What is SNOMED CT?

November 2019

SNOMED Clinical Terms

A controlled coded clinical terminology for use in Electronic Health Records

- Developed in the USA and the UK as a merger of earlier versions of SNOMED with the NHS Clinical Terms (Read Codes)
  - College of American Pathologists in USA
  - National Health Service (NHS) in the UK
- Design based on
  - Identified user requirements
  - Practical experience
  - Scientific principles established in peer reviewed publications
- First released in 2002

Acquired for the public good by IHTSDO in 2007

In 2017 IHTSDO adopted the trading name SNOMED International

Requirements for Meaningful Health Records

Making health records electronic

A significant step forward

Improves communication

Increases availability of relevant information

… but it is only a partial solution;

the real challenge is …

Making health records meaningful

Identifying significant facts in oceans of data

Enabling effective meaning-based retrieval

Linking the EHR to authoritative clinical knowledge

SNOMED CT represents clinical information meaningfully as part of a well-designed EHR

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SNOMED CT and Classifications

Classifications like ICD-9 and ICD-10

Valuable for statistical reporting

Limited value in an individual patient EHR

SNOMED CT

Rich semantic structure adds meaning to the EHR

Adequate detail for clinical recording

Broad scope of coverage

SNOMED CT maps to Classifications

Existing maps to ICD-9-CM and ICD-10

Enhanced rule-based mapping to ICD-10

Maps to ICD-10 are used by NLM for mapping to ICD-10-CM

SNOMED International and WHO

Cooperate on approaches to shared challenges

As a common terminology SNOMED CT eases transition to future versions of classifications

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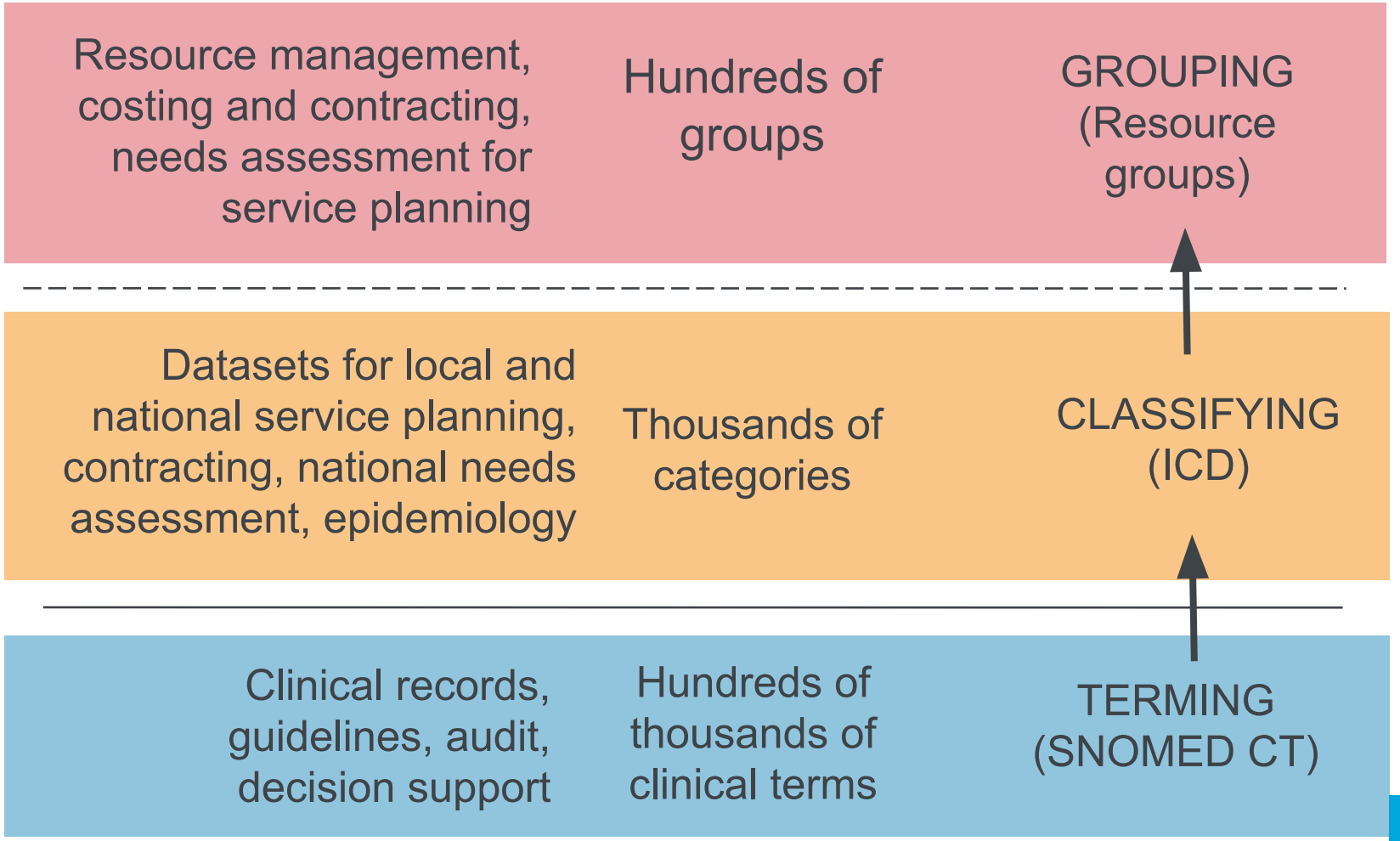
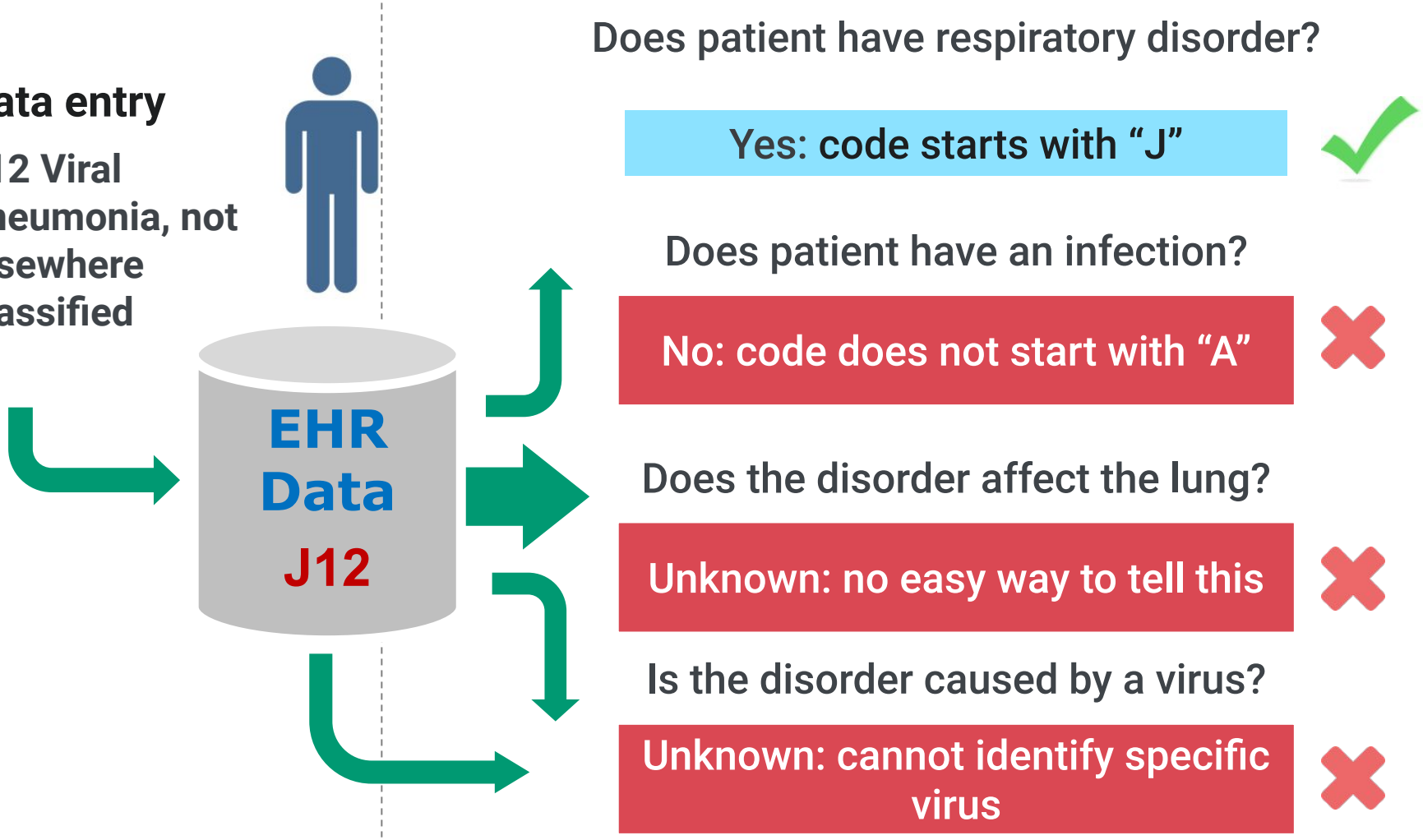
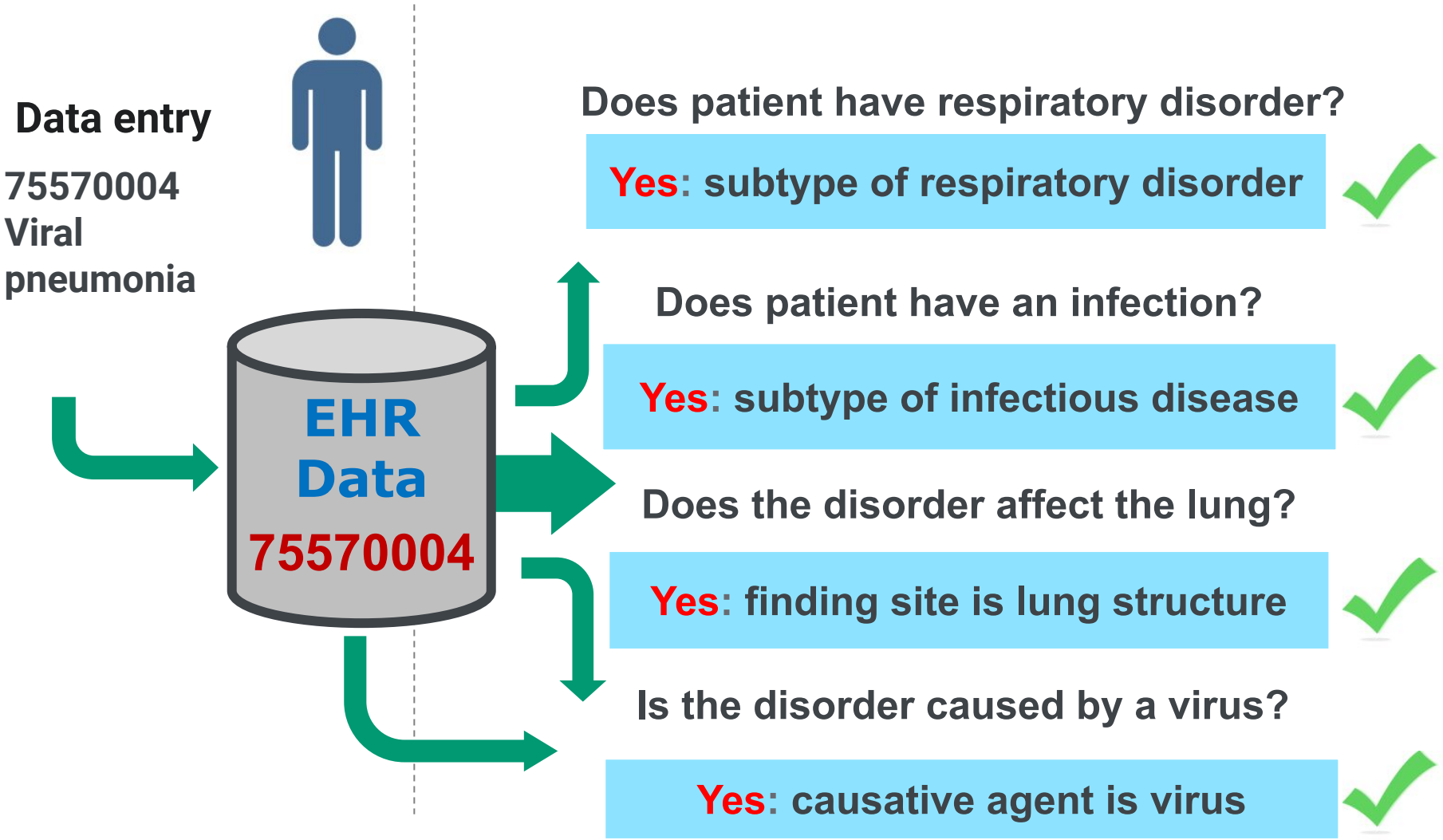
Clinical terminology principles - terms, classifications and groups



Supporting clinical queries – ICD-10



Supporting clinical queries – SNOMED CT



EHR Benefits of **SNOMED CT**

Enhancing care of individual patients by enabling

- Display of appropriate information
- Guideline and decision support integration
- Communicating and sharing relevant information

Enhancing care of populations of patients by supporting

- Epidemiology monitoring and reporting
- Research into the causes and management of diseases

Supporting cost-effective delivery of care by facilitating

- Use of guidelines that minimize the risk of costly errors
- Detection and reduction of duplicated investigation and interventions
- Auditing of the delivery of clinical services
- Future service planning by detection of emerging health trends

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Design Benefits of SNOMED CT

Logical definitions

- Common framework for consistent retrieval and processing
- Defining relationships between concepts
- Retrieval criteria based on the meaning of any related concept

Optional post-coordination

- Combining codes to add detail and specificity
- Increases scope without 'combinatorial explosion' of codes

Updates and versioning

- Regular updates to International Release (six-monthly)
- Support for incremental updates
- Full historical view of all previous versions of SNOMED CT

Comprehensive clinical scope

- Reduces need to support multiple code systems
- Common framework for consistent retrieval and processing

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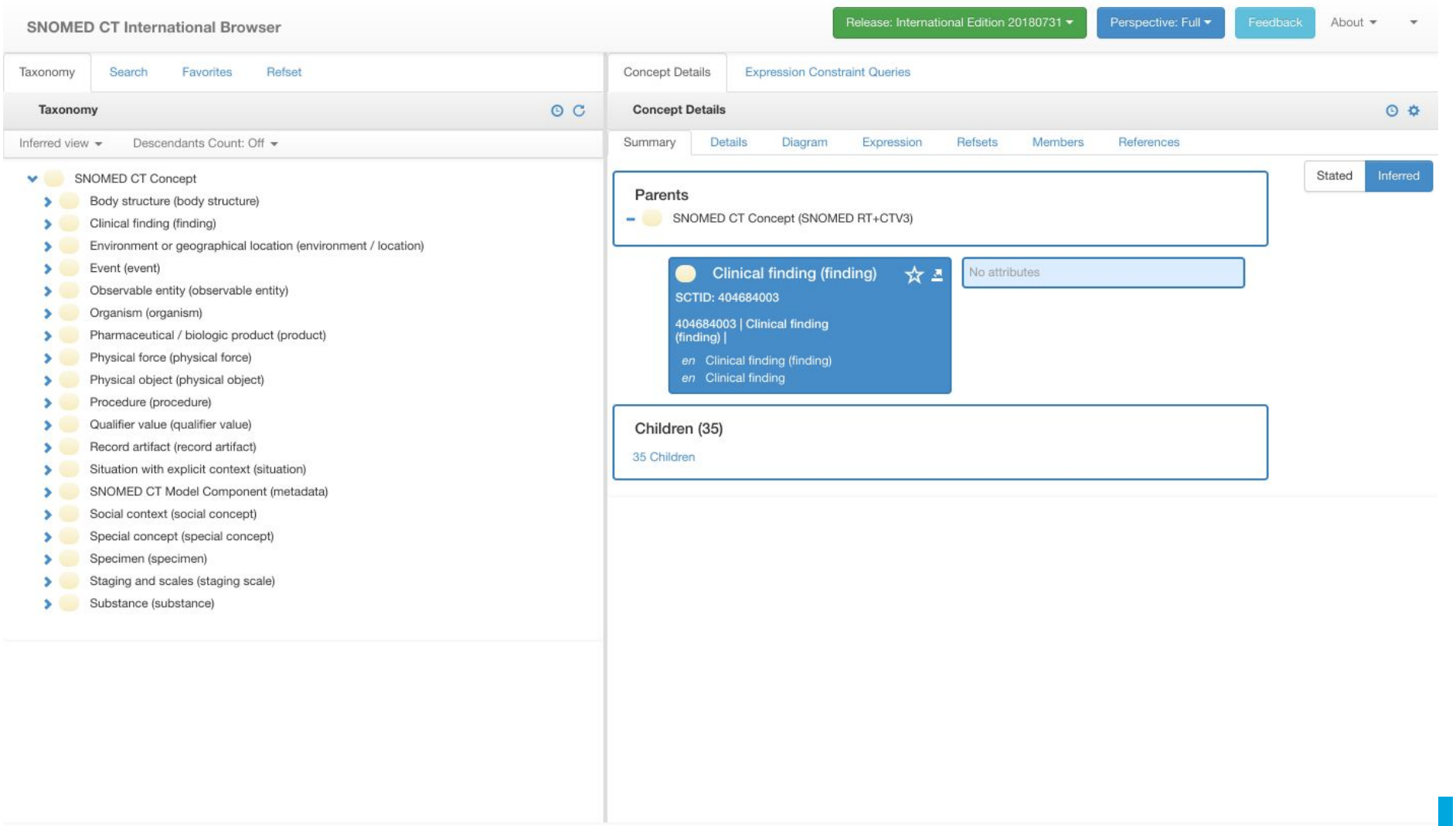
WHAT IS SNOMED CT?



Introduction to SNOMED CT Components Concepts, Descriptions and Relationships

SNOMED CT

The global language of healthcare

SNOMED CT Overview of the Logical Design

Content components

- Concepts
- Descriptions
- Relationships

Localization mechanisms

- Reference sets
- Extensions

Concept model

- How relationships represent the computable meaning of each concept

Expression model

- How SNOMED CT can be used to represent meaningful information in clinical records, knowledge resources, etc.

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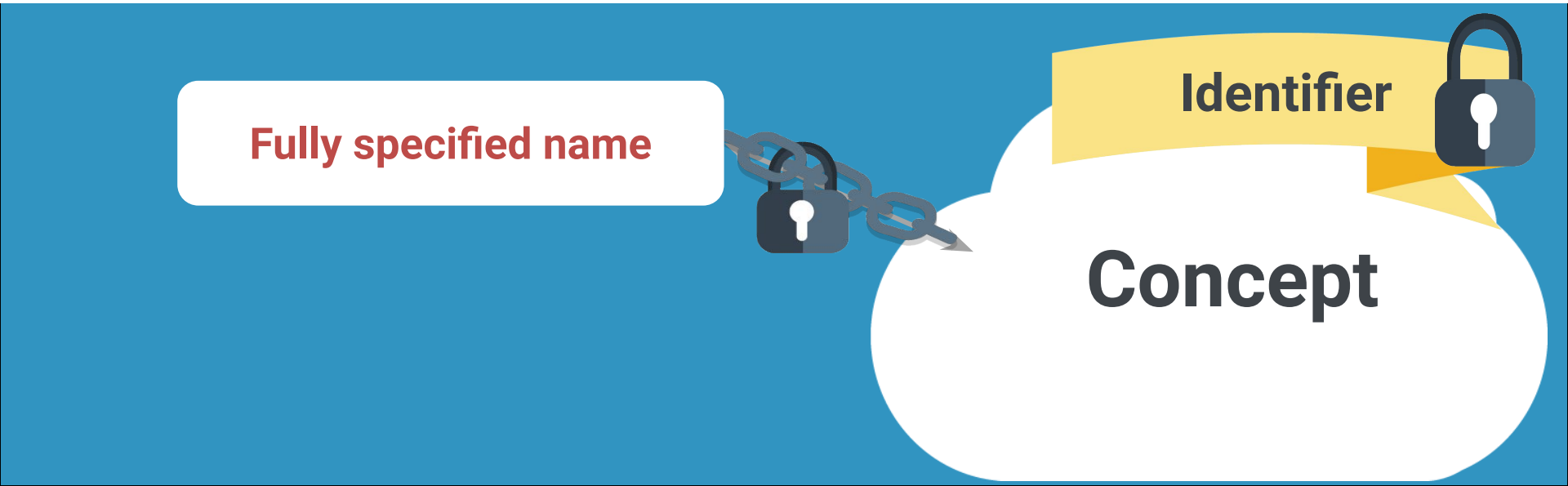
Concepts

- Concepts are the central components of SNOMED CT
- A SNOMED CT Concept is a clinical idea associated with a unique identifier
  - The meaning is specified by an association with a term known as the *fully specified name*
  - The link between the identifier and the meaning of that clinical idea is permanent and unchangeable



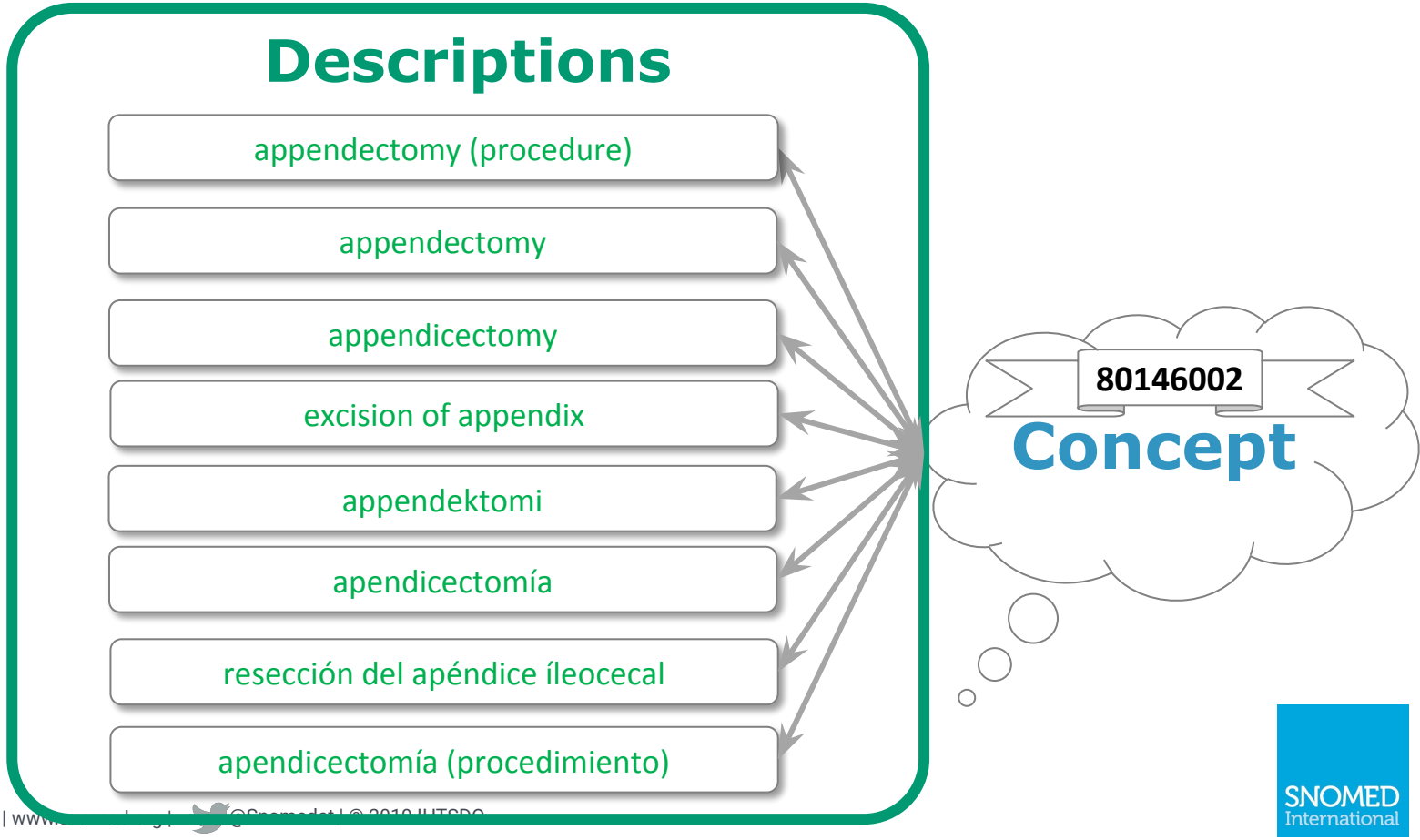
Concept Design

Each *concept* includes

- Its own unique identifier
  - A numeric identifier of up to 18 digits
  - This concept identifier is used to refer to that concept
    - From other SNOMED CT components
    - In health records or knowledge bases
- Versioning data
  - To allow it to be inactivated if necessary without deleting it
- An indication of whether its defining relationships are sufficient to distinguish it from other concepts

Concepts and Descriptions

- Each *concept* is associated with several *descriptions*
- A *description* links a human-readable *term* to a *concept*



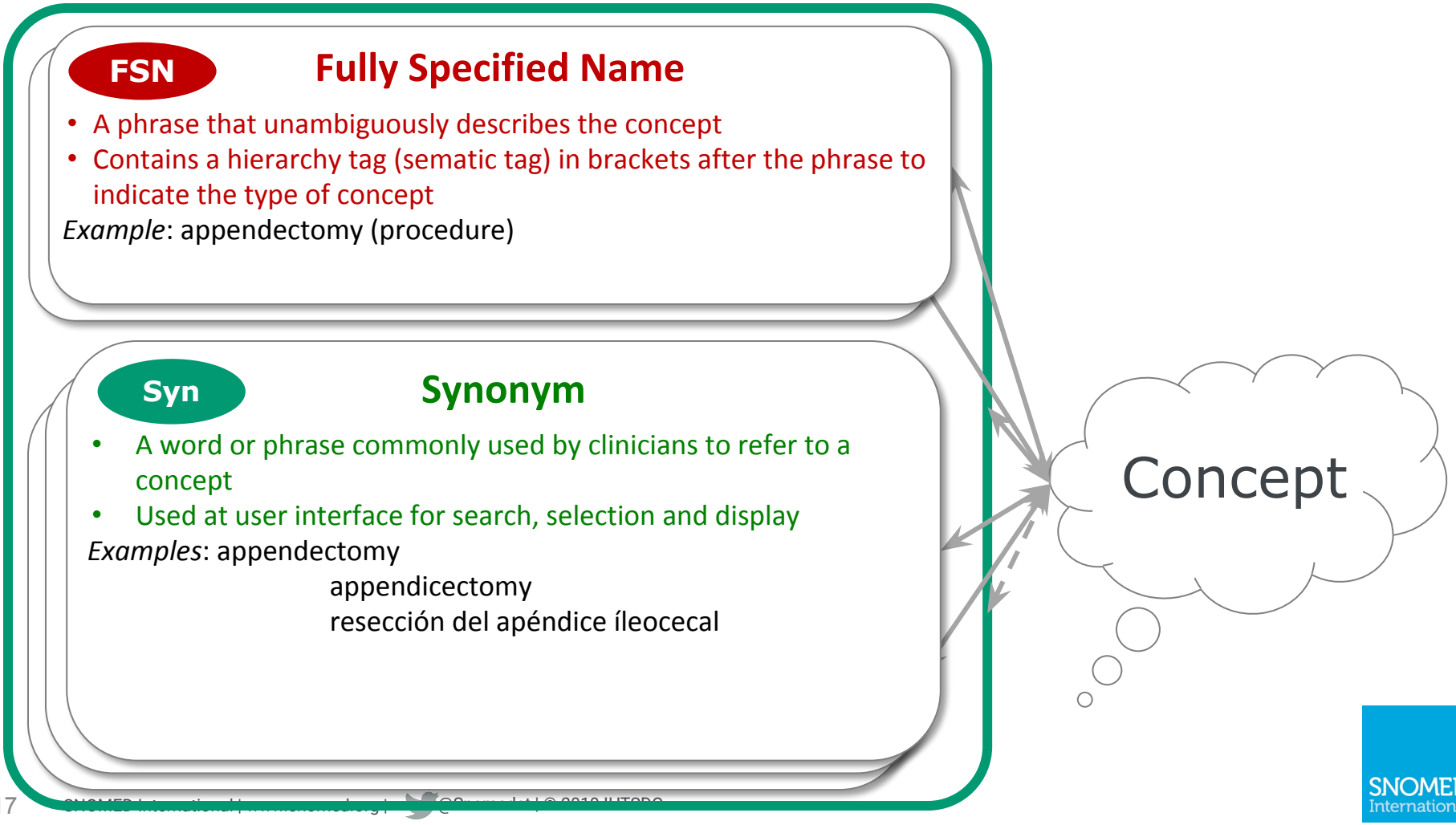
Description Design

Each *description* includes

- Its own unique identifier
  - (not the same as the identifier of the concept)
- Versioning data
  - To allow it to be inactivated if necessary without deleting it
- The identifier of the concept to which it applies
- The human-readable *term*
  - Uses UTF-8 to support accented characters and full range of Unicode characters
- An indication of the *description type* …

Description Types

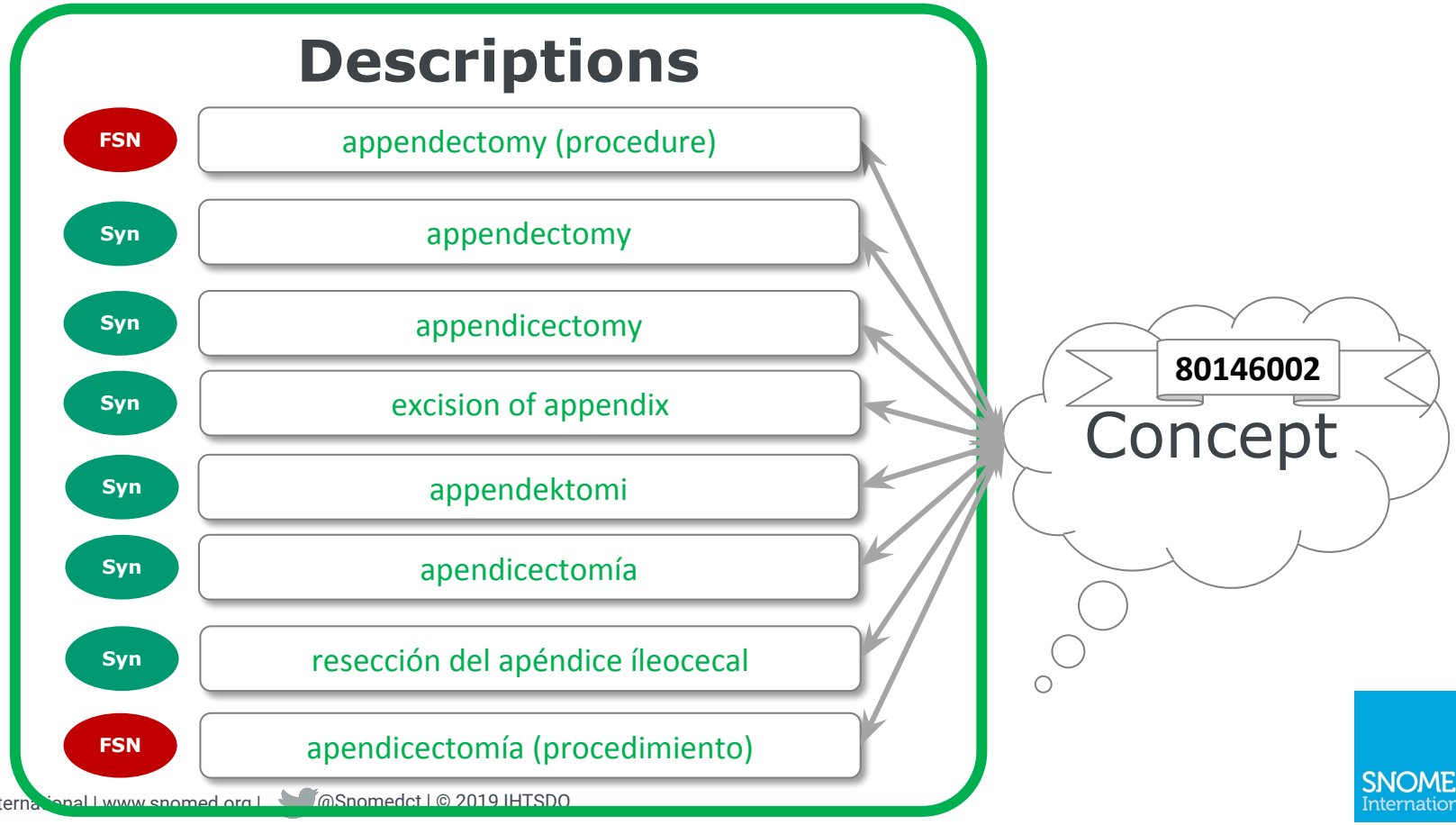
There are several types of description



Description Types - Example

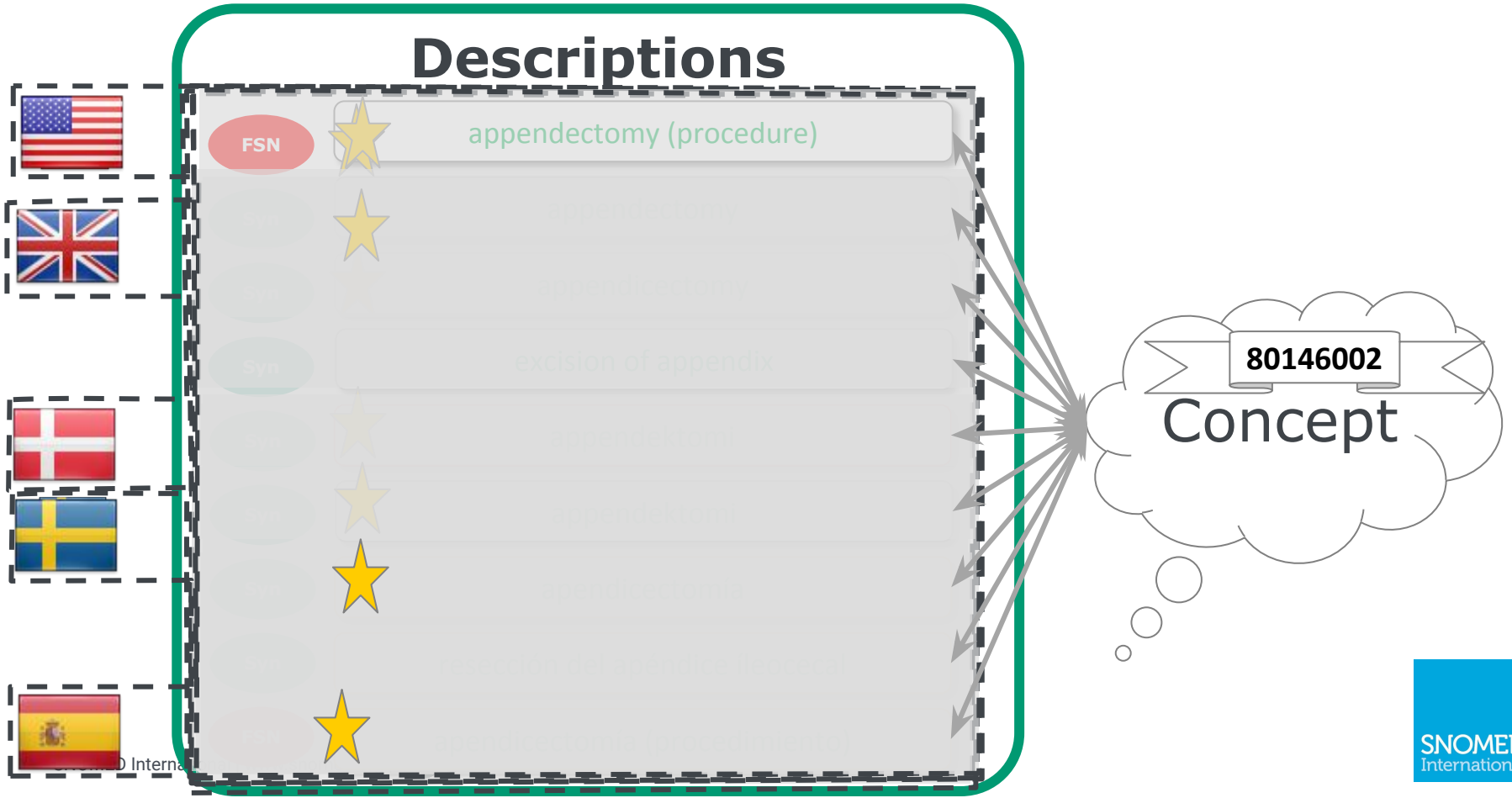
Description types applied to descriptions of the concept

80146002 | Appendectomy (procedure) |



Description Acceptability and Preferences

Language or dialect *acceptability* and *preferences* for particular terms are specified (in “Language Refsets”)

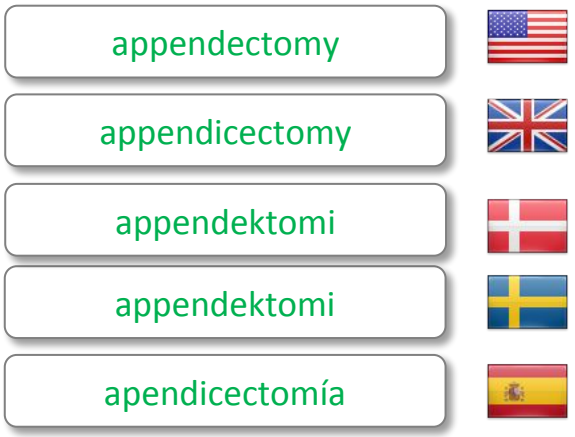


Preferred Terms

- The *preferred term* is the default display term for a concept
  - This means the *preferred term* should be displayed unless another term is explicitly selected or specified by a user
- *Preferred term* is not a *description type* as it can differ according to language or dialect
- The *preferred term* is the *synonym* marked as *preferred* in a particular language or dialect

For example

- Each of these is a *preferred term* in one or more language or dialect as indicated by the national flags



Terms Do Not Need to be Unique

The same *term* can be a *synonym* of more than one *concept*

- In these cases there is more than one *description* containing the same *term* and each description refers to a different *concept*
- The *fully specified name* can be checked to disambiguate *terms* that are associated with more than one concept

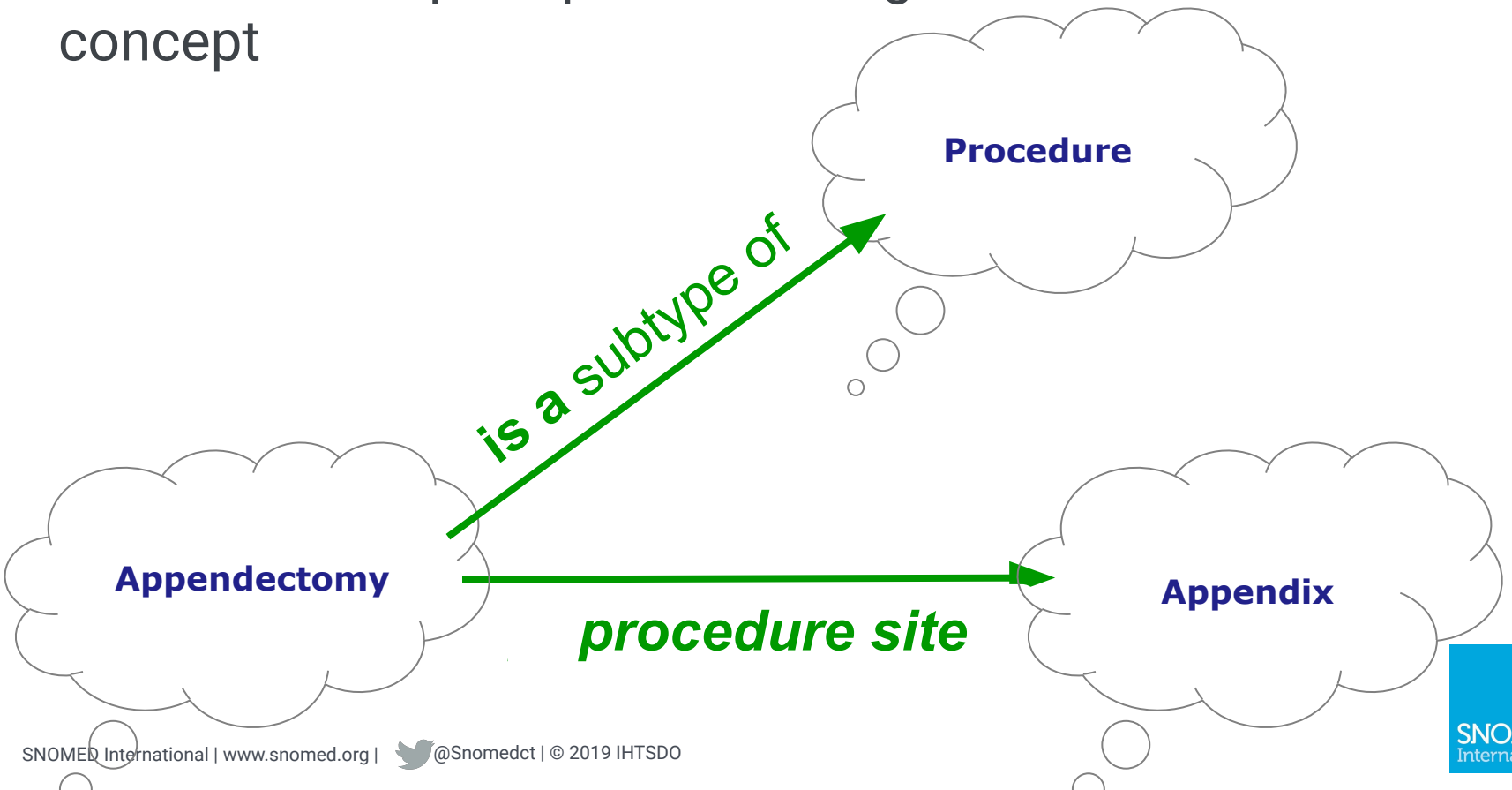
Example

- The *term* “fundus” is a short synonym which according to context can refer to one of four different body structures

Synonym	Fully specified name
Fundus	Gastric fundus structure (body structure)
Fundus	Structure of fundus of eye (body structure)
Fundus	Structure of fundus uteri (body structure)
Fundus	Structure of fundus of gallbladder (body structure)

Concepts and Relationships

- Each concept is associated with other concepts by a set of relationships
- The relationships express defining characteristics of a concept



Relationship Design

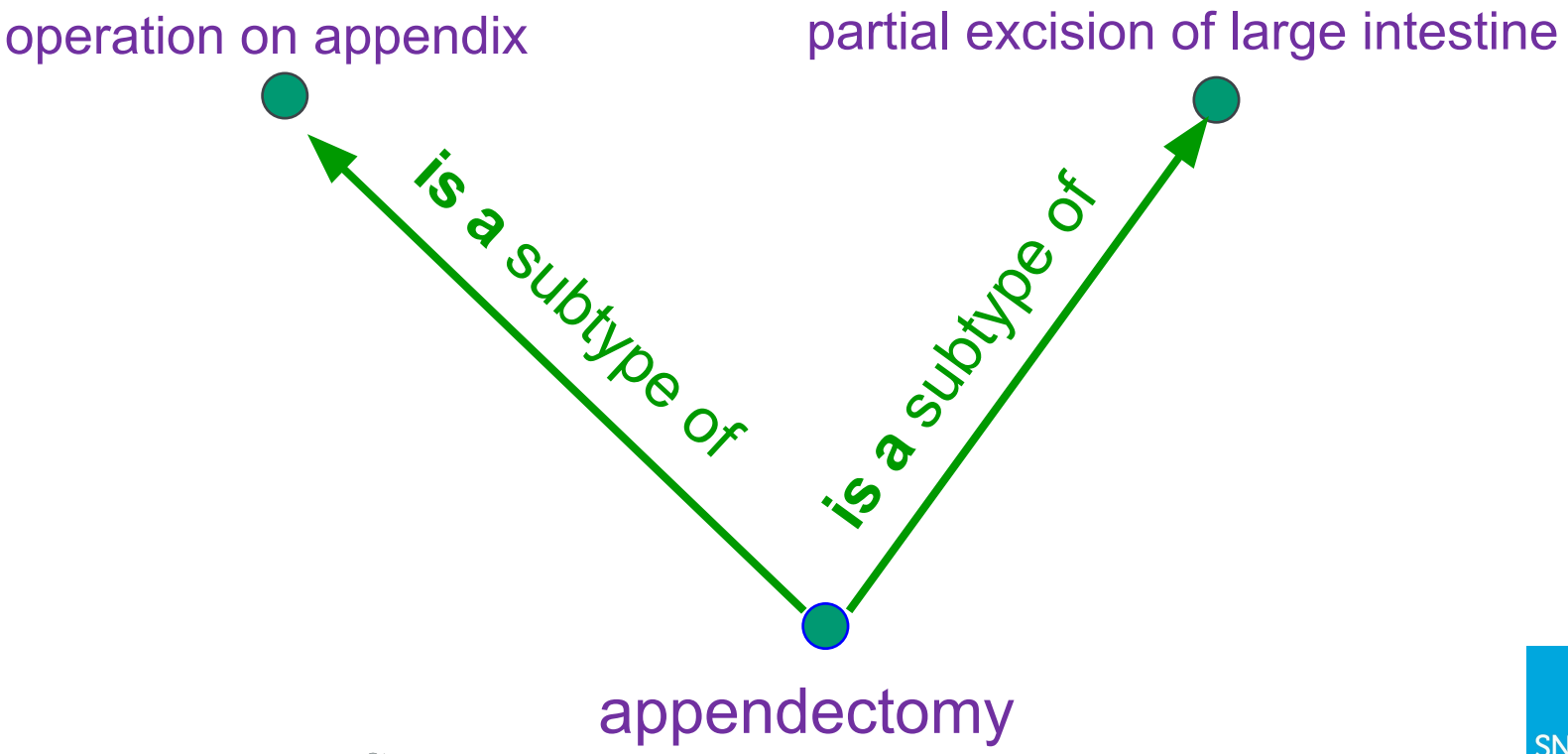
Each *relationship* includes

- Its own unique identifier
  - (not the same as the identifier of the concept)
- Versioning data
  - To allow it to be inactivated if necessary without deleting it
- The identifier of the *source* concept
  - The concept defined by the relationship
- The identifier of the relationship *type* concept
  - **is a** (if the destination is a more general concept)
  - or
  - a specific attribute (e.g. procedure site)
- The identifier of the *destination* concept
  - the more general (supertype) concept
  - or
  - the value of the attribute

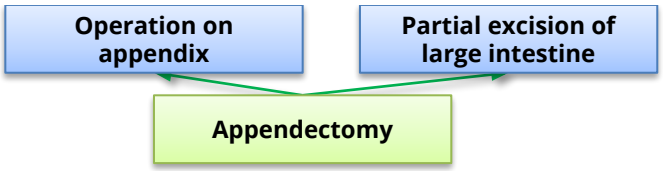
Subtype Hierarchy Relationships

Subtype relationships

- Create a hierarchy linking each concept to more general concepts
- Enable retrieval of specific concepts in response to general queries



Supertypes of Appendectomy

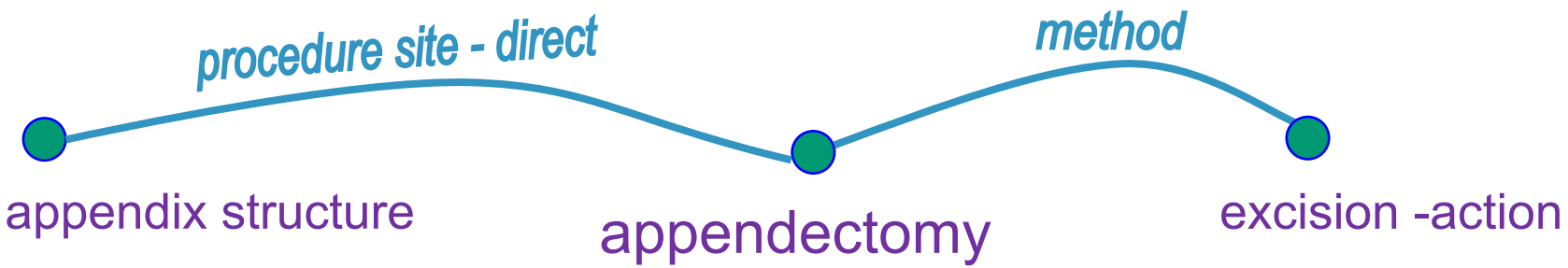


Attribute Relationships

Attribute relationships provide additional defining information about concepts

Examples

- Linking disorder concepts to sites, causative agents and morphological abnormalities
- Linking procedure concepts to sites and methods



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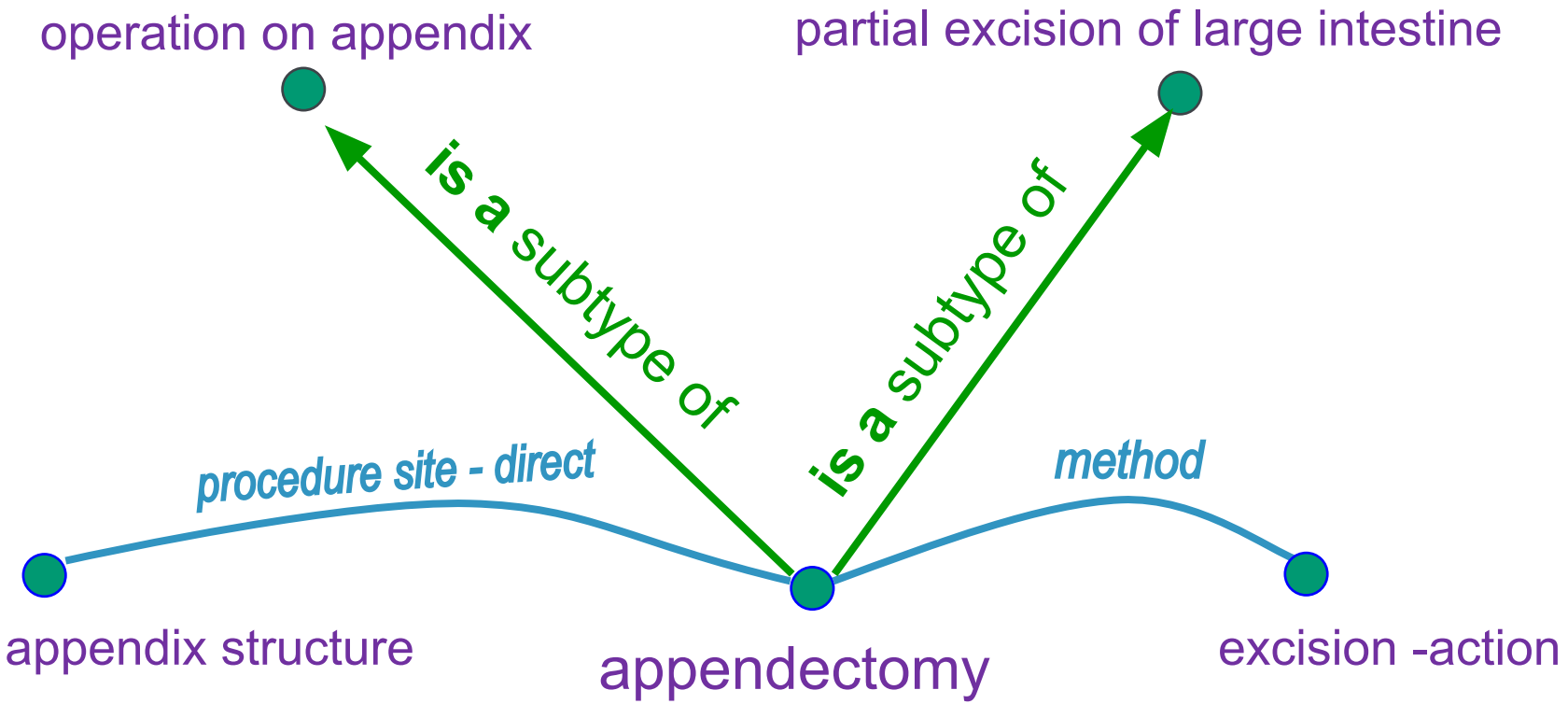
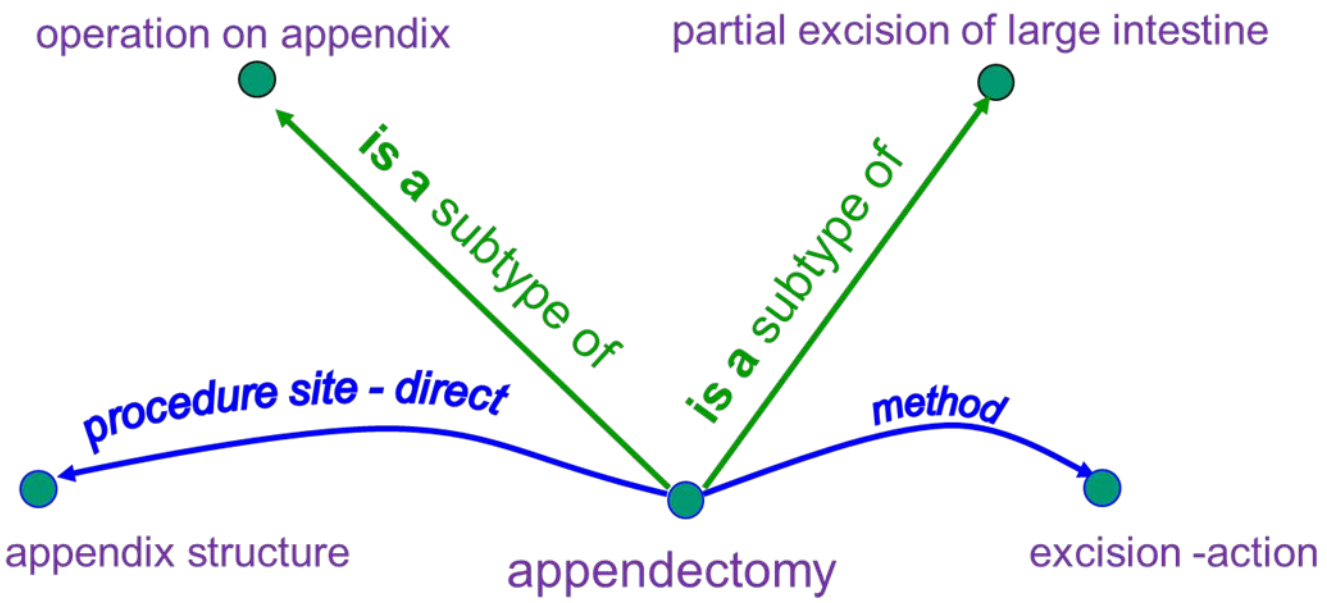
All the Defining Relationships of Appendectomy



Defining Relationships Must be “necessarily true”

This means that a defining relationship must always be true for the concept it defines



Examples of Concept Definitions

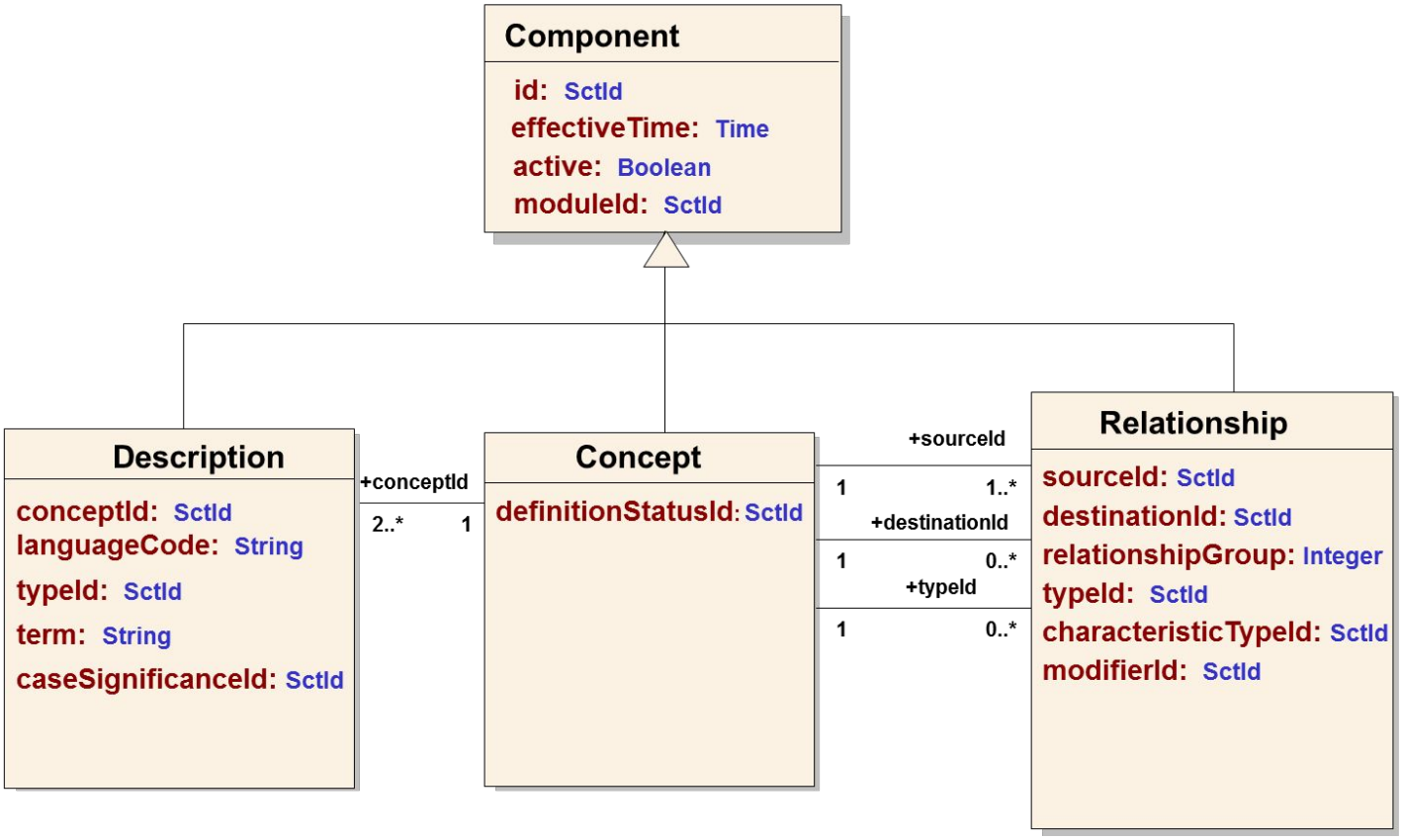
80146002 | Appendectomy (procedure) | Definition Status = Defined

Source	Type	Destination
appendectomy	is a	partial excision of large intestine
appendectomy	is a	operation on appendix
appendectomy	procedure site - direct	appendix structure
appendectomy	method	excision – action

82730006 | Incidental appendectomy (procedure) | Definition Status = Primitive

Source	Type	Destination
incidental appendectomy	is a	appendectomy
incidental appendectomy	procedure site - direct	appendix structure
incidental appendectomy	method	excision – action

Logical Model of SNOMED CT Content Components



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Links to Further Information

A summary of SNOMED CT components is provided in the SNOMED CT Starter Guide

- http://snomed.org/sg

Detailed documentation of SNOMED CT components is provided in the Release Files Specifications

- http://snomed.org/relfiles

Review other examples of concepts, descriptions and relationships by using an online browser

- SNOMED International's SNOMED CT Browser
- Other SNOMED CT Browsers

Reference Set Basics

Note: 'Refset' is an acceptable abbreviation for 'Reference set'

SNOMED CT

The global language of healthcare

Sets… all types of them

Reference Sets

A refset consists of a set of references to SNOMED CT components, like concepts, descriptions or relationships and is a published/released artefact

Value sets

A FHIR resource, a uniquely identifiable set of valid concept representations from **any** coding system/terminology

Subsets

A set is a subset if all of its members are all contained in another set.

Within SNOMED CT, both value sets and subsets can be represented by refsets

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Reference Sets

- A refset is a data structure defined by SNOMED International
- A refset consists of a set of references to SNOMED CT components, like concepts, descriptions or relationships
  - In its simplest form a refset can represent a subset of SNOMED CT components

References Sets with Additional Attributes

Most types of refsets include other attributes providing additional information about members of the refset

- This allows refsets to do far more than just define subsets

For example

- Define mappings to other nomenclatures, classifications and knowledge structures
- Define alternative hierarchical structures for concepts
- Support aspects of the SNOMED CT technical design

Refsets can be of different sizes

- A few concepts … right up to every concept

Reference Set Uses

- **Different types of refsets exist**
  - Content use cases
  - Technical use cases
- **New refset types can be created**
  - Designed to meet additional requirements
  - Associate other additional properties with the components in the refset than the already existing refset types
- **All refset types are described by a refset descriptor**

A Summary of Refset Uses

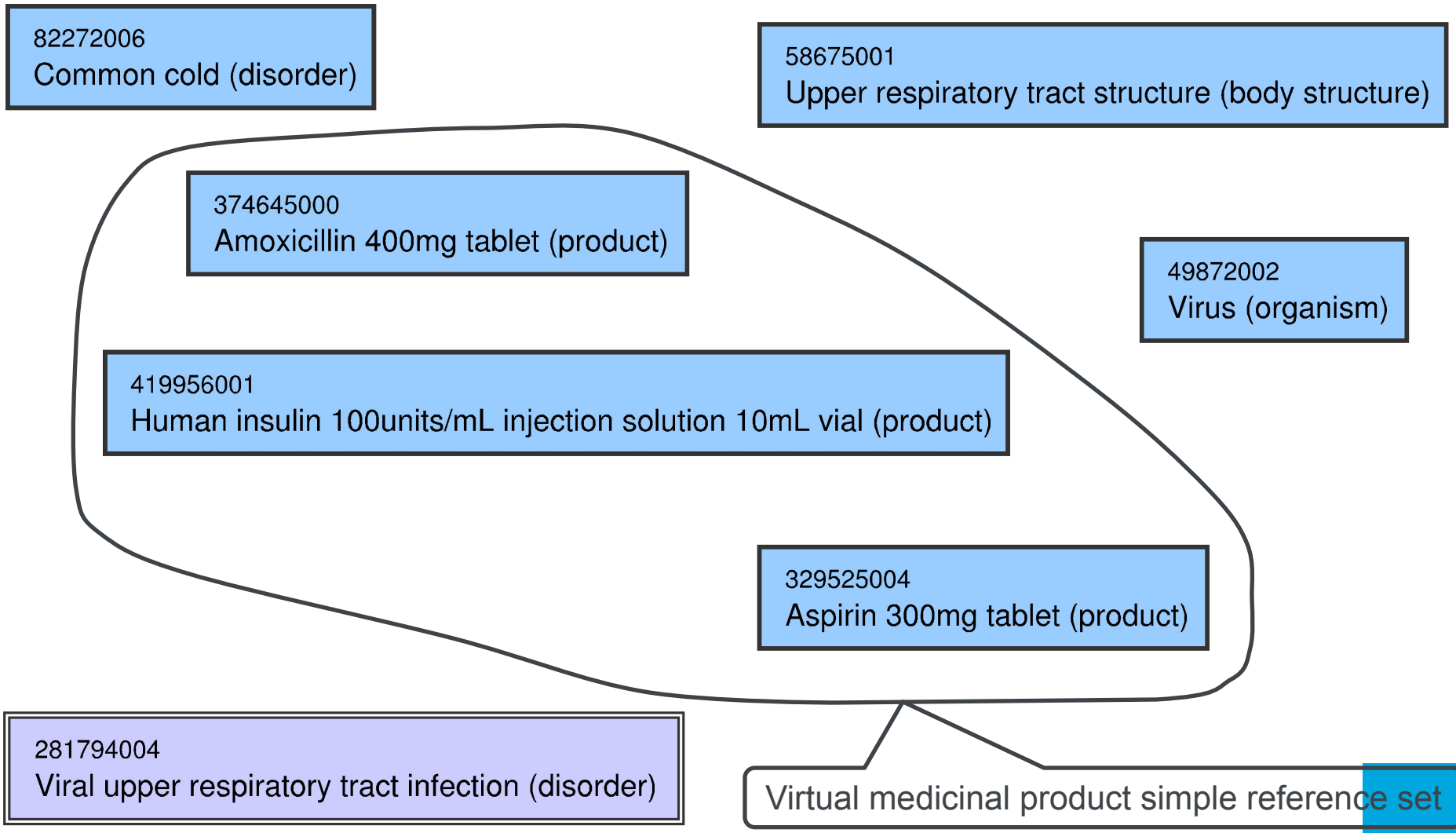
Refsets are used for many different purposes

- To represent subsets
- To indicate language/dialect preference for terms
- To prioritize particular items in a search list
- To specify alternative hierarchies
- To attach metadata to a component
- To attach annotations or other information to a component
- To represent maps to or from other code systems or classifications

Simple Reference Set

- Represents an extensional definition of a subset of components (concepts, descriptions, relationships and refsets)
- The components can be specified for inclusion or exclusion for a specified purpose
- Member attributes:
  - referencedComponentId: refers to a component that is a member of the refset

Simple Reference Set Example



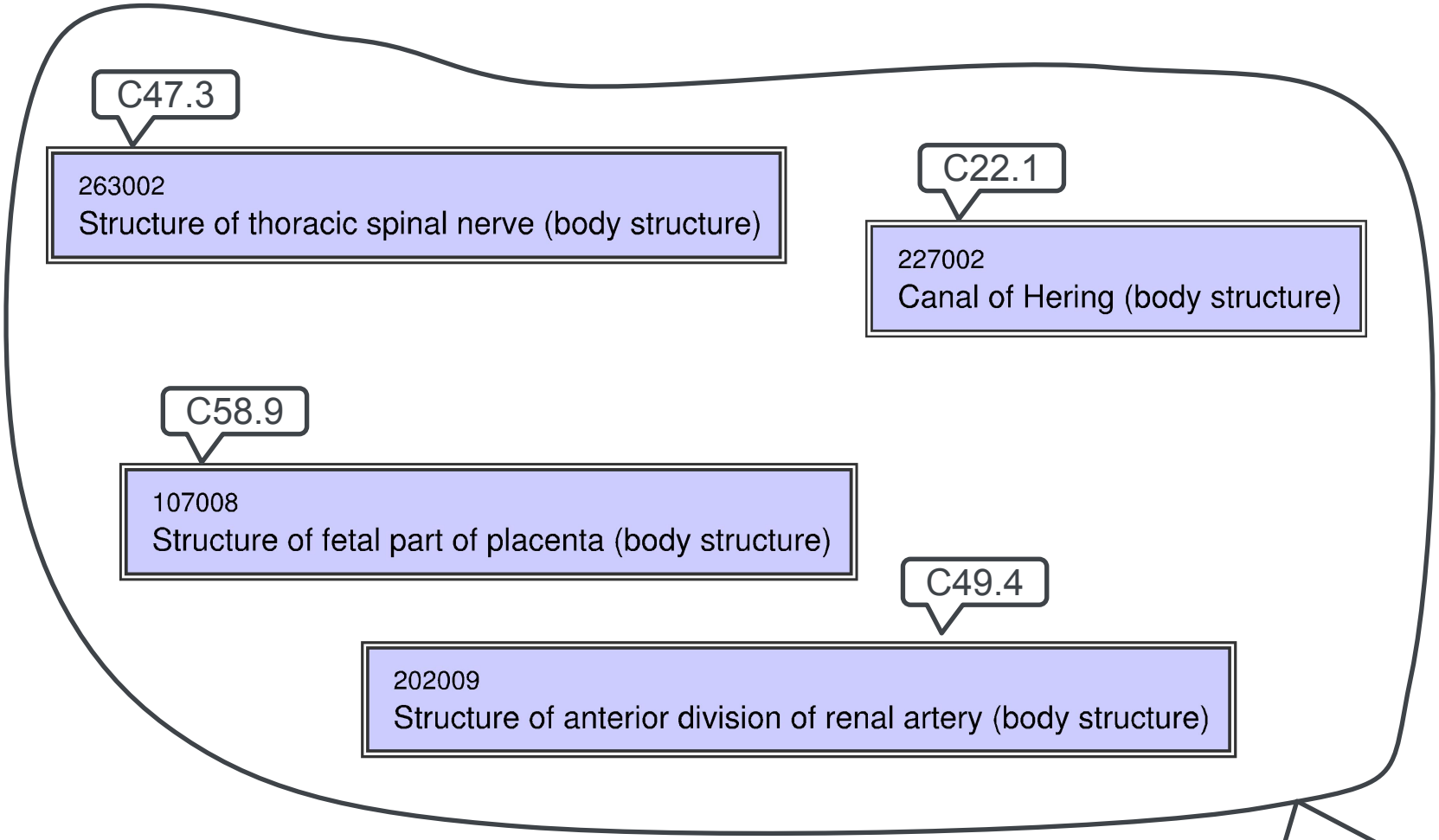
Simple Map Reference Set

- Allows representation of simple maps between SNOMED CT concepts and codes in other code systems
- The refset type is similar to the Simple type refset except the mapTarget
- Member attributes:
  - **referencedComponentId:** refers to a component that is a member of the refset
  - **mapTarget:** the code in the other code system

Simple Map Reference Set

- Usually only appropriate for “one-to-one” mappings
- “Many-to-one”, “one-to-many” and “many-to-many” mappings possible, but often less useful
- Complex and Extended map reference sets are normally used when each SNOMED CT concept may map to more than one code in a target scheme

Simple Map Reference Set Example



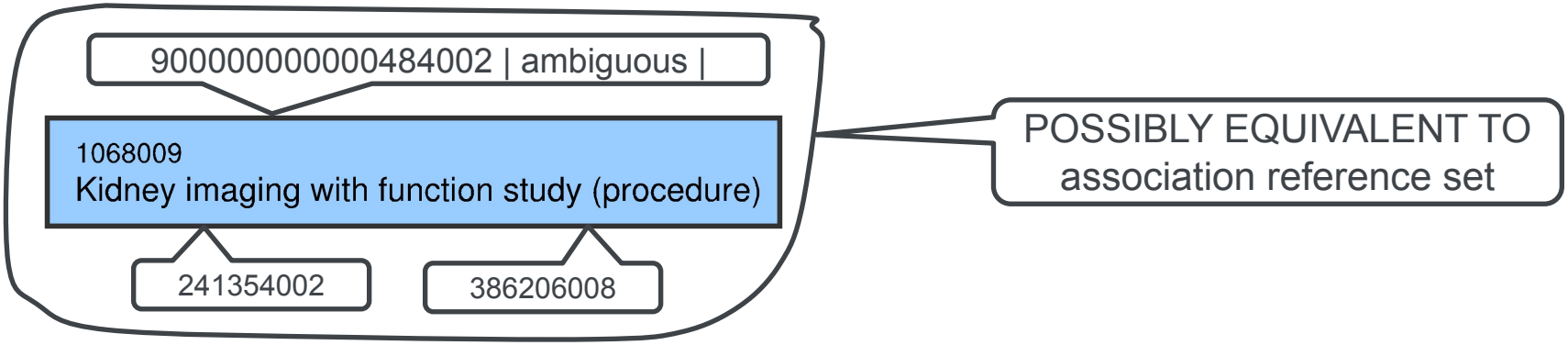
Language Reference Set

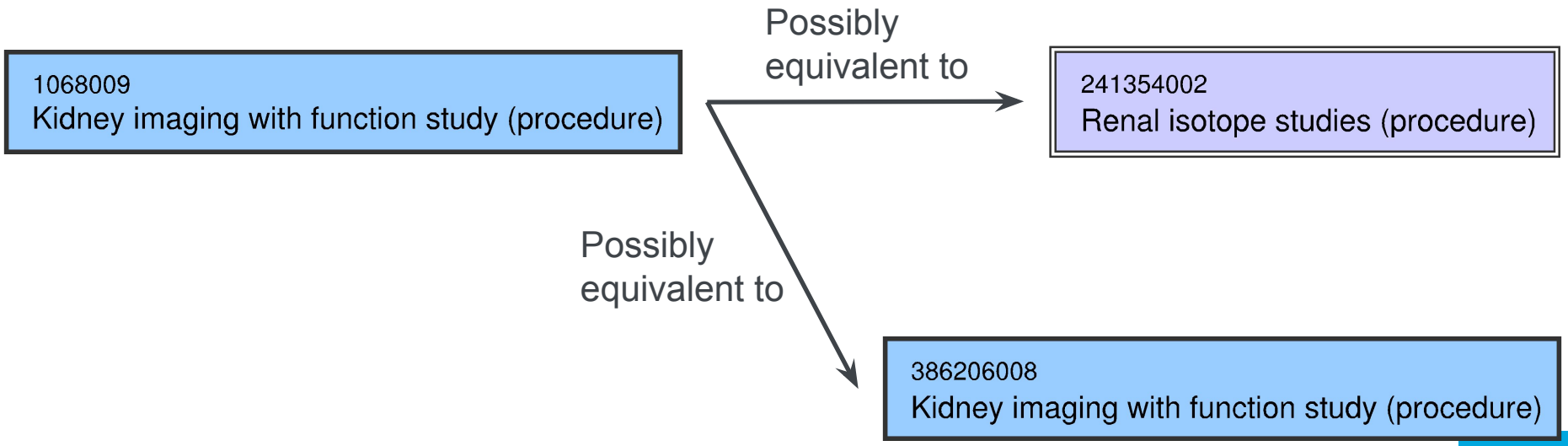
- This refset type is used to indicate which descriptions contain terms that are acceptable or preferred in a particular language or dialect
- Member attributes:
  - referencedComponentId: refers to a description that is used in the specified dialect or use case
  - acceptabilityId: indicating whether the description is acceptable or preferred for use in the specified dialect or use case
    - Preferred
    - Acceptable

Association Reference Set

- Represents a set of unordered associations of a particular type between components
- Several historical association refsets exists
  - Possibly equivalent to
  - Same as
  - Replaced by
  - …
- Member attributes:
  - referencedComponentId: the source component of the association
  - targetComponentId: the target component of the association

Association Reference Set





Reference Sets Summary

- **A refset consists of a set of references to SNOMED CT components**
- **Each of these references is a member of the refset**
- **There are different types of refset**
  - A simple refset represents a subset of components
  - Other refsets have additional attributes that provide additional information about members of the refset
- **Refsets are used for many purposes including**
  - Representing subsets
  - Indicating language/dialect preference for terms
  - Prioritize particular items in a search list
  - Mapping to other code systems and classification
  - Technical support for managing inactivated components
- **Refsets are likely to have more uses in future**

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Links to Further Information

SNOMED CT Starter Guide

- http://snomed.org/sg
  Extensions & Customization

SNOMED CT Release File Specifications

- Reference Set Release Files Specification
  http://snomed.org/rfs-refsetspec

SNOMED CT Terminology Services Guide

- Working with metadata
  http://snomed.org/tsg-metadata

SNOMED CT Record Services Guide

- http://snomed.org/rsg-comm
  Using Reference Sets to represent allowable value sets

