How to link SNOMED CT procedure and WHO International Classification of Health Interventions (ICHI)?

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Introduction :

- **Conclusion : by using a standard: ISO 1828 2012.**

- **Part 1: What is ISO 1828 2012 Standard**
- **Part 2 : Is ICHI claiming to be based on the standard complying with the standard**
  - **What is ICHI**
  - **ICHI is not compliant**
- **Part 3 What about SNOMED CT (SCT) Procedure hierarchy concept model**
  - **What is SNOMED CT procedure hierarchy concept model**
  - **Not claiming to be compliant**
  - **BUT…..**
- **Part 4 Example of issue with ICD9 CM mapped ICHI code**
- **Part 4: How to align ICHI with ISO 1828 and SNOMED CT Procedure Hierarchy**

ISO 1828 2012

Health informatics — Categorial structure for terminological systems of surgical procedures

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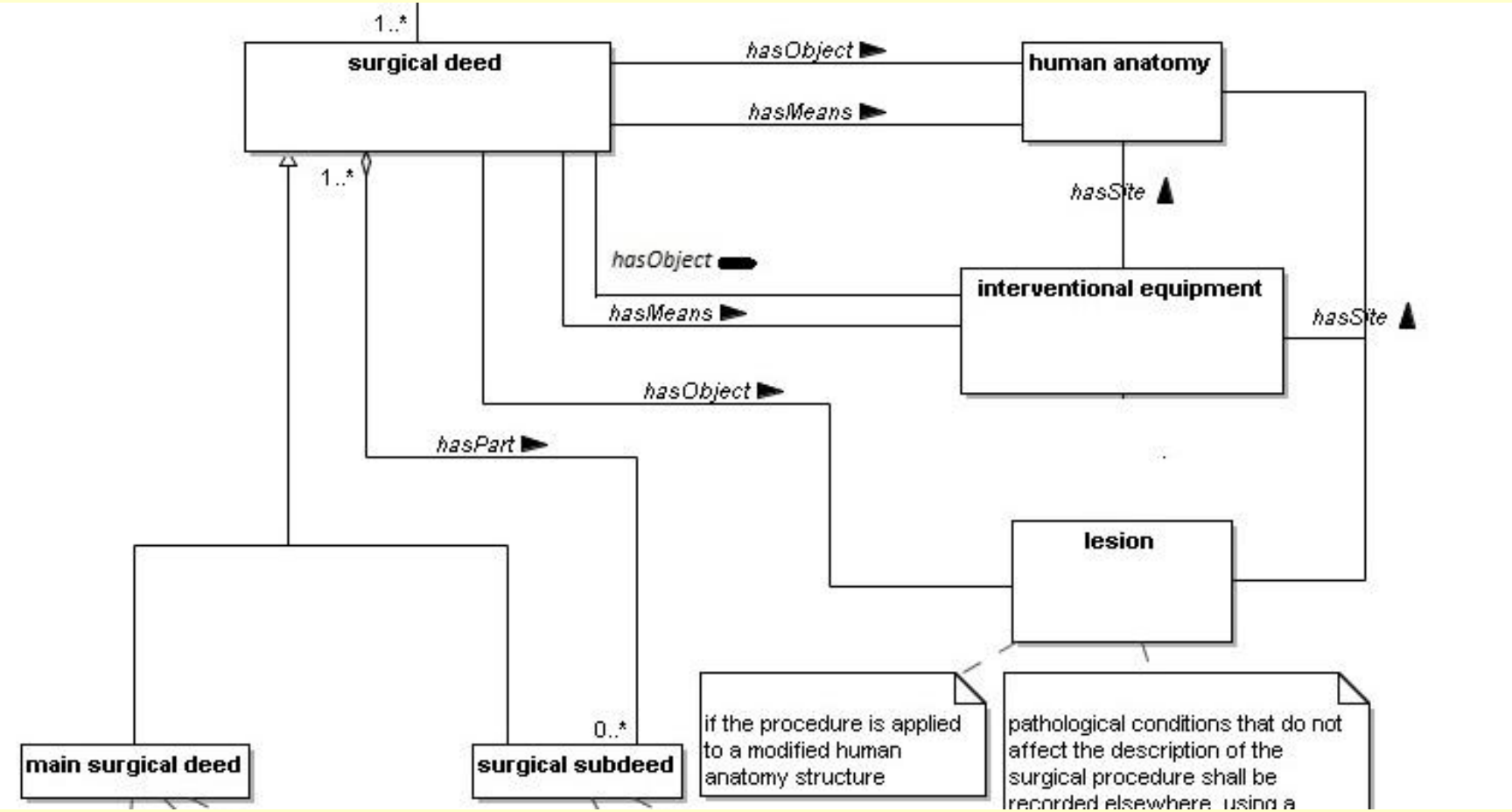
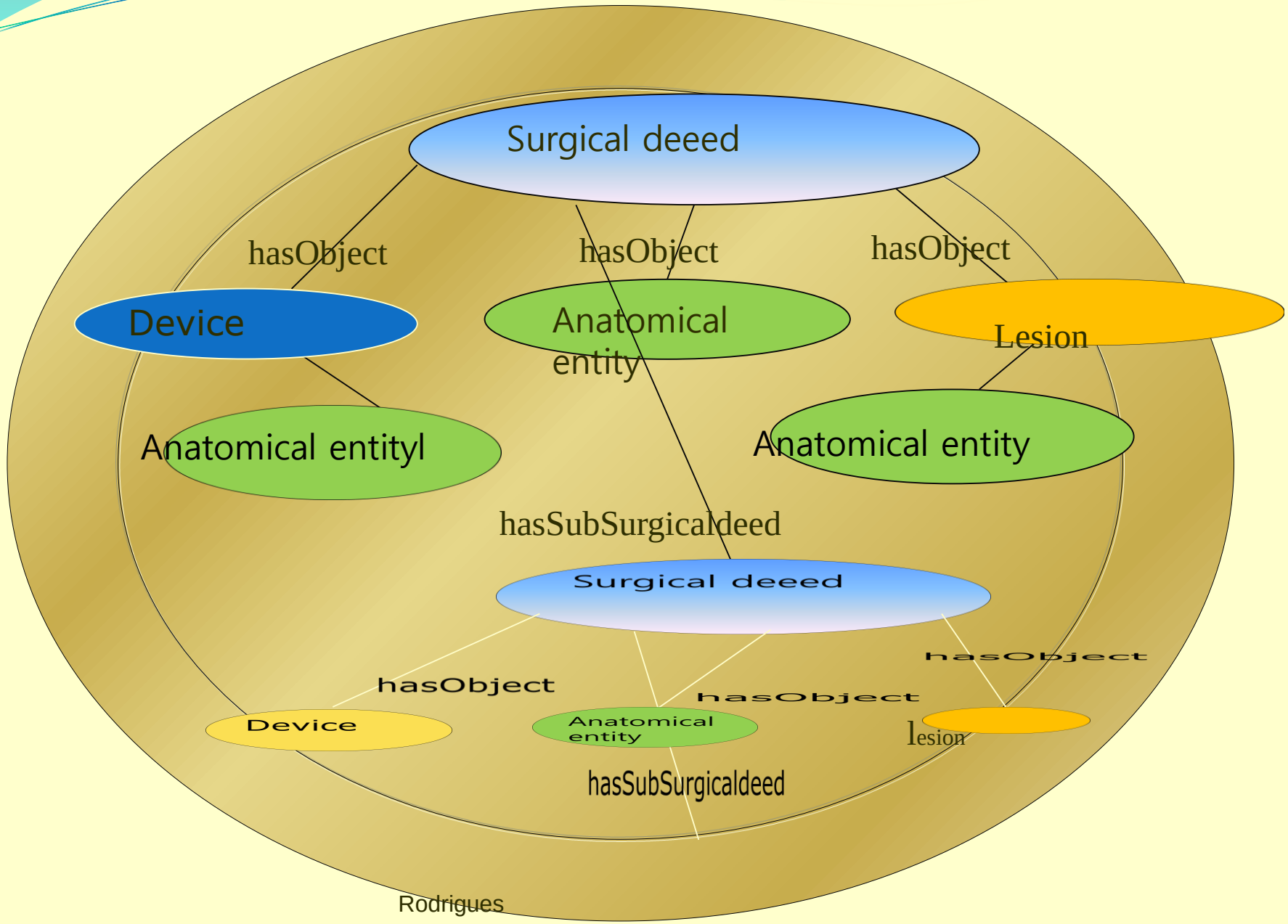
ISO 1828 2012 UML Categorial STructure (CAST)Diagram



ISO 1828 2012 CAST



Rodrigues

ISO 1828 2012 Semantic categories and Semantic Links

semantic categories :

- **"Surgical deed":** deed which can be done by an actor to the patient's body during the surgical procedure
- **"Anatomical entity"**: entity that constitutes the structural organization of a human body
- **"Lesion":** abnormal morphologic structure
- **"Interventional equipment":** medical device for use in surgical procedures

semantic links and autorised relations:

- **"hasObject":** representation of relations between the category surgical deed and the categories on which the surgical deed is carried out.
- **"hasSite":** representation of relations referring to that, to which, from which, or in which the surgical deed is carried out
- **"hasMeans":** representation of relations referring to the means by which the surgical deed is carried out
- **"hasSubsurgicaldeed":** representation of relations referring to the sub-process by which the main surgical deed is carried out

List of 5 minimal domain constraints to be conformant with the standard

ICHI

International Classification of Health Interventions

Section 1:Interventions on Body systems and Functions

https://https://mitel.dimi.uniud.it/ichi/

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3 axes semantic based ICHI

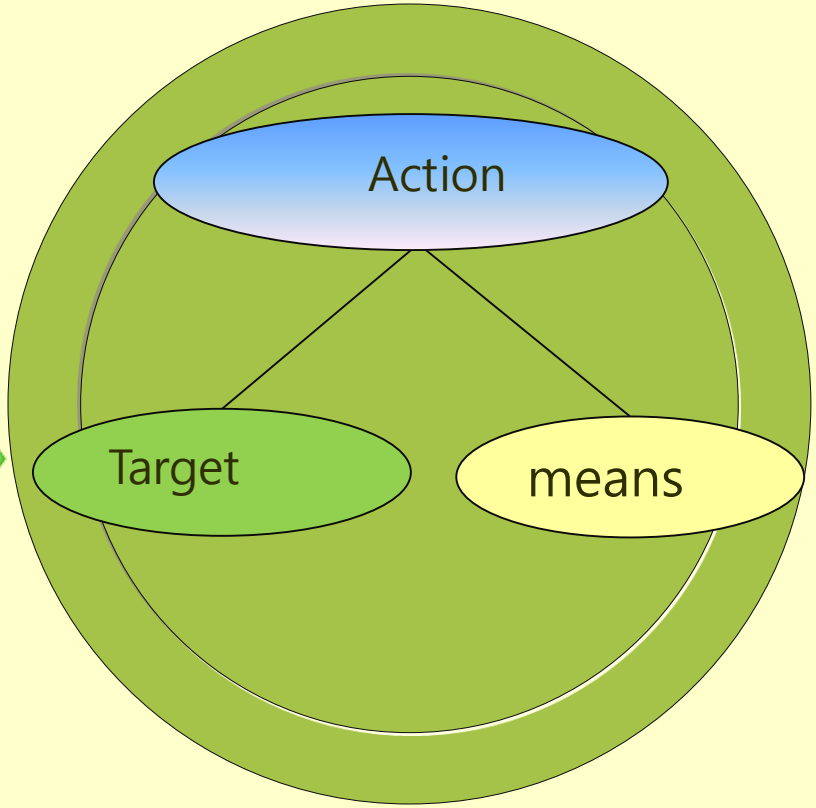
7 digits
Linear
codes
Target 3
Means 2
Action 2

3 AXES

TARGET

MEANS

ACTION



Flat coding system

ICHI structure

ICHI CAST

ICHI Semantic Structure and the standard 1828 :

ICHI semantic structure three axes:

- "Target": the entity on which the Action is carried out
- "Action": a deed done by an actor to a target
- "Means": the processes and methods by which the Action is carried out.

?

- only the "Action" axis is equivalent to ISO 1828 CAST "Surgical deed" semantic category
- "Anatomic entity" is present in "target"
- "Lesion" and "interventional equipment" are not present
- semantic links and authorised relations are implicit and only between ""Action" and "Target" and "Action" and "Means"

SNOMED CT Procedure hierarchy

http:// browser.ihtsdotools.org

Expression

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SNOMED CT Procedure Hierachy

- **SNOMED CT (SCT)** http://browser.ihtsdotools.org/: **27 countries, 11 versions, 10 languages or dialects**

Reference Clinical Terminology AND Ontology .

- 300.000 concepts in19 domains or hiérarchies: TERMINOLOGY
  - Is_a relation subsuming concepts
- 8 hierarchies or sub hierarchies (150 semantic tags) and only 186 121 concepts (international version release january 2016) have a so called « concept model »:ONTOLOGY
  - Definitional attributes of a DL concept model: coherence can be tested only with a DL reasoner.
  - Clinical finding 103 911 concepts=values
  - Procedure 55 423 concepts=values
  - Body structure 31 039concepts=values
  - Situation with explicit concept 4251
  - Event 3611
  - Pharmaceutical /biological Products 17291
  - Physical object. 14 625 concepts=values
  - Specimen 1634

IHTSDO Browser Hierarchy (summary,details)

and DL definition (diagram and owl expression)

Fichier Édition Affichage Historique Marque-pages Outils ?

SNOMED CT - Mitral valve ...

browser.ihtsdotools.org/?perspective=full&conceptId1=79619009&edition=en-edition&release=v20160131&server=http://browser.ihtsdotools.org/api/snomed&lang

Les plus visités Débuter avec Firefox http://apps.who.int/cl... https://www.program... favoris Google

IHTSDO SNOMED CT Browser

Release: International Edition 20160131 | Perspective: Full | Feedback | About | ihtsdo Delivering SNOMED CT

© IHTSDO 2016 v1.33

Taxonomy | Search | Favorites | Refset

Search

Options

Search Mode: Partial matching search mode

Status: Active components only

Group by concept

Filter results by Language

english 32

Filter results by Semantic Tag

disorder 32

Filter results by Module

SNOMED CT core module (core metadata concept) 32

Filter results by Refset

SNOMED RT identifier simple map (foundation metadata concept) 32

CTV3 simple map reference set (foundation metadata concept) 32

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

mitral valve stenosis

32 matches found in 0.18 seconds.

Mitral valve stenosis	Mitral valve stenosis (disorder)
Stenosis of fetal mitral valve	Stenosis of fetal mitral valve (disorder)
Stenosis of foetal mitral valve	Stenosis of fetal mitral valve (disorder)
Mitral valve stenosis (disorder)	Mitral valve stenosis (disorder)
Mitral prosthetic valve stenosis	Prosthetic mitral valve stenosis (disorder)
Prosthetic mitral valve stenosis	Prosthetic mitral valve stenosis (disorder)
Congenital stenosis of mitral valve	Congenital stenosis of mitral valve (disorder)
Non-rheumatic mitral valve stenosis	Non-rheumatic mitral valve stenosis (disorder)
Postprocedural mitral valve stenosis	Postprocedural mitral valve stenosis (disorder)
Stenosis of fetal mitral valve (disorder)	Stenosis of fetal mitral valve (disorder)
Prosthetic mitral valve calcific stenosis	Prosthetic mitral valve calcific stenosis (disorder)
Prosthetic mitral valve stenosis (disorder)	Prosthetic mitral valve stenosis (disorder)

Concept Details

Concept Details

Summary | Details | Diagram | Expression | Refsets | Members | References

Pre-coordinated Expression (*)

```
79619009 |Mitral valve stenosis (disorder)|
```

Expression from Stated Concept Definition (*)

```
=== 11851006 |Mitral valve disorder (disorder)| :
        { 363698007 |Finding site (attribute)| = 91134007 |Mitral valve
          116676008 |Associated morphology (attribute)| = 415582006 |Ste
```

Expression from Inferred Concept Definition (*)

```
=== 44241007 |Heart valve stenosis (disorder)| +
    11851006 |Mitral valve disorder (disorder)| :
        { 363698007 |Finding site (attribute)| = 91134007 |Mitral valve
          116676008 |Associated morphology (attribute)| = 415582006 |Ste
```

(*) The expressions are generated according to the ABNF syntax found in the "SNOMED CT Compositional Grammar Specification and Guide" (http://snomed.org/compgrammar)

SNOMED CT Compositional Grammar is a lightweight syntax for the representation of SNOMED CT expressions. SNOMED CT expressions are used in Electronic Health Records (EHRs) to represent clinical meanings in a way that enables automatic interpretation. They are also carried in messages, used to define precoordinated concepts and used to represent links between SNOMED CT and other terminologies.

These expressions are generated as an example from the published concept definition, a Pre-coordinated Expression is direct reference to the concept, and Post-coordinated expressions are generated from the stated or inferred relationships. In a Sufficiently Defined concept, all three will be equivalent.

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SNOMEDT CT Procedure Hierarchy concept model and the standard 1828 :

SNOMED CT nine main attributes:

- "Procedure site – Direct"
- "Procedure site – Indirect"
- "Direct morphology"
- "Indirect morphology"
- "Method"
- "Direct device"
- "Indirect device"
- "Using device"
- "Using access device"

?

- "Method" axis is equivalent to ISO 1828 CAST "Surgical deed" semantic category
- 2 "Procedure site" is equivalent to"Anatomic entity"
- 2"Morphology" is equivalent to "Lesion" and
- 2"device" is equivalent to "interventional equipment"
- semantic links and authorized relations are 20 (9 +11) fully documented

Example with ICD9 CM mapped ICHI code and SNOMED CT concept

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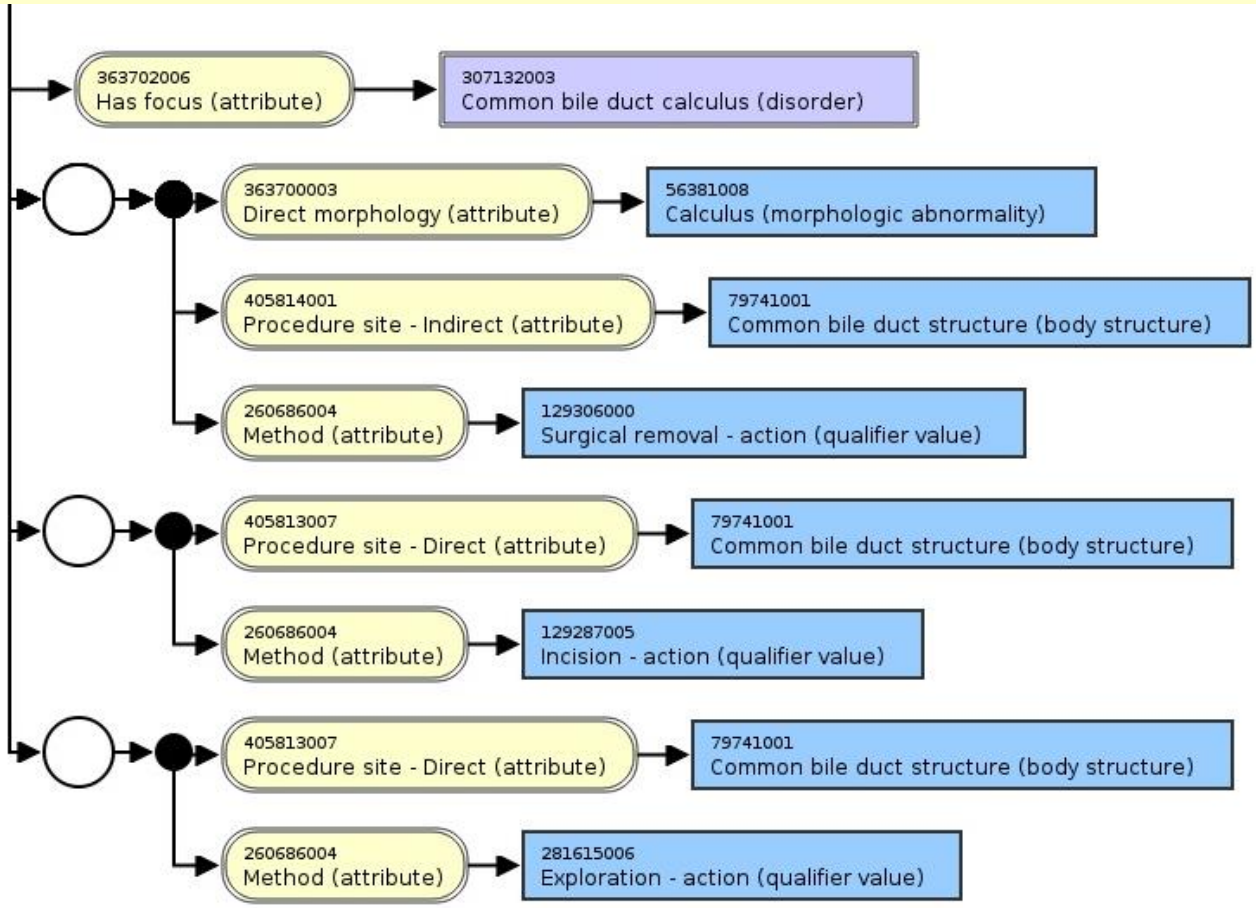
ICD 9 CM, ICHI and SNOMED CT map

ICD 9 CM code and name	ICHI code and name	SNOMED CT code and description
51.41 Common duct exploration for removal of calculus	KCM JD AA Common duct exploration for removal of calculus	708992008Incision and exploration of common bile duct for removal of calculus

Incision and exploration of common bile duct for removal of calculus



SNOMED CT concept represented with ISO 1828 CAST

- The figure 1 SNOMED CT concept model and its expression are equivalent to the ISO 1828 expression:
- **“Surgicaldeed” “Removal”**
- **“hasObject” “Calculus “(lesion)**
- **“hasSite”” Common bile duct” (anatomical entity)**
- **“hasSubsurgicaldeed”” Incision”**
- **“hasObject” “Common bile duct” (anatomical entity)**

ICHI code :**KCM JD AA Common duct exploration for removal of calculus**

ICHI coding structure three axes:

- "Target": KCM
- "Action": JD
- "Means": AA

?

- KCM "="Bile duct"
- JD ="Removal" "
- AA="Open Approach"

- "FA" = "Incision"
- "No code" = calculus

- Other missing entities in ICHI
  - Devices (Pacemaker, surgical suture device
  - Drugs as Chemotherapy
  - Imaging devices

How to align ICHI with ISO 1828 and SNOMED CT Procedure Hierarchy :

- By aligning ICHI on ISO 1828 standard :

- 1)The ICHI “Action” axis shall be allowed to be present several times.
- 2) The ICHI “Target” axis must be extended to “morphologic abnormalities” and main categories of “drugs” and “medical devices”.
- 3) The ICHI “Target” axis once extended shall be replaced by two axes: “Direct target” and “Indirect Target”

Thank you

Vielen Dank

Merci

Questions ?

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