

# ICD-11 (JLMMS) and SCT Inter- Operation

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# Introduction :

- **SNOMED CT (SCT)** is a standard clinical terminology and supported by a semantic model based on descriptive logic. It contains over 300,000 medical concepts and 19 areas or hierarchies, the most used are “ Clinical finding ” , “ procedure ” , “ organism ” , “ substance ” , “ body structure ” : The Multi-Kinship is a rule.
- **ICD-11JLMMS** is the final form of ICD-11 to replace ICD-10, it is made of exhaustive and mutually exclusive classes: it does not allow multi-kinship.
- In France, SNOMED CT is used only for research matters, while medical causes of death and billing (PMSI) are based on the ICD-10.
- SCT is used in conjunction with ICD-10 in 27 countries (need of more granular clinical description in the Electronic Health Record (EHR) against the need of statistical aggregation).

an agreement were signed in 2010 between WHO and IHTSDO to build the harmonisation between ICD and SCT around a Common Ontology following the widely acknowledged principles



## Why to represent the ICD-11JLMMS with the descriptive logic of SNOMED CT ?

- In 2010 WHO and IHTSDO decided to harmonize SCT and ICD.
- The mapping between terminological artifacts can not be correct (1 to 1) for less than 80% of the corpus.
- The EHR becomes the source of all health terminologies uses (mortality, pricing, clinical and epidemiological research).
- The ICD-11 is not supported by a semantic model.
- Multi-terminology tools. Have to be more used in the future
- Semantic interoperability is a critical node in e-health.

## Goals :

- Ensure a semantic interoperability between ICD-11 JLMMS and SNOMED CT :
  - *Apply the method developed by the JAG (Joint Advisory Group ) on the Circulatory chapter of ICD-11 Foundation to ICD-11 JLMMS.*
  - *Add more steps to the existing method, if necessary.*



# Materiels :

## • The ICD-11 (JLMMS)

- Chapter : « Circulatory System »  
The World Health Organization browser

**ICD-11 Beta Draft** (Joint Linearization for Mortality and Morbidity Statistics)

Foundation Id : <http://id.who.int/icd/entity/1015872326>

### CA12 Hypertensive renal disease

Parent

Hypertensive diseases

#### Definition

Hypertensive renal disease is a medical condition referring to damage to the kidney due to chronic high blood pressure.

#### Inclusions

- Chronic kidney disease due to hypertension
- arteriosclerosis of kidney
- arteriosclerotic nephritis (chronic)(interstitial)
- hypertensive nephropathy
- nephrosclerosis
- Glomerular diseases due to hypertension
- Unspecified contracted kidney due to hypertension

#### Exclusions

- Secondary hypertension (CA14)

## • SNOMED CT

### IHTSDO SNOMED CT browser

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Taxonomy Search Favorites Refset

Hypertensive renal disease

Expression from Stated Concept Definition (\*)

=== 90708001 |Kidney disease (disorder)| :  
47429007 |Associated with (attribute)| = 38341003  
|Hypertensive disorder, systemic arterial (disorder)|

#### Parents

- = Complication of systemic hypertensive disorder (disorder)
- = Kidney disease (disorder)

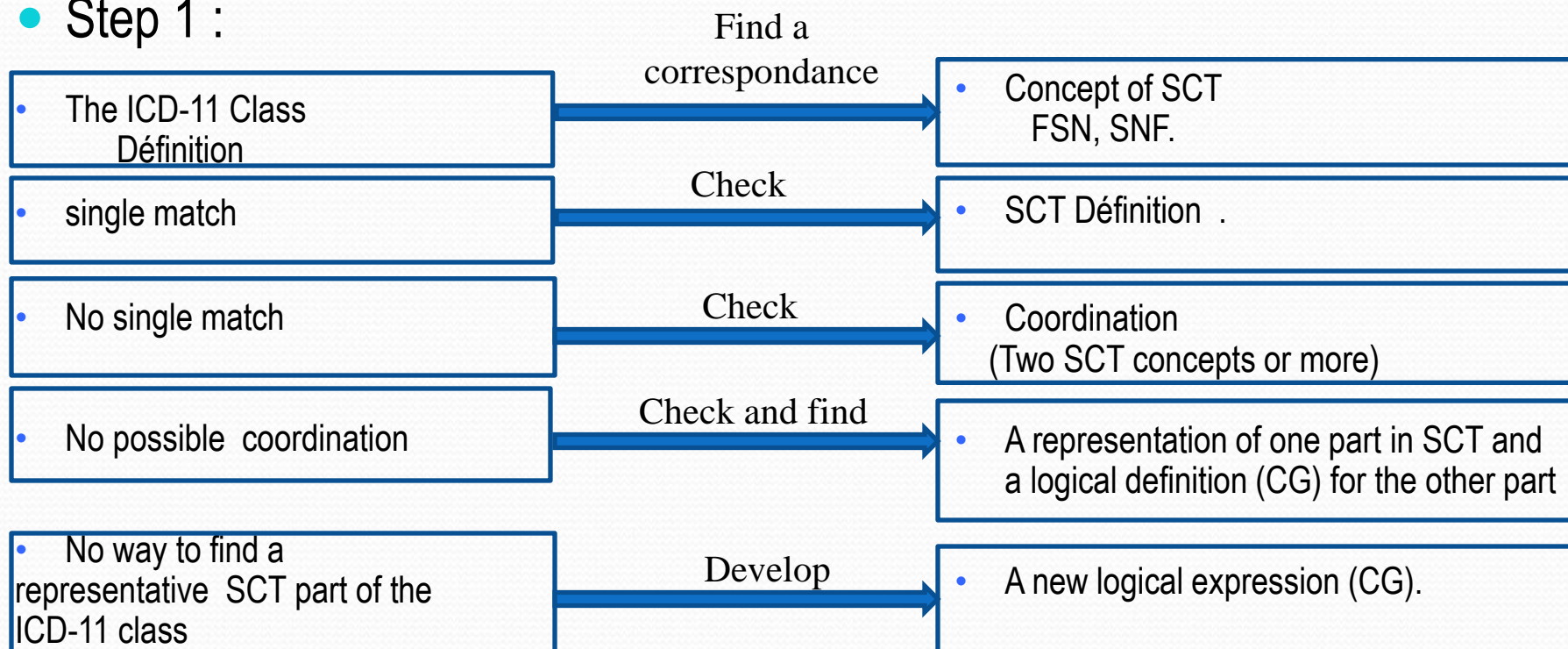
#### Children (16)

- = Arteriolari nephritis (disorder)
- = Autosomal dominant progressive nephropathy with hypertension (disorder)
- = Benign hypertensive renal disease (disorder)
- = Chronic hypertensive uremia (disorder)
- = Chronic kidney disease due to hypertension (disorder)
- = End stage renal disease due to hypertension (disorder)
- = Hypertension concurrent and due to end stage renal disease on dialysis (disorder)
- = Hypertension due to compression of renal parenchyma (disorder)
- = Hypertensive heart AND renal disease (disorder)
- = Hypertensive nephrosclerosis (disorder)
- = Hypertensive renal disease in obstetric context (disorder)
- = Hypertensive renal disease with renal failure (disorder)



## Methods :

### • Step 1 :



### • Step 2 :



**Circulatory system of the ICD-11 (JLMMS)**



## Results :

Matching types and meanings	Numbers %	Semantic representation
Unique match(M).	244 80,3 %	Short Normal Form (SNF) of SCT.
No unique match, but coordination is possible (O/A).	293 (matches) /304 ( the totality)	New coordinated expression .
Neither <u>unique</u> match nor coordination possible (O/E).	96,4% ← Of match	New CG logical expression .
No match at all (O/R).	8 2,6%	New logical expression respecting the compositional grammar.
The remaining classes (other and unspecified) excluded.	11 3,6 %	Residual concepts /or need for more clarification.

## Circulatory system of the ICD-11(JLMMS)

# Results :

## Step 1, example 1

Type of correspondance	ICD-11 Rubric	SCT (CG) logical expression
M	Necrosis of artery	359557001  Disorder of artery (disorder)  : { 363698007   Finding site (attribute)  = 51114001  Arterial structure (body structure) , 116676008  Associated morphology (attribute)  = 6574001  Necrosis (morphologic abnormality)  }

*Example of alignment throught **unique match** , between ICD-11 and the logical definitions of SCT.*

## Circulatory system of the ICD-11 (JLMMS)



# Results :

## Step 1, example 2

Matching types	ICD-11 rubric	SCT CG logical expression
O/A	<p>Acute myocardial infarction, STEMI, anterior wall</p> <p>Available in SNOMED CT, But we must combine two concepts</p>	<p>401303003   Acute ST segment elevation myocardial infarction   + 54329005   Acute anterior myocardial infarction  </p>

401303003 | Acute ST segment elevation myocardial infarction |

+

54329005 | Acute anterior myocardial infarction |

*Example of alignment throught **coordination**, of the logical definitions of SCT.*

**Circulatory system of the ICD-11 (JLMMS)**

# Results :

## Step 1, example 3

Type de correspondance	ICD -11 rubric	SCT CG logical definition
O/E	Coronary artery ostial stenosis  No unique representation with SNOMED CT	233970002   Coronary artery stenosis (disorder)  : { 363698007   Finding site (attribute)  = 55537005   Structure of ostium of coronary artery  , 116676008   Associated morphology   = 415582006   Stenosis   }

233970002 | Coronary artery stenosis (disorder)| :  
{ 363698007 | Finding site (attribute)| = 41801008 | Coronary artery  
structure (body structure)|, 116676008 | Associated morphology  
(attribute)| = 415582006 | Stenosis (morphologic abnormality)| }

+

| Finding site (attribute)| =  
55537005 | Structure of ostium  
of coronary artery|

*Example of alignment through **extension**, of the logical definitions of SCT.*

## Circulatory system of the ICD-11 (JLMMS)



# Results :

Step 2, example 1 with SCT Expression Constraint Language : **Inclusions.**

ICD-11 rubric	SCT (CG) logical defintion	Inclusion ICD-11 JLMMS	Representation with SCT expression constraint language
Hypertensive renal disease  M	<b>90708001  Kidney disease (disorder)  :</b> <b>47429007  Associated with (attribute)  = 38341003  Hypertensive disorder, systemic arterial (disorder) </b>  <b>Unique match, but problem with <u>inclusions</u></b>	1-Chronic kidney disease due to hypertension 2-arteriosclerosis of kidney 3-arteriosclerotic nephritis (Chronic)(interstitial) 4-hypertensive nephropathy 5-nephrosclerosis 6-Glomerular diseases due to hypertension 7-Unspecified contracted kidney due to hypertension	<b>(&lt;&lt; 90708001  Kidney disease (disorder)  AND &lt;&lt; 32916005  Nephrosclerosis (disorder)  ) AND 709978007  Contracted kidney (disorder)  :</b> <b>42752001  Due to (attribute)  = &lt;&lt; 38341003  Hypertensive disorder, systemic arterial (disorder) </b>

*Exemple of a SCT logical definition, using the SCT Expression Constraint Language.*

**Circulatory system of the ICD-11 (JLMMS)**

# Results :

Step2, example 2 with SCT Expression Constraint Language :  
**Exclusions.**

ICD-11 rubric	SCT (CG ) logical definitions	Exclusions ICD-11 JLMMS	representation with SCT constraint expression language
Mitral valve stenosis  M	11851006  Mitral valve disorder (disorder)  : { 363698007  Finding site (attribute)  = 91134007  Mitral valve structure (body structure) , 16676008  Associated morphology (attribute)  = 415582006  Stenosis (morphologic abnormality)  } <b>Unique match, but problem with <u>exclusions</u></b>	Mitral stenosis with regurgitation	<< 11851006  Mitral valve disorder (disorder)  <b>MINUS</b> 194726006  Mitral stenosis with insufficiency (disorder)  : { 363698007  Finding site (attribute)  = 91134007  Mitral valve structure (body structure) , 116676008  Associated morphology (attribute)  = 415582006  Stenosis (morphologic abnormality)  }

*Example of a SCT logical definition, using the SCT Expression Constraint Language .*

## Circulatory system of the ICD-11 (JLMMS)



Step2, example 3 with SCT Expression Constraint Language :  
**Inclusions and exclusions.**

ICD-11 rubric	SCT CG logical definition	ICD -11 JLMMS Inclusions and exclusions	Representation with SCT«constraint expression language
Coronary artery aneurysm  M	<p>301433005  Aneurysm of artery of trunk (disorder)  :  { 116676008  Associated morphology (attribute)  =  85659009  Aneurysm (morphologic abnormality) ,  363698007  Finding site (attribute)  = 41801008   Coronary artery structure (body structure)  }  <b>Unique match, but Problem with <u>inclusions</u> and <u>exclusions</u></b></p>	<p><b>Inclusions :</b>  -Coronary arteriovenous fistula, acquired    <b>Exclusions :</b>  -Congenital coronary artery aneurysm</p>	<p>( &lt;&lt;301433005  Aneurysm of artery of trunk (disorder)  AND &lt;&lt;253720000  Congenital coronary arteriovenous fistula (disorder)  ) MINUS  204378009  Congenital coronary aneurysm (disorder)  :  { 116676008  Associated morphology (attribute)  =  85659009  Aneurysm (morphologic abnormality) ,  363698007  Finding site (attribute)  = 41801008   Coronary artery structure (body structure)  } </p>

*Exemple of a SCT logical definition, using the SCT Expression Constraint Language .*

## Circulatory system of the ICD-11 (JLMMS)

## Discussion/Conclusion :

- This work shows some limitations :
  - Some of logical representations of SNOMED CT are not really complete (we say "primitive").
  - Some JLMMS classes are represented in descriptive logic as the categories "other" and "unspecified".
- However, in most cases, the representation of ICD11 JLMMS classes can best be represented with the two IHTSDO tools compositional grammar and expression constraint language much more effectively than with the ICD11 Foundation Component.
- Therefore, it seems that the methods initiated by the work can contribute to improving the interoperability between the two main worldwide health terminologies ICD-11 and SNOMED CT, despite their different structures, details and uses cases.



**Thank you**  
**Vielen Dank**  
**Merci**  
Questions ?

