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

Jean-Marie Rodrigues Sukil Kim, Béatrice Trombert Paviot, Jae Jin Lee and Syed Aljunid
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

rodriguesjeanmarie2@gmail.com
ehealth2017 may 24 th Vienna
ISO 1828 2012 UML Categorial STructure (CAST)Diagram

ehealth2017 may 24 th Vienna
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 authorised 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/

rodriguesjeanmarie2@gmail.com
ehealth2017 may 24 th Vienna
3 axes semantic based ICHI

3 AXES

TARGET
MEANS
ACTION

7 digits
Linear codes
Target 3
Means 2
Action 2

Flat coding system
ICHİ structure
ICHİ CAST
ICH1 Semantic Structure and the standard 1828:

ICH1 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

rodriguesjeanmarie2@gmail.com

ehealth2017 may 24 th Vienna
SNOMED CT Procedure Hierachy

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

Reference Clinical Terminology AND Ontology:

- 300,000 concepts in 19 domains or hierarchies: 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 31,039 concepts=values
  - Situation with explicit concept 4251
  - Event 3611
  - Pharmaceutical /biological Products 17291
- Physical object 14,625 concepts=values

- Specimen 1634

*Ehealth2017 May 24th Vienna*
IHTSDO Browser Hierarchy (summary, details)
and DL definition (diagram and owl expression)
SNOMED 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 “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

rodriguesjeanmarie2@gmail.com
ehealth2017 may 24 th Vienna
<table>
<thead>
<tr>
<th>ICD 9 CM code and name</th>
<th>ICHI code and name</th>
<th>SNOMED CT code and description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.41 Common duct exploration for removal of calculus</td>
<td>KCM JD AA Common duct exploration for removal of calculus</td>
<td>708992008Incision and exploration of common bile duct for removal of calculus</td>
</tr>
</tbody>
</table>
Incision and exploration of common bile duct for removal of calculus
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?

rodriguesjeanmarie2@gmail.com

ehealth2017 may 24 th Vienna