Example

**Element**

*Condition.bodySite*

**Attribute Binding**

363698007 |Finding site|


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## SNOMED CT Concept Domain Binding


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*Links an element, group or resource to a set of SNOMED CT concepts that represent the intended semantics of its instances*

When applied to a coded data element

- Objectives
  1. Quality checking models
    - Checking intended range against associated concept model attributes
    - Checking intended range against value set definitions
    - Checking for potential ambiguities caused by overlapping data
      - E.g. Code = |Fracture of femur|, Body site = |Humerus|
- Example
 

<b>Element</b>	<b>Attribute Binding</b>
<i>Condition.severity</i>	< 272141005  Severities


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## SNOMED CT Concept Domain Binding


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*Links an element, group or resource to a set of SNOMED CT concepts that represent the intended semantics of its instances*

When applied to a resource or data group

- Objectives
  1. Quality checking models
    - Defines the intended clinical scope of the model in a more formal way
    - Checking consistency with value sets (e.g. for 'code')
    - Checking that resource is composed/nested in an appropriate context
- Example
 

<b>Resource</b>	<b>Concept Domain Binding</b>
<i>Family Member History</i>	< 416471007  Family history of clinical finding



Links a resource to a SNOMED CT expression template that can be composed or decomposed

## SNOMED CT Template Binding

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*Links a resource (or group) to a SNOMED CT expression template that enables an instance to be composed or decomposed using the SNOMED CT concept model*

- Objectives
  2. Semantic checking of instances  
E.g.: Code = |Fracture of femur|, Body site = |Humerus|
  3. Composing/decomposing expressions
- Example: *Family Member History*

**Template Binding**

```

413350009 |Finding with explicit context| : [[@group1]]
{ 246090004 |Associated finding| = [[+@condition]],
  408732007 |Subject relationship context| = [[+@relationship]],
  408731000 |Temporal context| = 410511007 |Current or past|,
  408729009 |Finding context| = 410515003 |Known present|}
    
```



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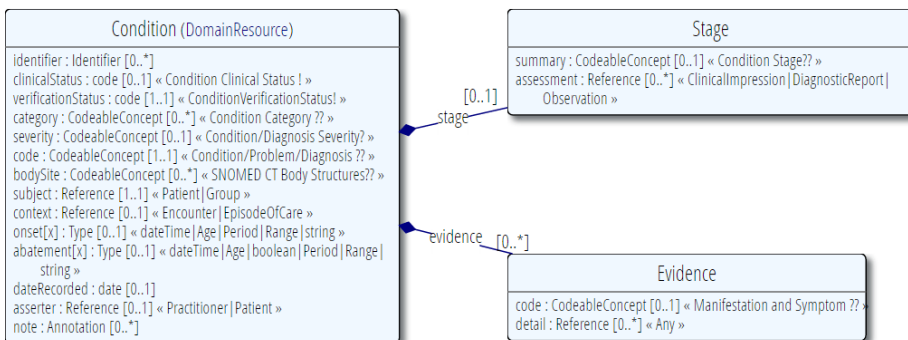


## Binding Example




## Condition

- Use to record detailed information about conditions, problems or diagnoses recognized by a clinician.




## Condition Resource – Value Set Binding

Path	Definition	Type	Reference
Condition.severity	A subjective assessment of the severity of the condition as evaluated by the clinician.	Preferred	Condition/Diagnosis Severity
Condition.code	Identification of the condition or diagnosis.	Example	Condition/Problem/Diagnosis Codes
Condition.bodySite	Codes describing anatomical locations. May include laterality.	Example	SNOMED CT Body Structures
Condition.stage.summary	Codes describing condition stages (e.g. Cancer stages).	Example	Condition Stage
Condition.evidence.code	Codes that describe the manifestation or symptoms of a condition.	Example	Manifestation and Symptom Codes



### Condition Resource – Attribute and Range Binding

Element	Attribute	Range
clinicalStatus	-	< 303105007  Disease phases
verificationStatus	246112005  Finding context	< 410514004  Finding context value
category	-	< 404684003  Clinical finding
code	246090004  Associated finding	< 404684003  Clinical finding  OR < 413350009  Finding with explicit context  OR < 272379006  Event
severity	246112005  Severity	< 272141005  Severities
bodySite	363698007  Finding site	< 442083009  Anatomical or acquired body structure
stage.summary	-	< 254291000  Staging and scales
evidence.code	-	< 404684003  Clinical finding



### Condition Resource – Attribute and Range Binding

Element	Attribute	Range
clinicalStatus	-	< 303105007  Disease phases
verificationStatus	246112005  Finding context	< 410514004  Finding context value
category	-	< 404684003  Clinical finding
code	246090004  Associated finding	((((((< 404684003  Clinical finding  MINUS << 420134006  Propensity to adverse reactions ) MINUS << 473010000  Hypersensitivity condition ) MINUS << 79899007  Drug interaction ) MINUS << 69449002  Drug action ) MINUS << 441742003  Evaluation finding ) MINUS << 307824009  Administrative status ) MINUS << 385356007  Tumor stage finding ) OR < 413350009  Finding with explicit context  OR < 272379006  Event
severity	246112005  Severity	< 272141005  Severities
bodySite	363698007  Finding site	< 442083009  Anatomical or acquired body structure
stage.summary	-	< 254291000  Staging and scales
evidence.code	-	< 404684003  Clinical finding



## Condition – Template Binding

Resource	SNOMED CT Expression Template
Condition	<pre> [[ +id @conditionWithContext ]] : [[ @group1 ]]   { 246090004  Associated finding  = ( [[ +id @condition ]] :     246112005  Severity  = [[ + @severity ]], [[ @group2 ]]     { 363698007  Finding site  = [[+ @bodySite ]],       255234002  After  = [[+ @after ]],       116676008  Associated morphology  = [[+ @morphology ]],       47429007  Associated with  = [[+ @associatedWith ]],       246075003  Causative agent  = [[+ @agent ]],       42752001  Due to  = [[+ @dueTo ]],       363713009  Has interpretation  = [[+ @hasInterpretation]],       363714003  Interprets  = [[+ @interprets ]],       370135005  Pathological process  = [[+ @pathProcess ]]       246454002  Occurrence  = [[+ @occurrence]] } }     408732007  Subject relationship context  = [[+ @subjectContext]],     408731000  Temporal context  = [[ + @temporalContext ]],     408729009  Finding context  = [[ + @findingContext ]] }                     </pre>



## Condition – Template Binding

Resource	SNOMED CT Expression Template (Structure Definition)
Condition	<pre> SCT_Condition_Template: SNOMEDCTExpressionTemplate   findingWithExplicitContext [1]: Coding   group1 [0..*]: RelationshipGroupElement   associatedFinding [1..1]: Coding   severity [0..1]: Coding   group2 [0..*]: RelationshipGroupElement   findingSite [0..1]: Coding   after [0..1]: Coding   morphology [0..1]: Coding   associatedWith [0..1]: Coding   agent [0..1]: Coding   dueTo [0..1]: Coding   hasInterpretation [0..1]: Coding   interprets [0..1]: Coding   pathProcess [0..1]: Coding   occurrence [0..1]: Coding   subjectRelationship [1]: Coding   temporalContext [1]: Coding   findingContext [1]: Coding                     </pre>

## Condition – Template Binding

Resource	SNOMED CT Expression Template (Structure Definition)
Condition	<p>SCT_Condition_Template: SNOMEDCTExpressionTemplate</p> <p>findingWithExplicitContext [1]: Coding</p> <p>group1 [0..*]: RelationshipGroupElement</p> <p>associatedFinding [1..1]: Coding</p> <p>severity [0..1]: Coding</p> <p>group2 [0..*]: RelationshipGroupElement</p> <p>findingSite [0..1]: Coding</p> <p>after [0..1]: Coding</p> <p>morphology [0..1]: Coding</p> <p>associatedWith [0..1]: Coding</p> <p>agent [0..1]: Coding</p> <p>dueTo [0..1]: Coding</p> <p>hasInterpretation [0..1]: Coding</p> <p>interprets [0..1]: Coding</p> <p>pathProcess [0..1]: Coding</p> <p>occurrence [0..1]: Coding</p> <p>subjectRelationship [1]: Coding</p> <p>temporalContext [1]: Coding</p> <p>findingContext [1]: Coding</p>

## Condition – Template Binding

Condition

```

clinicalStatus = "active"
verificationStatus = "provisional"
severity = 246090004 |Severe|
code = 125605004 |Fracture of bone|
bodySite = 71341001 |Femur|
subject = <Patient>
    
```

 Mapping

```

SCT_Condition_Template
definitionStatus = 900000000000073002 |Defined|
findingWithExplicitContext = 413350009 |Finding with explicit context|
group1
  associatedFinding = 125605004 |Fracture of bone|
  severity = 246090004 |Severe|
group2
  findingSite = 71341001 |Femur|
  Morphology = 246090004 |Fracture|
subjectRelationship = 246090004 |Subject of care|
temporalContext = 246090004 |Current or specified|
findingContext = 246090004 |Suspected|
    
```

## Condition – Template Binding

Condition

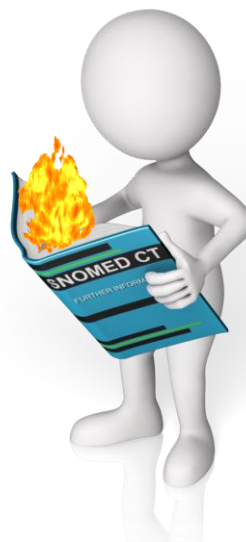
```
clinicalStatus = "active"
verificationStatus = "provisional"
severity = 246090004 |Severe|
code = 125605004 |Fracture of bone|
bodySite = 71341001 |Femur|
subject = <Patient>
```

 **Serialize**

```
=== 413350009 |Finding with explicit context| :
{ 246090004 |Associated finding| = (125605004 |Fracture of bone| :
  246112005 |Severity| = 246090004 |Severe|,
  { 363698007 |Finding site| = 71341001 |Femur|,
    116676008 |Associated morphology| = 246090004 |Fracture| )
  408732007 |Subject relationship context| = 46090004 |Subject of care|,
  408731000 |Temporal context| = 246090004 |Current or specified|,
  408729009 |Finding context| = 246090004 |Suspected| }
```

## Links to Further Information

- Technical Implementation Guide
  - <http://snomed.org/tig>
- HL7 FHIR
  - <http://hl7.org/fhir>
- Compositional Grammar
  - <http://snomed.org/scg>
- Expression Constraint Language
  - <http://snomed.org/ecl>
- Template Syntax
  - <http://snomed.org/sts>



# Questions and Discussion

