Semantic Standards

SPHN Training

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House Keeping

House Keeping

- Anonymous poll question – your experience or your input
- You are muted during presentation
- Questions & Answers at the end – please type your questions in the Q&A

Content

- Semantic standards intro
- ATC, CHOP, ICD-10, SNOMED CT, LOINC

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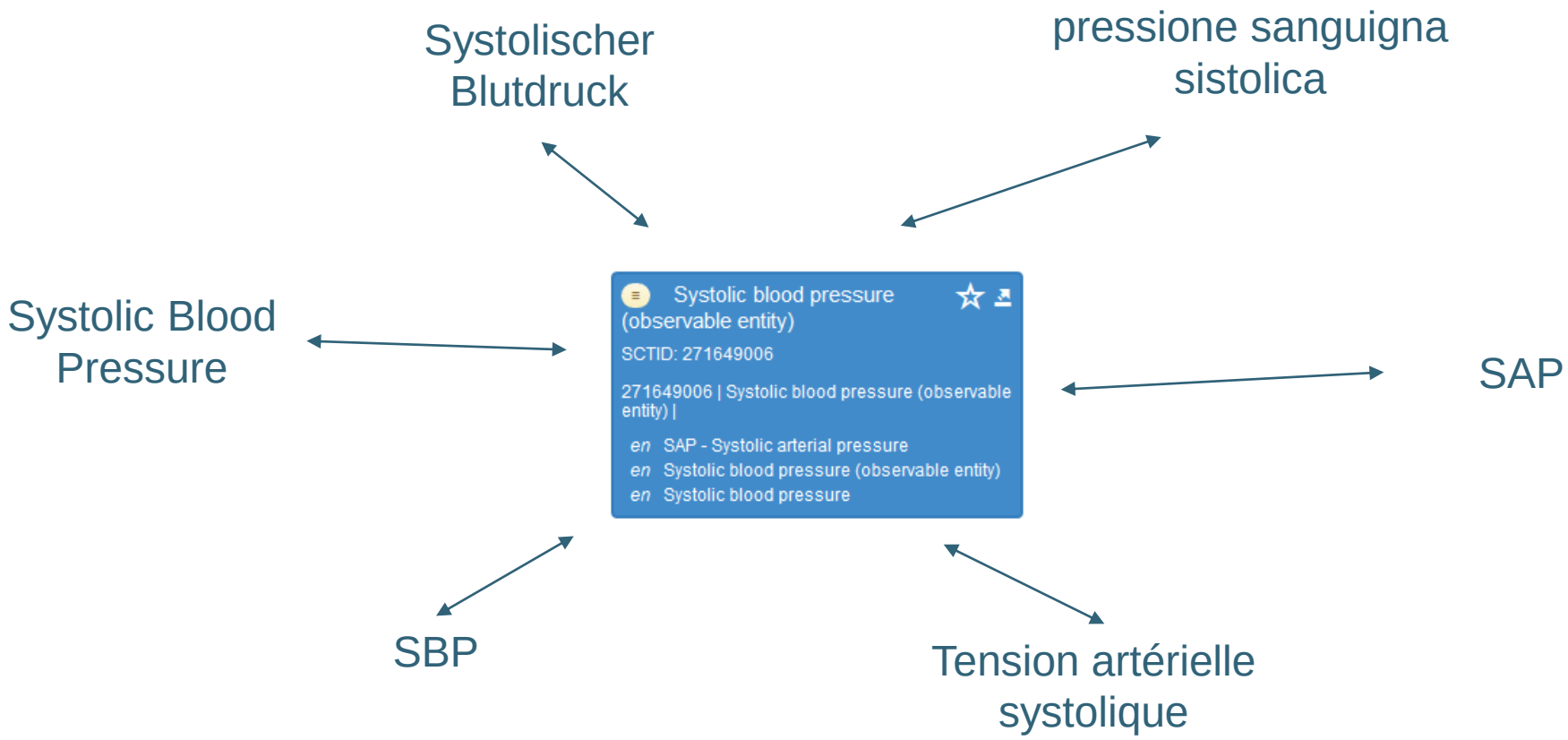
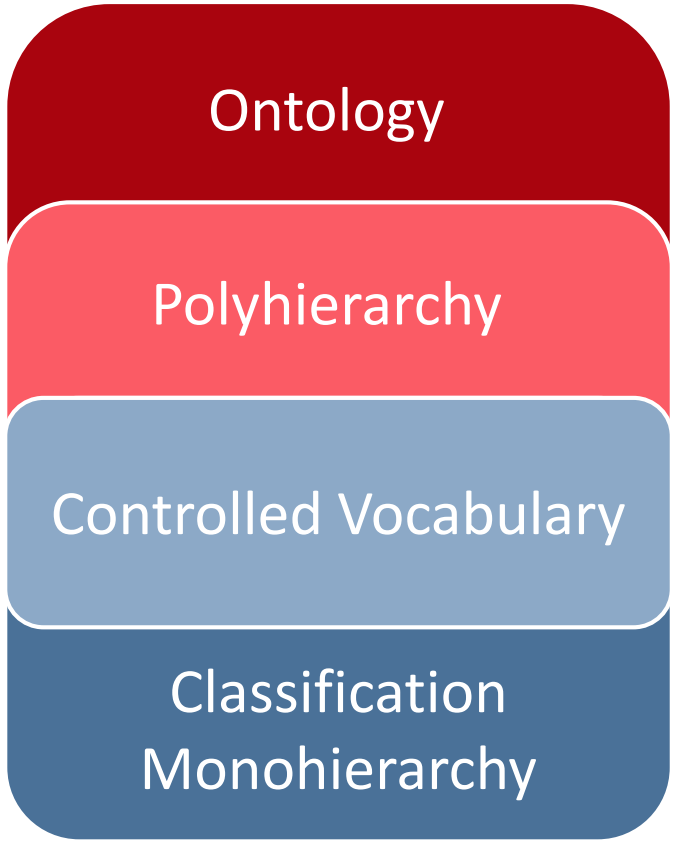
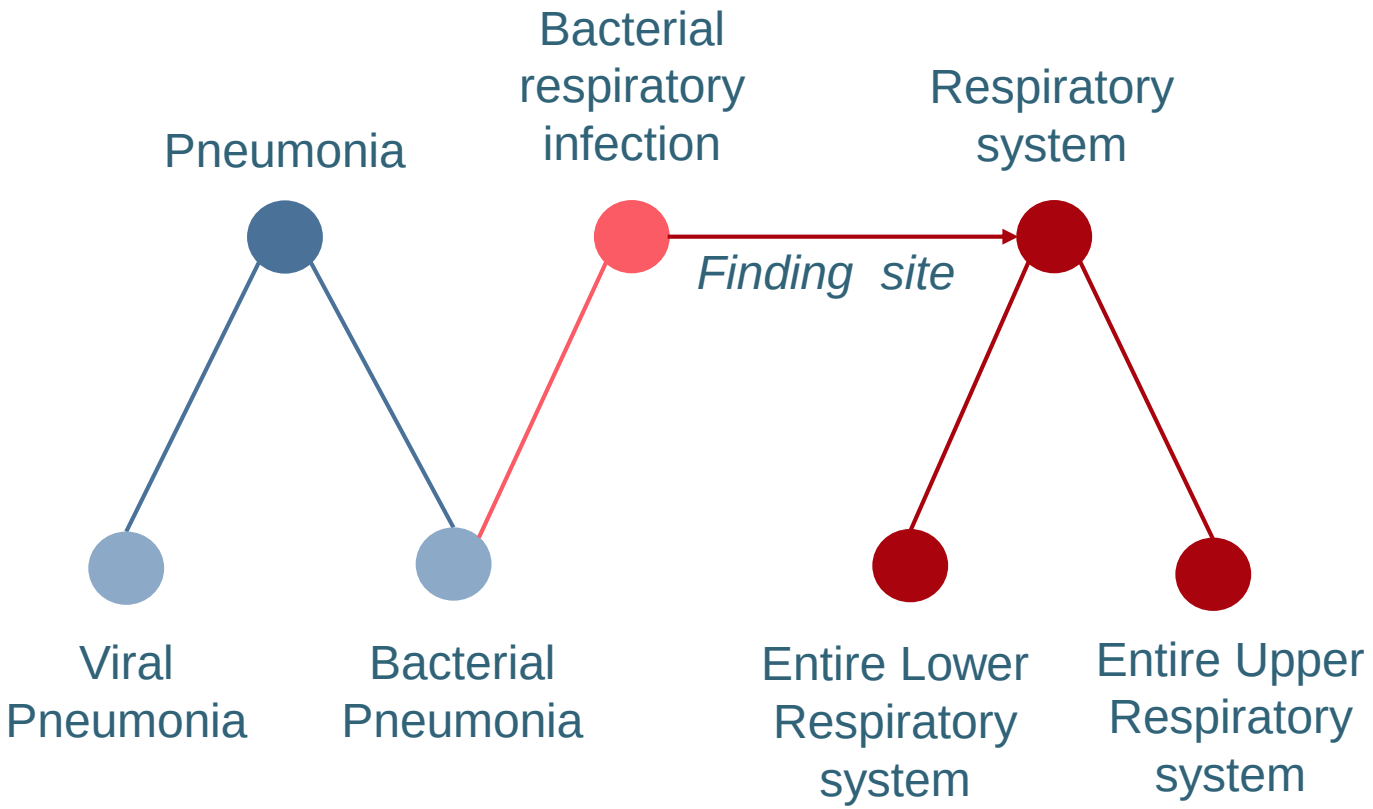
Why Semantic Standards?



Types of Semantic Standards





Selection of Semantic Standards

* Ontology
⁺ Classification
° Vocabulary

Switzerland

⁺CHOP
(procedures)

⁺ICD-10-GM
(diagnoses)

International

⁺ATC
(substance)

⁺MedDRA
(adverse events)

*SNOMED CT
(clinical terms in general)

⁺NANDA
(diagnoses)

°UCUM
(units of measure)

⁺LOINC
(laboratory tests)

⁺ICD-O
(diagnoses)

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Anatomical Therapeutic Chemical Classification (ATC)

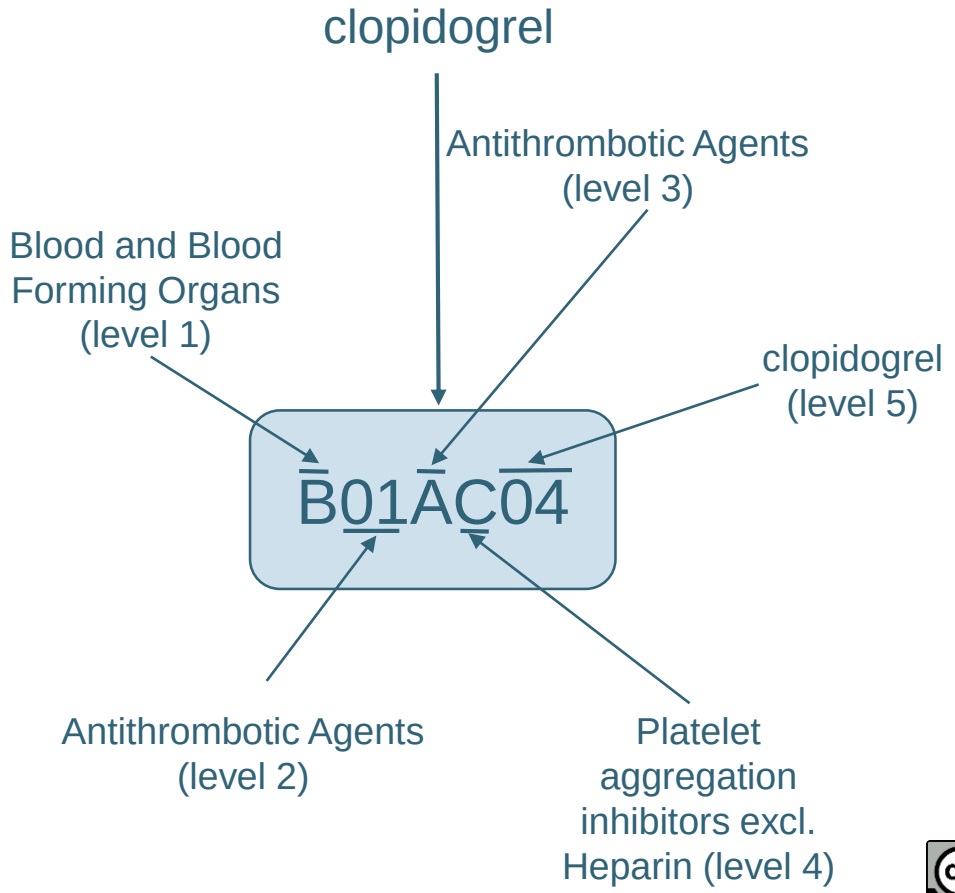
World Health Organization Collaborating Centre for Drug Statistics Methodology (WHOCC), released yearly, language: English

Coverage: Medications (in context of indication)

Type: Classification - 5 levels (monohierarchy)

1. Anatomical
2. Therapeutic
3. Therapeutic/pharmacological
4. Chemical/therapeutic/pharmacological
5. Chemical substance

Usage: Codes for active substances, Swissmedic extended list of medicinal products



Limitation of monohierarchies - example of ATC

Example: active substance: **acetylsalicylicum**

Indication Swissmedic	Thrombocyte aggregation inhibitor	Relief of fever and pain during colds
ATC Code	B01AC30	N02BA51

swissmedic

Approved medicinal products for human use

B **BLOOD AND BLOOD FORMING ORGANS**
B01 **ANTITHROMBOTIC AGENTS**
B01A **ANTITHROMBOTIC AGENTS**
B01AC **Platelet aggregation inhibitors excl. heparin**

N **NERVOUS SYSTEM**
N02 **ANALGESICS**
N02B **OTHER ANALGESICS AND ANTIPYRETICS**
N02BA **Salicylic acid and derivatives**

ATC - other limitations

Hierarchical constraints: Substance exist more than once with different codes, e.g. acetylsalicylicum

Not all level 5 codes are single substances
- **Combinations**, e.g. A02BD13 rabeprazole, amoxicillin and metronidazole
- **Broader terms**, e.g. S03CA06 bethamethasone and antiinfectives

Not all medications have an ATC code, e.g. Investigational Medicinal Products (IMPs), root tinctures

- e.g. Atibuclimab → C172657 = code in National Cancer Institute Thesaurus

No codes for custom mixtures

→ More Information https://www.whocc.no/atc_ddd_index/; https://www.youtube.com/watch?v=a3i0Wqyw5hM

Schweizerische Operationsklassifikation (CHOP)

Federal Statistical Office, CH, released yearly, languages: German, French, Italian

Coverage: Surgical procedures, radiotherapeutic procedures, procedures for patient activation, etc

Type: Classification - 6 levels (monohierarchy)

Usage: Coding of procedures for billing and accounting

Relation to others: Based on ICD-9

Coding: most granular level →

Example of CHOP hierarchy

Level 1	**C1** Operations on the nervous system (01–05)
Level 2	**Z01** Incision and excision on the skull, brain and meninges
Level 3	**Z01.1** Diagnostic measures on the skull, brain and meninges
Level 4	**Z01.11** Closed [percutaneous] [needle] biopsy on the brain
Level 5	**Z01.11.0** Detail of subcategory 01.11
Level 6	**Z01.11.10** Stereotactic closed [percutaneous] [needle] biopsy on the meninges

International Statistical Classification Of Diseases and Related Health Problems, 10th (ICD-10-GM)

Swiss Federal Office of Statistics (FSO) / German by Federal Institute of Drugs and Medical Devices (BfArM), released yearly,

languages: German, French, Italian

Coverage: Diagnosis

Type: Classification - 5 levels (monohierarchy)

Usage: Coding of diagnoses for billing and accounting, statistics and reporting

Relation to others: Based on ICD-10 WHO

Coding: most granular level

(coding as specific as possible – can be 3, 4 or 5 digit codes)

Example of ICD-10-GM hierarchy

Chapter	**XVII** Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)
Group	**Q80-Q89** Other congenital malformations
Category 3 digits	**Q89.-** Other congenital malformations, not elsewhere classified
Category 4 digits	**Q89.0-** Congenital malformations of spleen
Category 5 digits	**Q89.00** Congenital splenomegaly

ICD-10-GM – Further Information

Browser ICD-10-GM
https://www.dimdi.de/static/de/klassifikationen/icd/icd-10-gm/kode-suche/htmlgm2021/

Browser ICD-10 WHO
https://icd.who.int/browse10/2019/en#/

Downloads

- German https://www.dimdi.de/dynamic/de/klassifikationen/icd/icd-10-gm/
- French https://www.bfs.admin.ch/bfs/fr/home/statistiques/sante/nomenclatures/medkk/instruments-codage-medical.html
- Italian https://www.bfs.admin.ch/bfs/it/home/statistiche/salute/nomenclature/medkk/strumenti-codifica-medica.html

Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT)

SNOMED International (IHTSDO), released twice yearly, CH National Release Center: eHealth Suisse, languages: English, Spanish for the International Edition + local extensions in various languages

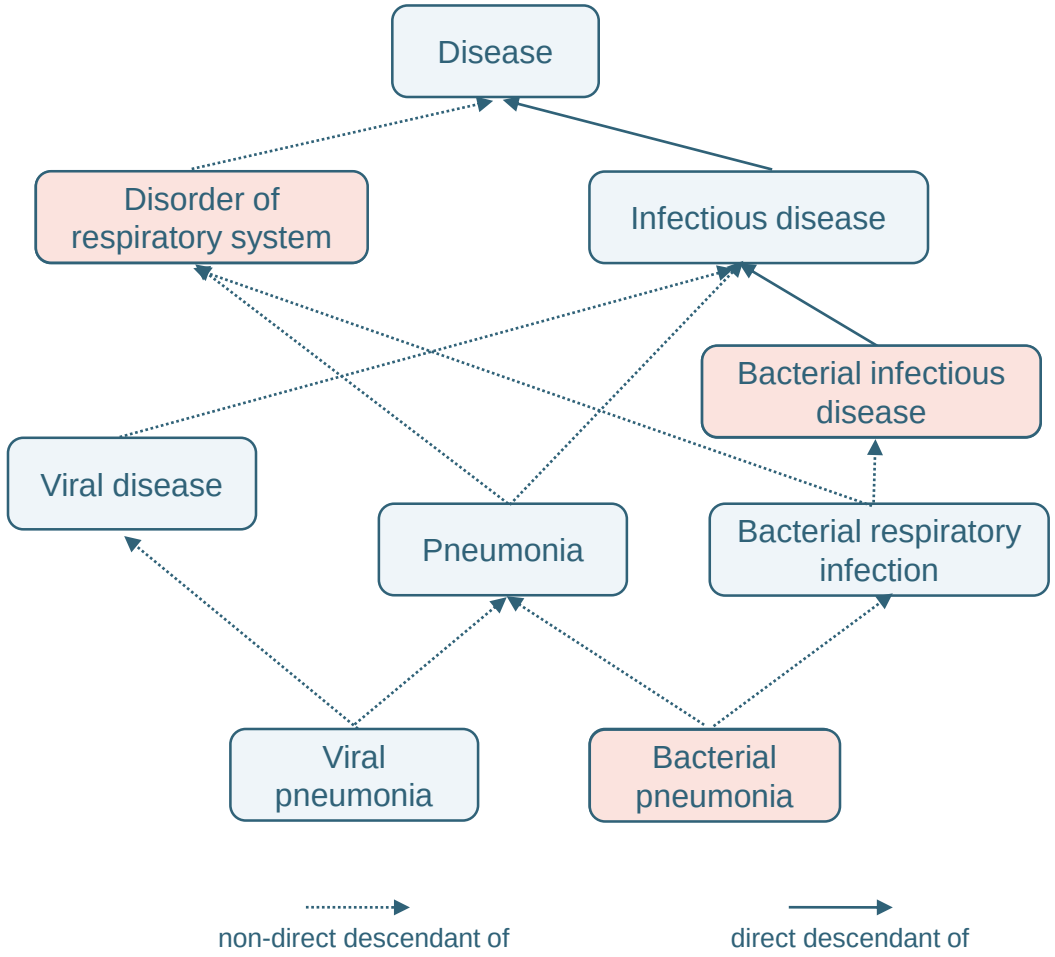
Coverage: Electronic Health Record (EHR)

Type: Polyhierarchy with attribute relationships

Usage: Adoption in CH for the Electronic Patient Dossier (EPD)

- Body structure (body structure)
- Clinical finding (finding)
- Environment or geographical location (environment / location)
- Event (event)
- Observable entity (observable entity)
- Organism (organism)
- Pharmaceutical / biologic product (product)
- Physical force (physical force)
- Physical object (physical object)
- Procedure (procedure)
- Qualifier value (qualifier value)
- Record artifact (record artifact)
- Situation with explicit context (situation)
- SNOMED CT Model Component (metadata)
- Social context (social concept)
- Special concept (special concept)
- Specimen (specimen)
- Staging and scales (staging scale)
- Substance (substance)

SNOMED CT - Polyhierarchy



Question: all patients with **disorder of respiratory system**

Question: all patients with **bacterial infectious diseases**

patients with disease **bacterial pneumonia** in both answer sets

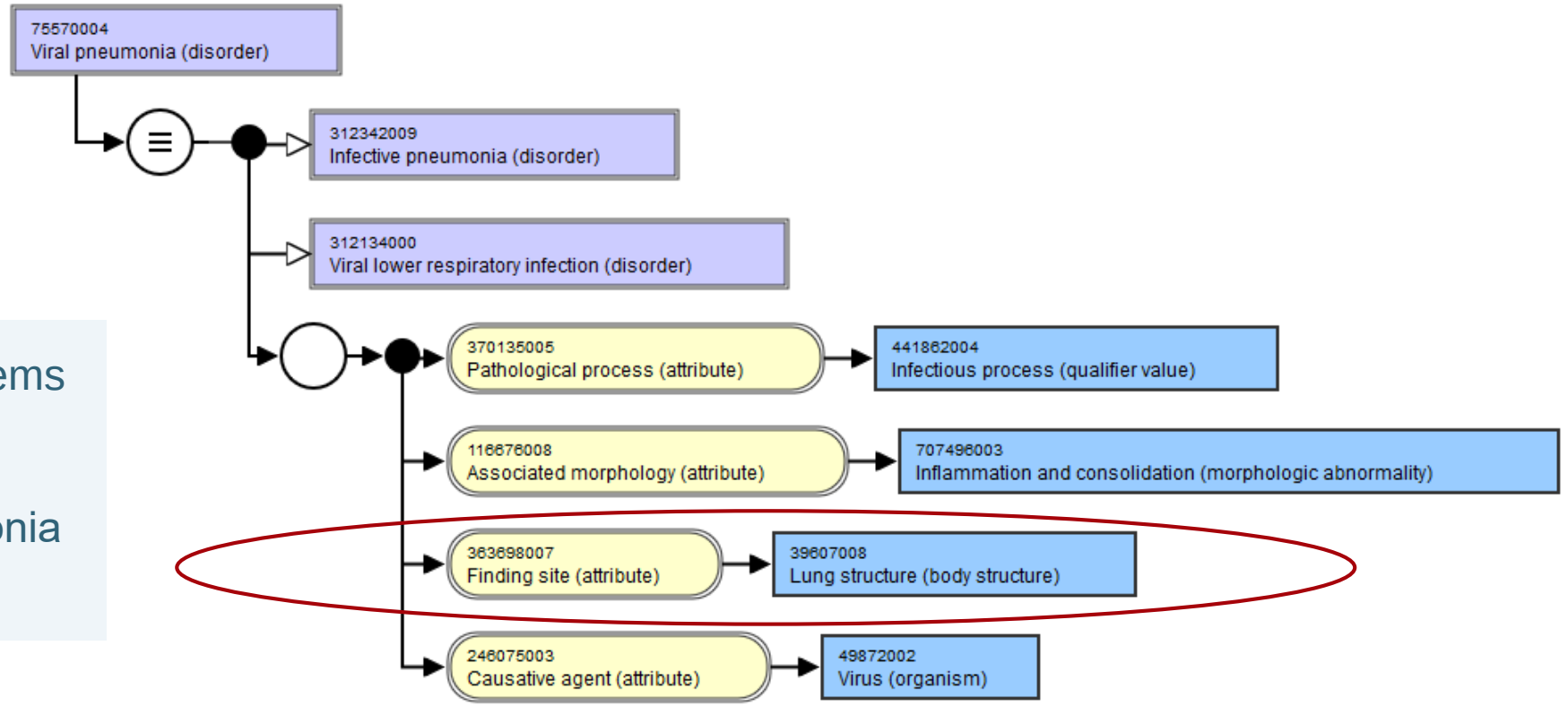
allows data aggregation according to different characteristics

SNOMED CT - Attribute Relationships

- Concepts are defined by attribute relationships
- Enables uncovering information hidden in the data

All patients with lung problems

Patients with Viral pneumonia included in the results



SNOMED CT – Further Information

Tools

- Browser https://browser.ihtsdotools.org/
- International Open Tooling Framework https://ihtsdo.github.io/

Documentation

- SNOMED CT Editorial Guide http://snomed.org/eg

Training

- Library of videos on IHTSDO training platform https://elearning.ihtsdotools.org/
- Regular online training courses
  e.g. SNOMED CT Implementation course twice a year (pre-condition: Foundation course)

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SNOMED CT versus ICD 10
Polyhierarchy versus monohierarchy

SNOMED CT	patient with **parainfluenza virus pneumonia**	**ICD-10**
Code: 64917006		Code: J12.2

answerable		answerable
Yes (subtype of respiratory disorder)	Does the patient have respiratory disorder?	Yes (placed in chapter respiratory diseases)
Yes (subtype of infectious disease)	Does patient have an infection?	No (not in chapter A certain infectious and prasitic diseases)
Yes (finding site is lung structure)	Does the disorder affect the lung?	No (information not available)
Yes (causative agent is Human parainfluenza viruses which is a subtype of virus)	Is the disorder caused by a virus?	No (information not available)

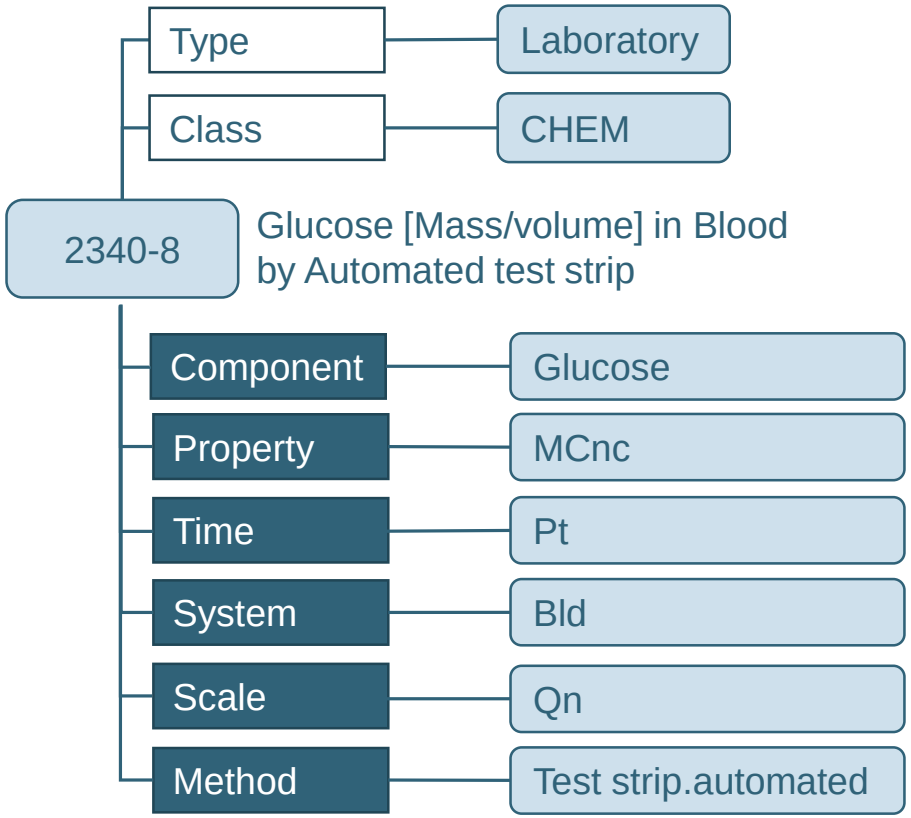
Logical Observation Identifier Names and Codes (LOINC)

Regenstrief Institute, released twice yearly, languages: English

Coverage: Clinical observations, **lab tests**, and documents

Type: Axial hierarchy – 6 axes

Relation to others: Example units in UCUM



Customized queries tailored to project needs, e.g.

All patient with the LOINC code 2340-8
OR
All patients with Glucose in Blood
OR
All patients with Glucose in Blood with a quantitative result

Search string: *Component:Glucose AND System:Bld AND Scale:Qn*

LOINC Parts

LOINC code	30313-1	75928-2
Long Common Name	Hemoglobin [Mass/volume] in Arterial blood	Hemoglobin [Moles/volume] in Arterial blood
Component	Hemoglobin	Hemoglobin
Property	Mass Concentration (MCnc) *Example UCUM Unit: g/dL*	Substance Concentration (SCnc) *Example UCUM Unit: mmol/L*
Timing	Point in time (Pt)	Point in time (Pt)
System	Blood arterial (BldA)	Blood arterial (BldA)
Scale	Quantitative (Qn)	Quantitative (Qn)
Method	<null>	<null>

Change in one single part ➡ different LOINC code

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LOINC – Further Information

Browser

- https://loinc.org/search/

Documentation

- https://loinc.org/kb/users-guide/
- https://loinc.org/syntax-card/

IVD Industry Connectivity Consortium

- https://ivdconnectivity.org/livd/)

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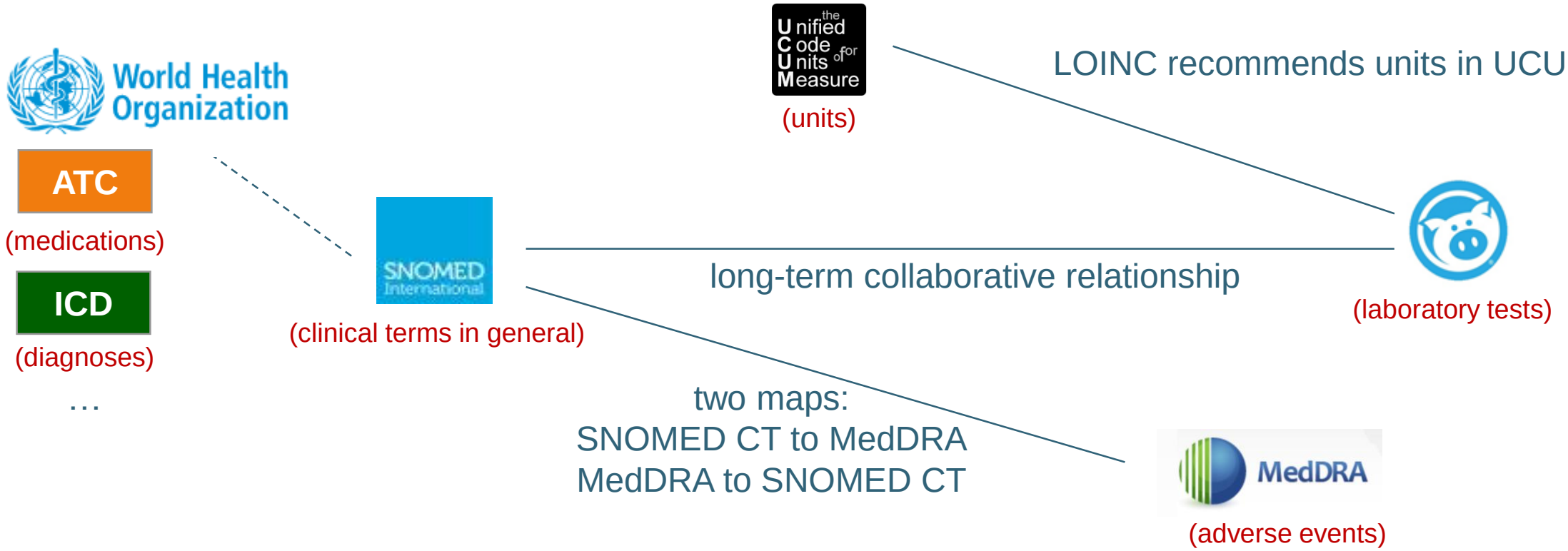
Harmonized Ecosystem of Semantic Standards

Collaboration between Standard Development Organizations (SDOs): agreements and recommendations; mappings between standards



Summary & Links

- Semantic standards support interoperability
- Not one single standard but harmonized ecosystem
- National and international standards
- Semantic standards are independent of technical platforms

- SPHN Dataset https://sphn.ch/document/sphn-dataset/
- Semantic Strategy of SPHN https://sphn.ch/2021/05/20/rdf-ication-of-semantic-framework/
- Documentation for Semantic Standards, the SPHN Dataset and implementation in RDF
  https://sphn-semantic-framework.readthedocs.io/en/latest/

Thank you for your attention!

Q&A

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Bonus Content – ICD-11

- Timelines
  - Released in May 2019 by World Health Assembly
  - Usable from 1st Jan 2022 onwards (transition period of 5 years)
- What stays?
  - Purpose: mortality and morbidity statistics
  - Classification with residual categories
  - Organization into chapters & alphanumeric codes
- What is new?
  - More chapters, e.g. 26 Traditional Medicine Conditions, X Extension Codes
  - Possibility of post-coordinated codes
  - Unique resource identifiers (URIs) for each concept, e.g. http://id.who.int/icd/entity/257068234 for Cholera
  - REST API

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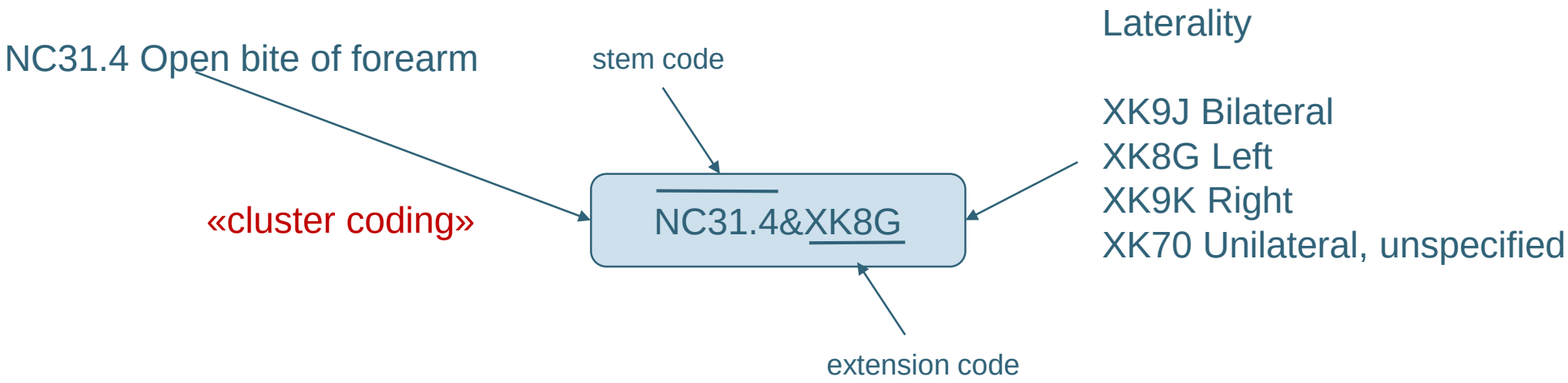
Bonus Content – ICD-11

Post-coordination example with extension code

Chapter 22
Injury, poisoning or certain other consequences of external causes

Chapter X
Extension Codes