

SNOMED CT in a Nutshell

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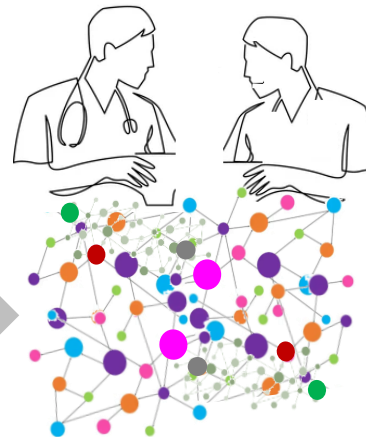
SNOMED CT in a Nutshell

1. What is SNOMED? What is SNOMED CT ?
2. What medical knowledge is in SNOMED CT?
3. Given ICD, OPS etc. Why SNOMED CT ?
4. What languages does SNOMED CT speak?

Standardised, contextualised data representation

Structured

Brain imaging type	
Non-Contrast CT	<input type="checkbox"/>
Non-Contrast CT + CT Angiography	<input type="checkbox"/>
Non-Contrast CT + CT Angiography + CT Perfusion	<input type="checkbox"/>
MR DWI / Flair	<input type="checkbox"/>
MR DWI / Flair + MR Angography	<input type="checkbox"/>
MR DWI / Flair + MR Angography + MR Perfusion	<input type="checkbox"/>
Imaging done in another hospital	<input type="checkbox"/>
Imaging not done	<input type="checkbox"/>
CT / MR Perfusion deficit	
Medial	<input type="checkbox"/>
Anterior	<input type="checkbox"/>
Posterior	<input type="checkbox"/>
Carotid	<input type="checkbox"/>
No, analysis not possible due to bilateral stenosis	<input type="checkbox"/>
No deficit	<input type="checkbox"/>
CT / MR perfusion core volume	
CT / MR perfusion core volume	...ml
CT / MR perfusion deficit hyperfusion volume	
CT / MR perfusion deficit hyperfusion volume	...ml
Imaging done at what time?	
Old infarcts seen on the imaging	...
Yes	<input type="checkbox"/>
No	<input type="checkbox"/>
Cortical	
Yes	<input type="checkbox"/>
No	<input type="checkbox"/>
Subcortical (basal ganglia, internal capsule)	
Yes	<input type="checkbox"/>
No	<input type="checkbox"/>
Stroke type	
Ischemic stroke	<input type="checkbox"/>
Intracerebral Hemorrhage	<input type="checkbox"/>
Transient Ischemic Attack (TIA)	<input type="checkbox"/>
Subarachnoid Hemorrhage	<input type="checkbox"/>
Cerebral Venous Thrombosis	<input type="checkbox"/>
Stroke mimics	<input type="checkbox"/>
Undetermined (Unknown stroke type)	<input type="checkbox"/>
ASPECT score (number)	...



SNOMED CT HL7® FHIR®

Unstructured

CT Brain (Non-contrast):

Hypodensity in the left middle cerebral artery (MCA) territory, consistent with acute ischemic stroke. Areas of encephalomalacia and gliosis in the right frontal lobe, suggestive of old infarcts. No evidence of hemorrhage or significant mass effect.

MRI Brain (DWI and ADC sequences):

Diffusion restriction in the left MCA distribution, involving the frontal, parietal, and temporal lobes. T2 hyperintensities in the right basal ganglia and periventricular white matter, consistent with prior small vessel ischemic changes. No evidence of recent hemorrhage or space-occupying lesions.

CT Angiography (CTA):

Moderate stenosis in the left internal carotid artery (ICA). No occlusion of the major cerebral arteries.

Stroke Type:

Current Stroke: Large vessel ischemic stroke involving the left MCA territory.

Old Brain Infarcts: Evidence of previous infarcts in the right frontal lobe and basal ganglia, consistent with small vessel disease or lacunar infarcts.

Diagnosis:

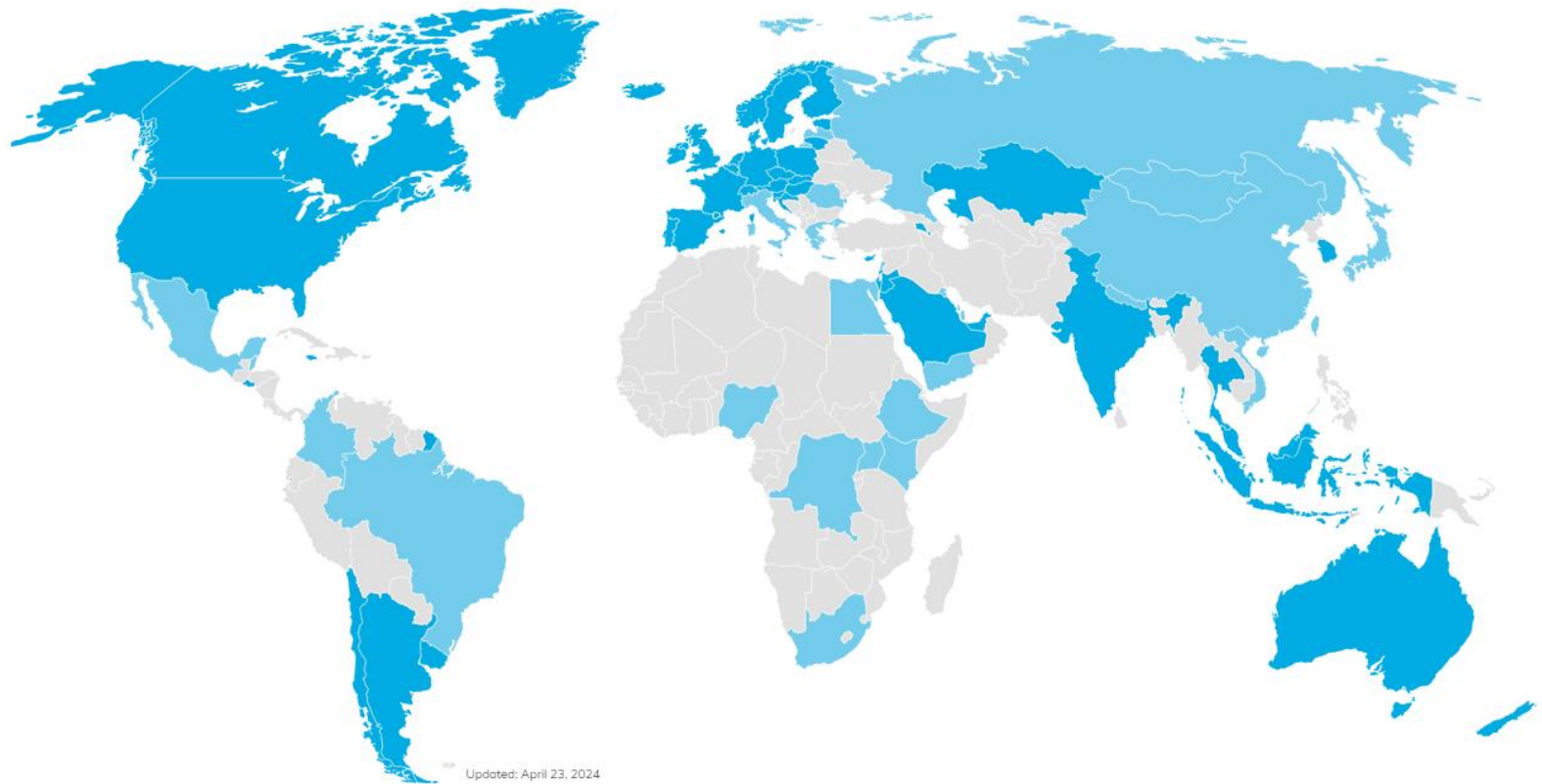
Acute Left MCA Ischemic Stroke (Large vessel occlusion)

Chronic Small Vessel Ischemic Disease with prior infarcts in the right frontal and basal ganglia regions.

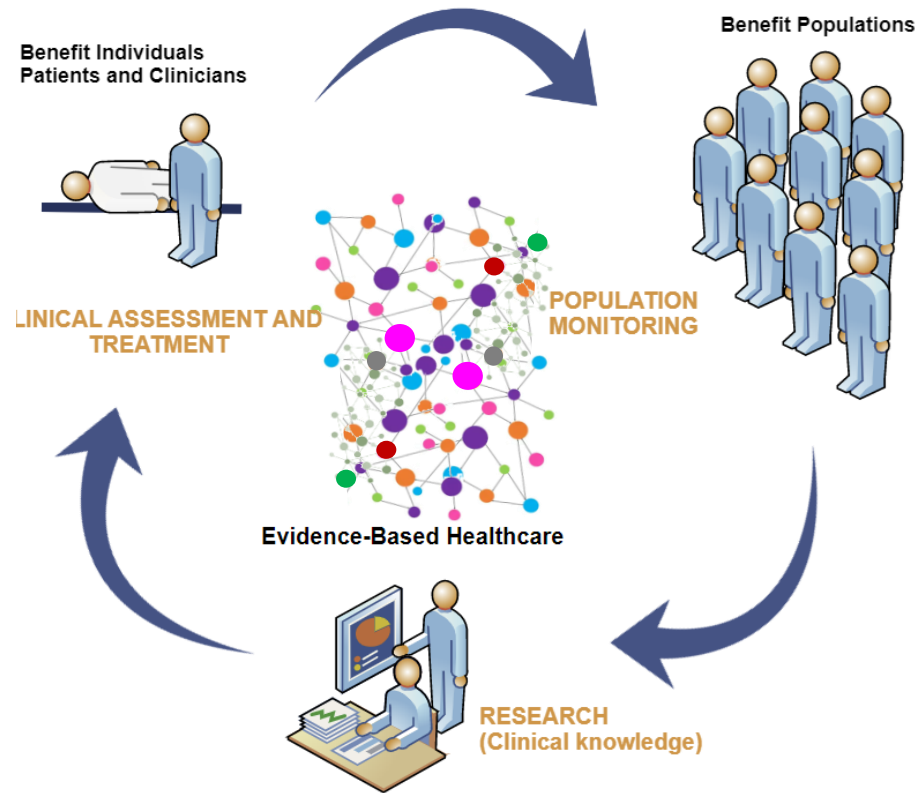
Clarifying the name "SNOMED"

- ▶ ~~Systematized Nomenclature of Medicine~~ (SNOMED), edited 1974 - 2007 by the College of American Pathologists. Characterised as a Nomenclature (Versions I, II, 3.*, NT). German Version 1984 (F. Wingert)
- ▶ SNOMED CT: comprehensive medical terminology for clinical documentation. Based on SNOMED NT after Fusion with NHS Clinical Terms (CT). Ontology-based terminology system, no longer characterised as a nomenclature
- ▶ SNOMED International is a non-for-profit international Organisation, owned by its members It has owned all rights to all SNOMED versions since 2007, but only continues to develop SNOMED CT

SNOMED International Member States



SNOMED CT as a clinical standard

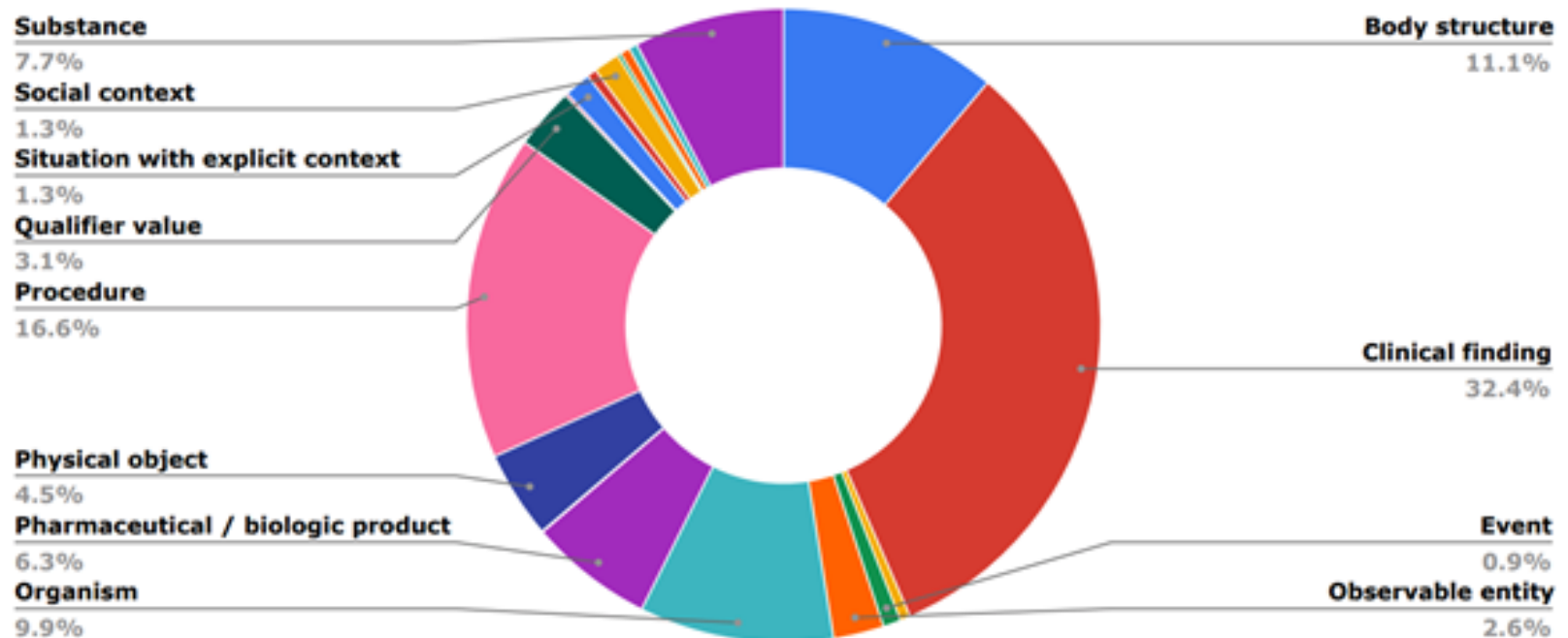


- Monitoring public health
- Measuring the quality of care
- Semantic integration of care data with scientific data
- Facilitating access to relevant information

... through clear, internationally standardised codes for all relevant content in healthcare (and medical research)

SNOMED CT – Top level-Hierarchies

SNOMED CT is huge: 368285 concepts (2024)



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- 2. What medical knowledge is in SNOMED CT?**
3. Given ICD, OPS etc. Why SNOMED CT ?
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How is SNOMED CT structured?

Ontology: Description of the domain

- ▶ SNOMED CT concepts
 - ▶ Classes
 - ▶ Attributes (relations)
- ▶ Hierarchy
- ▶ Axioms
 - ▶ Relationships (Triples +)
 - ▶ OWL expressions
 - ▶ Transferrable to EL logics

SNOMED IDs



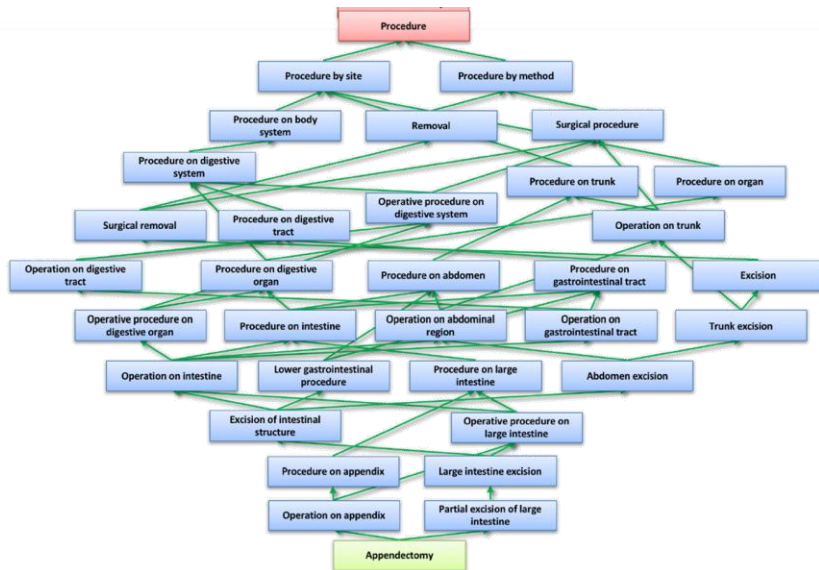
Terminology: Description of the domain

- ▶ SNOMED CT terms
 - ▶ Synonyms
 - ▶ Preferred terms
 - ▶ Fully specified names
- ▶ Descriptions
 - ▶ Terms in context
- ▶ Free text definitions



Ontological aspects of SNOMED CT

Multiple subclass hierarchies



Source: Peter G. Williams - An Introduction to SNOMED CT

Formal axioms

EquivalentClasses(

:80146002 | Excision of appendix (procedure)|

```
ObjectIntersectionOf( :71388002 | Procedure (procedure) |
```

```
ObjectSomeValuesFrom( :609096000 |Role group (attribute)|
```

```
ObjectIntersectionOf(ObjectSomeValuesFrom(
```

:260686004 | Method (attribute)|

:129304002 | Excision - action (qualifier value) |

ObjectSomeValuesFrom(

:405813007 | Procedure site - Direct (attribute) |

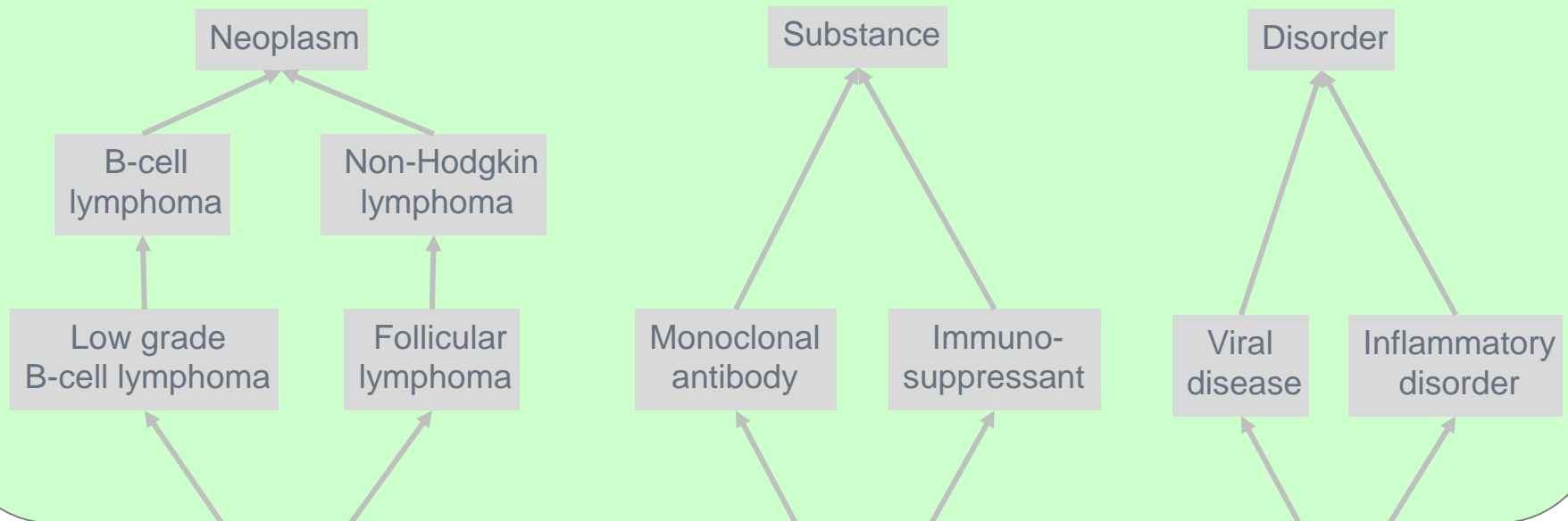
```
:66754008 |Appendix structure (body structure)| )))))
```

- ▶ SNOMED CT only contains "for all" statements in the sense of definitional or necessary properties, e.g.

- ▶ Every appendectomy targets some appendix
- ▶ Every asthma is located in some lung
- ▶ Every Thumb is part of some hand
- ▶ Every ASS is a salicylate

Value of multiple hierarchies

Aggregated classes for querying



Detailed representations of a clinical case

Terminological aspects of SNOMED CT

English and Spanish are the official languages of SNOMED CT. Not all other languages have all content translated, often only the preferred term (and some synonyms)

Code

- ▶ Internationally unique:

SCTID: 274864009

Fully specified name

- ▶ Language-specific label
- ▶ Self-explanatory, unique
- ▶ Has semantic tag (e.g. "event")

**Glycogen storage disease
due to acid maltase
deficiency (disorder)**

**enfermedad por depósito de
glucógeno debida a deficiencia
de maltasa (trastorno)**

Preferred term

- ▶ Language and dialect-related preferred synonym, no semantic tag

**Glycogen storage disease
due to acid maltase
deficiency**

**Glykogenose
Typ 2**

**enfermedad por depósito de
glucógeno debida a deficiencia
de maltasa**

Synonym

- ▶ Represents current usage
- ▶ possibly ambiguous

Pompe disease

Morbus Pompe

enfermedad de Pompe

Text definition

- ▶ Currently only available for a minor part and not for all languages

Glycogen storage disease due to acid maltase deficiency (AMD) is an autosomal recessive trait leading to metabolic myopathy that affects cardiac and respiratory muscles in addition to skeletal muscle and other tissues. AMD represents a wide spectrum of clinical presentations caused by an accumulation of glycogen in lysosomes.

La enfermedad por almacenamiento de glucógeno debida a deficiencia de maltasa (DMA) ácida es un rasgo autosómico recesivo que da lugar a una miopatía metabólica que afecta a los músculos cardíacos y respiratorios además de los músculos esqueléticos y otros tejidos. La DMA es una amplia gama de presentaciones clínicas causadas por la acumulación de glucógeno en los lisosomas

How is SNOMED CT structured?

Ontology: Description of the domain

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sct2_Concept_Snapshot_INT_20240701.txt

- ▶ Hierarchy

sct2_Relationship_Snapshot_INT_20240701.txt

- ▶ Axioms
 - ▶ Relationships (Triples +)
 - ▶ OWL expressions
 - ▶ Transferrable to EL logics

SNOMED IDs



Terminology: Description of the domain

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 - ▶ Preferred terms
 - ▶ Fully specified names

sct2_Description_Snapshot-en_INT_20240701.txt

- ▶ Descriptions
 - ▶ Terms in context

sct2_TextDefinition_Snapshot-en_INT_20240701.txt

- ▶ Free text definitions

- ▶ Refsets

- ▶ subset of SNOMED CT content
- ▶ mappings, e.g. to LOINC, ICD-10

der2_iisssccRefset_ExtendedMapSnapshot_INT_20240801.txt



Sources of SNOMED CT



➔ <https://mlds.ihtsdotools.org/>

Releases available for Registered Users

SNOMED International [View License](#)

SNOMED CT Germany National Edition

SNOMED CT National Edition Germany release packages

SNOMED CT Spanish package - Edición en Español

The SNOMED CT Spanish package releases, as distributed by SNOMED International.
Versiones de la Edición en Español de SNOMED CT, distribuidas por SNOMED International.

SNOMED CT International Edition

SNOMED CT International Edition release packages

SNOMED CT GP/FP Refset package

This package contains the SNOMED CT International General/Family Practice Reasons for encounter and Health issues refset.

➔ **SnomedCT_InternationalIRF2_PRODUCTION_20240901T120000Z.zip**

doc_SnomedCTReleaseNotes_Current-en-US_INT_20240901.pdf

▼ SnomedCT_InternationalIRF2_PRODUCTION_2

> Full

▼ Snapshot

▼ Refset

Content

Language

Map

Metadata

Terminology

sct2_Concept_Snapshot_INT_20240801.txt

sct2_Description_Snapshot-en_INT_20240801.txt

sct2_Identifier_Snapshot_INT_20240801.txt

sct2_Relationship_Snapshot_INT_20240801.txt

sct2_RelationshipConcreteValues_Snapshot_INT_20240801.txt

sct2_sRefset_OWLExpressionSnapshot_INT_20240801.txt


sct2_StatedRelationship_Snapshot_INT_20240801.txt

sct2_TextDefinition_Snapshot-en_INT_20240801.txt

How is SNOMED CT structured?

Ontology: Description of the domain

- ▶ SNOMED CT concepts
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domain knowledge

Terminology: Description of the domain

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- ▶ Free text definitions

linguistic knowledge



How is SNOMED CT structured?

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All medical
publications
> 300 km

domain knowledge



Ontology: Description of the domain



- ▶ Approx. 1.7 million axioms using about 270,000 concepts
- ▶ Why is this ontological content so relevant?
- ▶ How does it differ from medical knowledge in general?

All medical
publications
> 300 km



SNOMED Browser (<https://browser.ihtsdotools.org>)

SNOMED CT Browser

Release: International Edition Version: 2024-09-01 Perspective: Full Feedback About

Taxonomy Search Favorites Refset

Search

Options

Search: Prefix any order

Status: Active concepts only

Description type: All

Language Refsets

☒ Group by concept

Filter results by Language

english 43

Filter results by Semantic Tag

☐ disorder 41

☐ product 1

☐ situation 1

Filter results by Module

SNOMED CT core 43

Filter results by Refset

CTV3 to SNOMED CT simple map 59

SNOMED CT to ICD-10 49

Type at least 3 characters ✓ Example: shou fra

Glycogen storage

43 matches found in 0.407 seconds.

Glycogen storage disease	Glycogen storage disease (disorder)
Glycogen storage disease food	Glycogen storage disease food (product)
Glycogen storage disease type 8	Glycogen storage disease type VIII (disorder)
Glycogen storage disease type 0	Glycogen synthase deficiency (disorder)
Glycogen storage disease type V	Glycogen storage disease, type V (disorder)
Glycogen storage disease type 3	Glycogen storage disease, type III (disorder)
Glycogen storage disease type X	Muscle phosphoglycerate mutase deficiency (disorder)
Glycogen storage disease type Ic	Phosphate transport defect (disorder)
Glycogen storage disease, type I	Glycogen storage disease, type I (disorder)
Glycogen storage disease type IV	Glycogen storage disease, type IV (disorder)
Glycogen storage disease type IX	Glycogen storage disease type IX (disorder)
Glycogen storage disease type Id	Glucose transport defect (disorder)

Concept Details

Summary Details Diagram Expression Refsets Members History References

Stated Inferred

Parents

- Autosomal recessive hereditary disorder (disorder)
- Glycogen storage disease (disorder)

Glycogen storage disease due to acid maltase deficiency (disorder)

SCTID: 274864009

274864009 | Glycogen storage disease due to acid maltase deficiency (disorder) |

en Glycogen storage disease due to acid maltase deficiency (disorder)

en Glycogen storage disease due to acid maltase deficiency

en Alpha-1,4-glucosidase acid deficiency

en Glycogen heart disease

en Glycogen storage disease, type II

en Glycogenosis due to acid maltase deficiency

en Glycogenosis type II

en Pompe disease

en Pompe's disease

en Glycogen storage disease due to acid maltase deficiency (AMD) is an autosomal recessive trait leading to metabolic myopathy that affects cardiac and respiratory muscles in addition to skeletal muscle and other tissues. AMD represents a wide spectrum of clinical presentations caused by an accumulation of glycogen in lysosomes.

Occurrence → Congenital

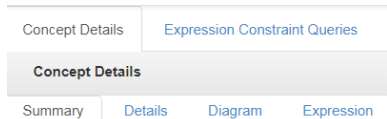
Due to → Deficiency of glucan 1,4-alpha-glucosidase

Children (2)

- Glycogen storage disease due to acid maltase deficiency, infantile onset (disorder)
- Glycogen storage disease due to acid maltase deficiency, late-onset (disorder)

Ontological content of SNOMED CT

Formal ontologies are theories that formulate precise properties and relations of objects in a knowledge domain. They provide axioms about classes of these objects that are based on formal logic. (Based on Thomas Hofweber and Alan Rector)



multiple taxonomic
hierarchies
(Subclass hierarchie)

Concept names
Fully specified name
und code

Concepts = units of meaning that usually define classes of individual entities (objects, processes, qualities etc.)

A class can have multiple parent classes and multiple child classes
All individuals in a class are also contained in each of its parent classes (set theory)

Parents

- Malignant tumor of lung (disorder)
- Primary malignant neoplasm of intrathoracic organs (disorder)
- Primary malignant neoplasm of respiratory tract (disorder)

Primary malignant neoplasm of lung (disorder) ☆

SCTID: 93880001

93880001 | Primary malignant neoplasm of lung (disorder) |

en Primary malignant neoplasm of lung

en Primary malignant neoplasm of lung (disorder)

en Lung cancer

Finding site → Lung structure

Associated morphology → Malignant neoplasm, primary

Children (31)

- Carcinoma of lung parenchyma (disorder)
- Epithelioid hemangioendothelioma of lung (disorder)
- Non-Hodgkin's lymphoma of lung (disorder)
- Non-small cell lung cancer (disorder)
- Overlapping malignant neoplasm of bronchus and lung (disorder)
- Pancoast tumor (disorder)
- Pleuropulmonary blastoma (disorder)
- Primary acinar cell carcinoma of lung (disorder)
- Primary adenocarcinoma of lung (disorder)
- Primary basaloid squamous cell carcinoma (disorder)

All instances of type 93880001 are located in and instance of 39607008 (Lung structure) und have a morphological feature of type 86049000 (Malignant neoplasm, primary) ... and vice versa (equivalence)

These are statements about real objects, not about data! Such statements are generally stable and generally valid

The OWL-EL logic on which SNOMED CT is based is limited to

- Statements that apply to all instances of a SNOMED-CT class without exception
- Definitions that allow the conclusion to be drawn about a new class from the properties of existing ones

Not expressible are

- Default statements (which allow exceptions, e.g. "All elephants are grey")
- Probabilistic statements ("Smoking causes lung cancer")
- Currently (still): Statements that contain negations

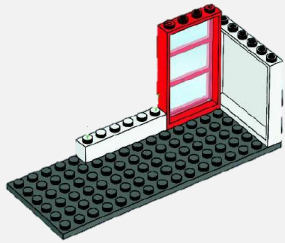
SNOMED CT Pre- and post-coordination

- **Pre-coordination:** named classes for logically assembled SNOMED CT expressions.
- **Post-coordination:** new expressions using the same elements and building principles

Pre-coordination example: Deep partial thickness burn of skin of finger – **SNOMED ID: 770615001**

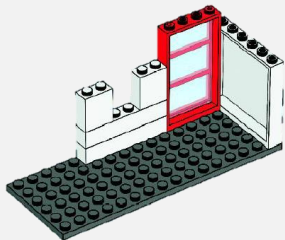
EquivalentClasses(

```
:770615001 | Deep partial thickness burn of skin of finger (disorder)|
ObjectIntersectionOf( :64572001 | Disease (disorder)|
  ObjectSomeValuesFrom(
    :609096000 | Role group (attribute)|
    ObjectIntersectionOf (ObjectSomeValuesFrom(
      :116676008 | Associated morphology (attribute)|
      :262588000 | Deep partial thickness burn (morphologic abnormality)| )
    ObjectSomeValuesFrom(
      :363698007 | Finding site (attribute)|
      :56213003 | Skin of finger (body structure)| ) ) ) ) )
```



Post-coordination example: Deep partial thickness burn of skin of back of right index finger – **SNOMED ID: none**

```
ObjectIntersectionOf ( :64572001 | Disease (disorder)|
  ObjectSomeValuesFrom (
    :609096000 | Role group (attribute)|
    ObjectIntersectionOf (ObjectSomeValuesFrom(
      :116676008 | Associated morphology (attribute)|
      :262588000 | Deep partial thickness burn (morphologic abnormality)| )
    ObjectSomeValuesFrom (
      :363698007 | Finding site (attribute)|
      ObjectIntersectionOf (
        : 37314006 | Skin structure of dorsal surface of index finger (body structure)|
        ObjectSomeValuesFrom (
          :272741003 | Laterality (attribute)|
          :24028007 | Right (qualifier value)| ) ) ) ) ) )
```



OWL Reasoning with SNOMED CT

Data Properties x Individuals by class x DL Query x Individuals x

DL query:

Query (class expression)

'Role group (attribute)' **some**
 (('Causative agent (attribute)' **some** 'Family Coronaviridae (organism)')
and
 ('Finding site (attribute)' **some** 'Respiratory tract structure (body structure)'))

Execute Add to ontology

Query results

Direct superclasses (0 of 1)

Direct subclasses (2 of 2)

- 'Pneumonia caused by Human coronavirus (disorder)'
- 'Severe acute respiratory syndrome of upper respiratory tract (disorder)'

Subclasses (3 of 4)

- 'Pneumonia caused by Human coronavirus (disorder)'
- 'Pneumonia caused by Severe acute respiratory syndrome coronavirus (disorder)'
- 'Severe acute respiratory syndrome of upper respiratory tract (disorder)'

Query for

- ☒ Direct superclasses
- ☐ Superclasses
- ☐ Equivalent classes
- ☒ Direct subclasses
- ☒ Subclasses
- ☐ Instances

Result filters


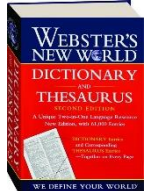

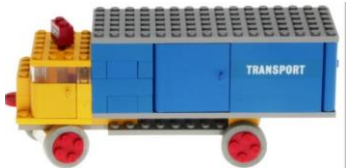
- ▶ SNOMED OWL Toolkit
github.com/IHTSDO/snomed-owl-toolkit/releases
- ▶ Protégé 5 Editor (with ELK reasoner)
<https://protege.stanford.edu/>

- ▶ OWL specification
<https://www.w3.org/TR/owl-features/>
- ▶ OWL API
<http://owlcs.github.io/owlapi/>

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Classification systems vs. Ontologies

	Classifications (catalogues)				Ontologies
Examples	ICD-10	OPS	ATC	LOINC	SNOMED CT
Context of use	<ul style="list-style-type: none"> ▶ Health Statistics ▶ Reimbursement ▶ Diagnosis-related groups 				<ul style="list-style-type: none"> ▶ Clinical Documentation ▶ Vocabulary for text mining ▶ Basis for querying EHR content 
Architecture	<ul style="list-style-type: none"> ▶ Single hierarchies ▶ Non-overlapping classes ▶ Residuals ("others", "unspecified") ▶ Classification rules ▶ Non-modular 				<ul style="list-style-type: none"> ▶ Multiple hierarchies ▶ Overlapping classes ▶ No residuals ▶ Coordination rules ("grammar") ▶ Modular 
Semantics	Taxonomies (subclass) Exclusions (not)				Description logics OWL-EL (subclass, equivalence, conjunction, existential restrictions)

Synopsis ICD-10 – SNOMED CT

ICD-10

- J84.1 Sonstige interstitielle Lungenkrankheiten mit Fibrose
Inkl.: Akute interstitielle Pneumonie [AIP]
 Diffuse Lungenfibrose
 Fibrosierende Alveolitis (kryptogen)
 Gewöhnliche interstitielle Pneumonie
 Hamman-Rich-Syndrom
 Idiopathische Lungenfibrose
- Exkl.:** Lungenfibrose (chronisch): durch Einatmen von chemischen Substanzen, Dämpfen (J68.4)
 Lungenfibrose (chronisch): nach Strahleneinwirkung (J70.1)
- J84.8 Sonstige näher bezeichnete interstitielle Lungenkrankheiten
 J84.9 Interstitielle Lungenkrankheit, nicht näher bezeichnet
Inkl.: Interstitielle Pneumonie o.n.A.

Same code for
different diseases

Exclusions

Subtypes in
other chapters

Residual classes

SNOMED CT

Parents

- Disorder of lung (disorder)
- Lesion of lung (finding)

Parents

Code, Label,
Synonyms

Fibrosis of lung (disorder) ☆

SCTID: 51615001

51615001 | Fibrosis of lung (disorder)

en Fibrosis of lung
 en Cirrhosis of lung
 en Fibrosis of lung (disorder)
 en Pulmonary fibrosis

Associated morphology → Fibrosis
 Finding site → Lung structure

Children (26)

- Atrophic fibrosis of lung (disorder)
- Chronic fibrosis of lung (disorder)
- Confluent fibrosis of lung (disorder)
- Diffuse interstitial pulmonary fibrosis (disorder)
- Drug induced pulmonary fibrosis (disorder)
- Fibrosis of lung caused by radiation (disorder)
- Graphite fibrosis of lung (disorder)
- Hereditary fibrosing poikiloderma, tendon contractures, myopathy, pulmonary fibrosis syndrome (disorder)
- Idiopathic hilar fibrosis (disorder)
- Idiopathic pulmonary fibrosis (disorder)
- Interstitial pulmonary fibrosis of prematurity (disorder)
- Localized pulmonary fibrosis (disorder)

Formal
definitions

Children

Pragmatics of ICD-10 and SNOMED CT use


















ICD-10

- ▶ Different versions (outpatients, inpatients, mortality statistics, Germany, Austria,...)
- ▶ Different coding rules
 - ▶ DRG coding with ICD-10-GM:
 - If treatment started and test results unclear, the suspected diagnosis is coded
 - Only secondary diagnoses are coded if they justify additional resource consumption

SNOMED CT

- ▶ No coding rules intended for SNOMED CT
- ▶ SNOMED CT code stands for the subject of the documentation, regardless of the purpose of downstream use
- ▶ Meaning given by (self-explanatory) fully specified term, formal and textual definitions
- ▶ Context ideally given through reference to SNOMED codes from standardised information model (e.g. FHIR)

Patient-level context by standardised information templates

Name	Flags	Card.	Type	Description & Constraints	
 Condition	TU		DomainResource	Detailed information about conditions, problems or diagnoses + <i>Warning: If category is problems list item, the clinicalStatus should not be unknown</i> + <i>Rule: If condition is abated, then clinicalStatus must be either inactive, resolved, or remission.</i> Elements defined in Ancestors: id , meta , implicitRules , language , text , contained , extension , modifierExtension	
 identifier	Σ	0..*	Identifier	External Ids for this condition	
 clinicalStatus	?! Σ C	1..1	CodeableConcept	active recurrence relapse inactive remission resolved unknown Binding: Condition Clinical Status Codes (Required)	time pattern codes
 verificationStatus	?! Σ	0..1	CodeableConcept	unconfirmed provisional differential confirmed refuted entered-in-error Binding: Condition Verification Status (Required)	
 category	C	0..*	CodeableConcept	problem-list-item encounter-diagnosis Binding: Condition Category Codes (Preferred)	certainty degree codes
 severity		0..1	CodeableConcept	Subjective severity of condition Binding: Condition/Diagnosis Severity (Preferred)	severity codes
 code	Σ	0..1	CodeableConcept	Identification of the condition, problem or diagnosis Binding: Condition/Problem/Diagnosis Codes (Example)	disorder codes
 bodySite	Σ	0..*	CodeableConcept	Anatomical location, if relevant Binding: SNOMED CT Body Structures (Example)	
 subject	Σ	1..1	Reference(Patient Group)	Who has the condition?	
 encounter	Σ	0..1	Reference(Encounter)	The Encounter during which this Condition was created	
 onset[x]	Σ	0..1		Estimated or actual date, date-time, or age	time points / intervals
 onsetDateTime			dateTime		
 onsetAge			Age		
 onsetPeriod			Period		
 onsetRange			Range		
 onsetString			string		

Mappings to other Terminologies

- ▶ Different architectures affect mappings between SNOMED CT and ICD or OPS
- ▶ Lexical mapping semantically problematic, z.B.
 - ▶ SNOMED CT: Urinary tract infection (68566005) is a parent of Urinary tract infection during pregnancy (307534009)
 - ▶ ICD-10: Urinary tract infection (N39.0) excludes Urinary tract infection during pregnancy (O23.9)
- ▶ SNOMED-ICD-10 Map by SNOMED International:
 - ▶ <https://confluence.ihtsdotools.org/display/DOCICD10>
- ▶ SNOMED-OPS Map:
 - ▶ for the 2150 most frequently use OPS-Codes*
- ▶ LOINC-Codes will be imported into SNOMED CT and represented as pre-coordinated expressions
 - ▶ <https://loincsnomed.org/browser>
- ▶ No SNOMED-ATC-Map

*Schulz, S; Steffel, J; Polster, P; Pachuk, M; Daumke, P. Aligning an Administrative Procedure Coding System with SNOMED CT. JOWO 2019 - The Joint Ontology Workshops: ODL5 2019 - Ontologies and Data in Life Sciences. 2518: Aachen: CEUR Workshop Proceedings; 2019

SNOMED CT in a Nutshell

1. What is SNOMED? What is SNOMED CT ?
2. What medical knowledge is in SNOMED CT?
3. Given ICD, OPS etc. Why SNOMED CT ?
- 4. What languages does SNOMED CT speak?**

Multilingual SNOMED CT

International Editions

Go browsing...
International Edition
2024-09-01

Go browsing...
Spanish Edition
2024-03-31

Go browsing...
International Derivatives
2024-01-01

Additional Information

Release Stats

MRCM Browser

Local Extensions

Go browsing...
Argentinian Edition
2024-05-31

Go browsing...
Australian Edition
2022-01-31

Go browsing...
Austrian Edition
2024-08-15

Go browsing...
Belgian Edition
2024-05-15

Go browsing...
Canadian Edition
2024-08-31

Go browsing...
Danish Edition
2024-03-31

Go browsing...
Estonian Edition
2024-05-30

Go browsing...
Finnish Edition
2023-12-15

Go browsing...
French Edition
2024-06-21

Go browsing...
Germany Edition
2024-05-15

Go browsing...
Irish Edition
2024-04-21

Go browsing...
Jamaican Edition
2024-07-25

Go browsing...
Netherlands Edition
2024-03-31

Go browsing...
New Zealand Edition
2024-04-01

Go browsing...
Norwegian Edition
2024-05-15

Go browsing...
Swedish Edition
2024-05-31

Go browsing...
Swiss Edition
2024-06-07

Go browsing...
United States Edition
2024-09-01

Go browsing...
Uruguay Edition
2024-06-15

Go browsing...
All Editions

or

take the Tour...

Externally Hosted Extensions

Go browsing...
United Kingdom edition
(hosted by the UK)

Go browsing...
Spain edition
(hosted by Spain)

Multilingual SNOMED CT

SNOMED CT Browser

Search

Favorites

Search

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

93880001

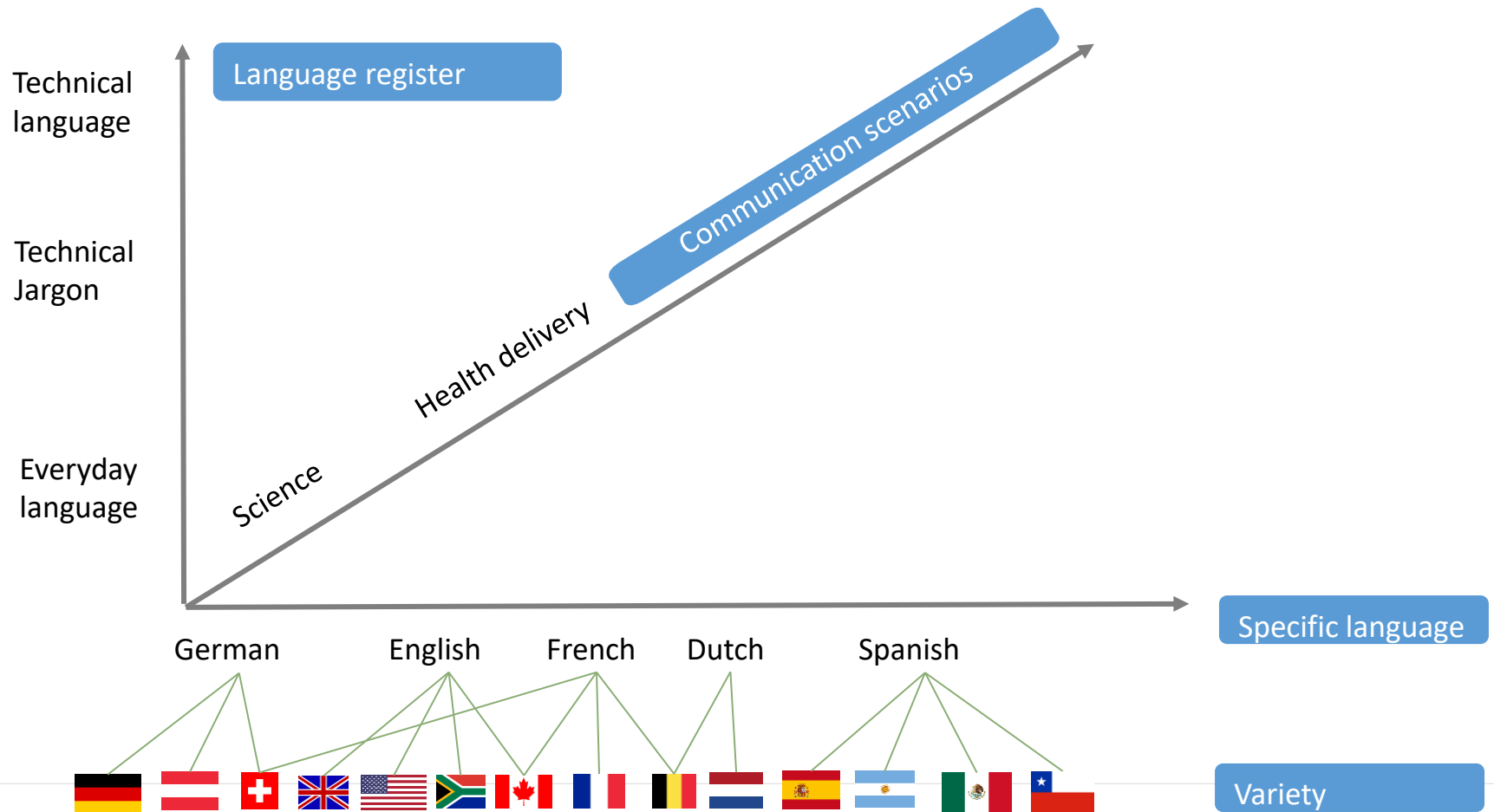
15 matches found in seconds.

longkanker	Primary malignant neoplasm of lung (disorder)
Lung cancer	Primary malignant neoplasm of lung (disorder)
primär malign tumör i lunga	Primary malignant neoplasm of lung (disorder)
Primært malignt neoplasme i lunge	Primary malignant neoplasm of lung (disorder)
tumeur maligne primaire du poumon	Primary malignant neoplasm of lung (disorder)
Tumeur maligne primaire du poumon	Primary malignant neoplasm of lung (disorder)

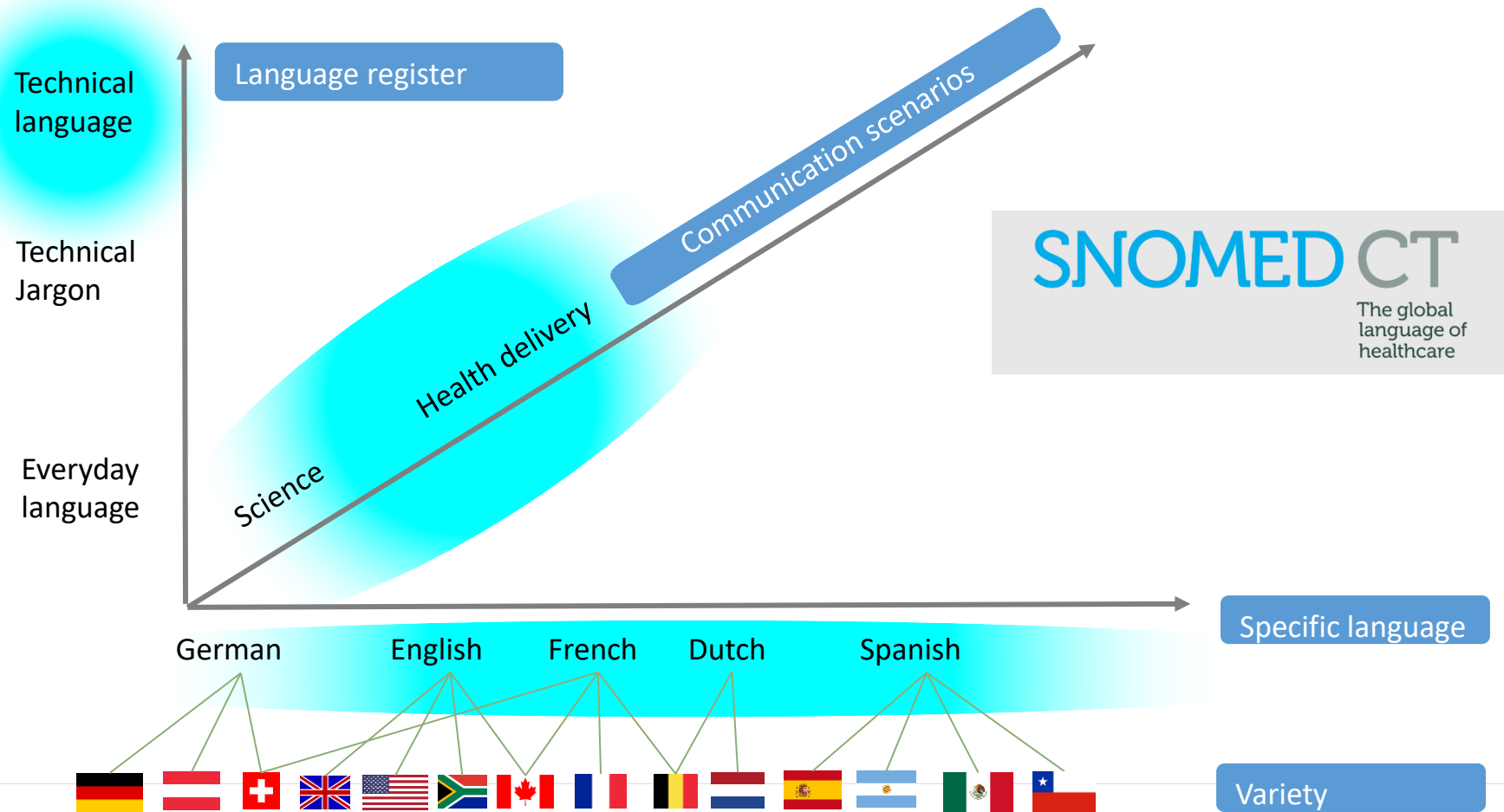
tumeur maligne primaire du poumon	Primary malignant neoplasm of lung (disorder)
Primary malignant neoplasm of lung	Primary malignant neoplasm of lung (disorder)
primair maligne neoplasma van long	Primary malignant neoplasm of lung (disorder)
primair maligne neoplasma van long	Primary malignant neoplasm of lung (disorder)
neoplasia maligna primaria de pulmón	Primary malignant neoplasm of lung (disorder)
tumeur maligne primaire du poumon (trouble)	Primary malignant neoplasm of lung (disorder)
Primary malignant neoplasm of lung (disorder)	Primary malignant neoplasm of lung (disorder)
primair maligne neoplasma van long (aandoening)	Primary malignant neoplasm of lung (disorder)
neoplasia maligna primaria de pulmón (trastorno)	Primary malignant neoplasm of lung (disorder)

All results are displayed

Aspects of Language



Aspects of Medical Language



Lokalisation of SNOMED CT

- Adaptation to local requirements
 - German language
 - Clinical terminology including clinical jargon
- Strategies
 - Complete translation according to SNOMED International guidelines (<https://confluence.ihtsdotools.org/display/DOCTRANSLATE>)
 - Use-case-driven translation
 - Mapping of existing value sets / thesauri to SNOMED CT
 - Creation of local interface terminologies, particularly for text mining and term retrieval

St.p. Appendektomie

Code-ID Suche in: ☐ Keiner ☐ ICPC2 ☒ SNOMED CT ☐ ICD-10 ☐ Inkl. Orphanet

Kapitelauswahl: Alle A B D F H K L N P R S T U W X Y Z

Farbauswahl: Alle Symp Proz Infe Neub Verl Angeb Diag Subs Risk Vorerk Eingr Impla

Anzeige: ☐ ICPC2 ☒ SNOMED CT ☐ ICD-10 ☒ Interfacebegriffe

Thesaurus	SNOMED CT
Notfall-Appendektomie	174036004 [Emergency appendectomy (procedure)]
Appendektomie	80146002 [Excision of appendix (procedure)]
Laparoskopische Appendektomie	6025007 [Laparoscopic appendectomy (procedure)]
Zustand nach: Appendektomie	428251008 [History of appendectomy (situation)]
Zustand nach: Laparoskopischer Appendektomie	1156321000 [History of laparoscopic appendectomy (situation)]

ICPC2: D28 Kriterien: kein Eintrag

Indexterme aus der SNOMED-CT-Interfaceterminologie der Meduni Graz:

History of laparoscopic appendectomy (situation)
 Zustand nach laparoskopischer Blinddarmoperation
 anamnestisch laparoskopische Blinddarmoperation
 Z.n. laparoskopischer Blinddarmoperation
 Zn laparoskopischer Blinddarmoperation
 anamn. laparoskopische Blinddarmoperation
 Vorgeschichte einer laparoskopischen Blinddarmoperation
 St.p. laparoskopischer Blinddarmoperation
 History of laparoscopic appendectomy

Example: SNOMED CT – Graz Interface Terminology

- ▶ Interface terminologies are...
 - ▶ „collections of language expressions that actually occur in medical documentation. Such interface terms are typically the building blocks of clinical narratives but also are used as text values for structured data entry“¹
- ▶ German Interface-Terminology für SNOMED CT²
 - ▶ Maintained at Medical University of Graz (since 2015)
 - ▶ Semi-automatic creation
 - ▶ Currently ~ 4 million terms mapped to SNOMED codes
 - ▶ Main purpose:
 - term indexing for manual coding
 - Text mining

```
[Term]
id: 40583006
name: Resection of trachea (procedure)
synonym: "Resection of trachea (procedure)" EXACT PREF []
synonym: "Resektion der Trachea" EXACT []
synonym: "Trachearesektion" EXACT []
synonym: "Tracheaentfernung" EXACT []
synonym: "Tracheaexzision" EXACT []
synonym: "Trachealexzision" EXACT []
synonym: "Tracheaabtragung" EXACT []
synonym: "Luftröhrenexzision" EXACT []
synonym: "Luftröhrenresektion" EXACT []
synonym: "Luftröhrenabtragung" EXACT []
synonym: "Luftröhrenentfernung" EXACT []
synonym: "Entfernung der Trachea" EXACT []
synonym: "Entfernung der Luftröhre" EXACT []
synonym: "Resektion der Luftröhre" EXACT []
synonym: "Resection of trachea" EXACT []
```

```
[Term]
id: 405830009
name: Neurofibromin (substance)
synonym: "Neurofibromin (substance)" EXACT PREF []
synonym: "Neurofibromatose Typ 1 Protein" EXACT []
synonym: "NF Typ 1 Protein" EXACT []
synonym: "Neurofibromin" EXACT []
synonym: "NF1-Protein" EXACT []
synonym: "NF1-Eiweiß" EXACT []
synonym: "NF1-Gesamtprotein" EXACT []
synonym: "Neurofibromatose Typ 1 Eiweiß" EXACT []
synonym: "NF Typ 1 Eiweiß" EXACT []
synonym: "Neurofibromin" EXACT []
```

```
[Term]
id: 405829004
name: Nuclear phosphoprotein (substance)
synonym: "Nuclear phosphoprotein (substance)" EXACT PREF []
synonym: "nukleäres Phosphoprotein" EXACT []
synonym: "nukleares Phosphoprotein" EXACT []
synonym: "Kernphosphoprotein" EXACT []
synonym: "Kern-Phosphoprotein" EXACT []
synonym: "Nuclear phosphoprotein" EXACT []
```

1. Schulz S, Rodrigues JM, Rector A, Chute CG. Interface Terminologies, Reference Terminologies and Aggregation Terminologies: A Strategy for Better Integration. Stud Health Technol Inform. 2017;245:940-944.
2. Hashemian Nik D, Kasáč Z, Goda Z, Semlitsch A, Schulz S. Building an Experimental German User Interface Terminology Linked to SNOMED CT. Stud Health Technol Inform. 2019 Aug 21;264:153-157.

Outlook

SNOMED CT

- ▶ provides fine-grained semantic codes, labels and definitions for everything of interest in health care
- ▶ is characterised by intense curation effort by an international standards organisation using open platforms and processes
- ▶ is being translated to more and more languages
- ▶ defines interfaces and mappings to other important clinical documentation standards, e.g. ICD-10, LOINC, HL7-FHIR

Check whether SNOMED CT meets the requirements of your use cases, give feedback and contribute to its further development:

- ▶ National release center: snomed@bfarm.de SNOMED Intl: info@snomed.org
- ▶ Questions? → stefan.schulz@averbis.com

Dank und Kontakt (Layout „Abschlussfolie“)

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