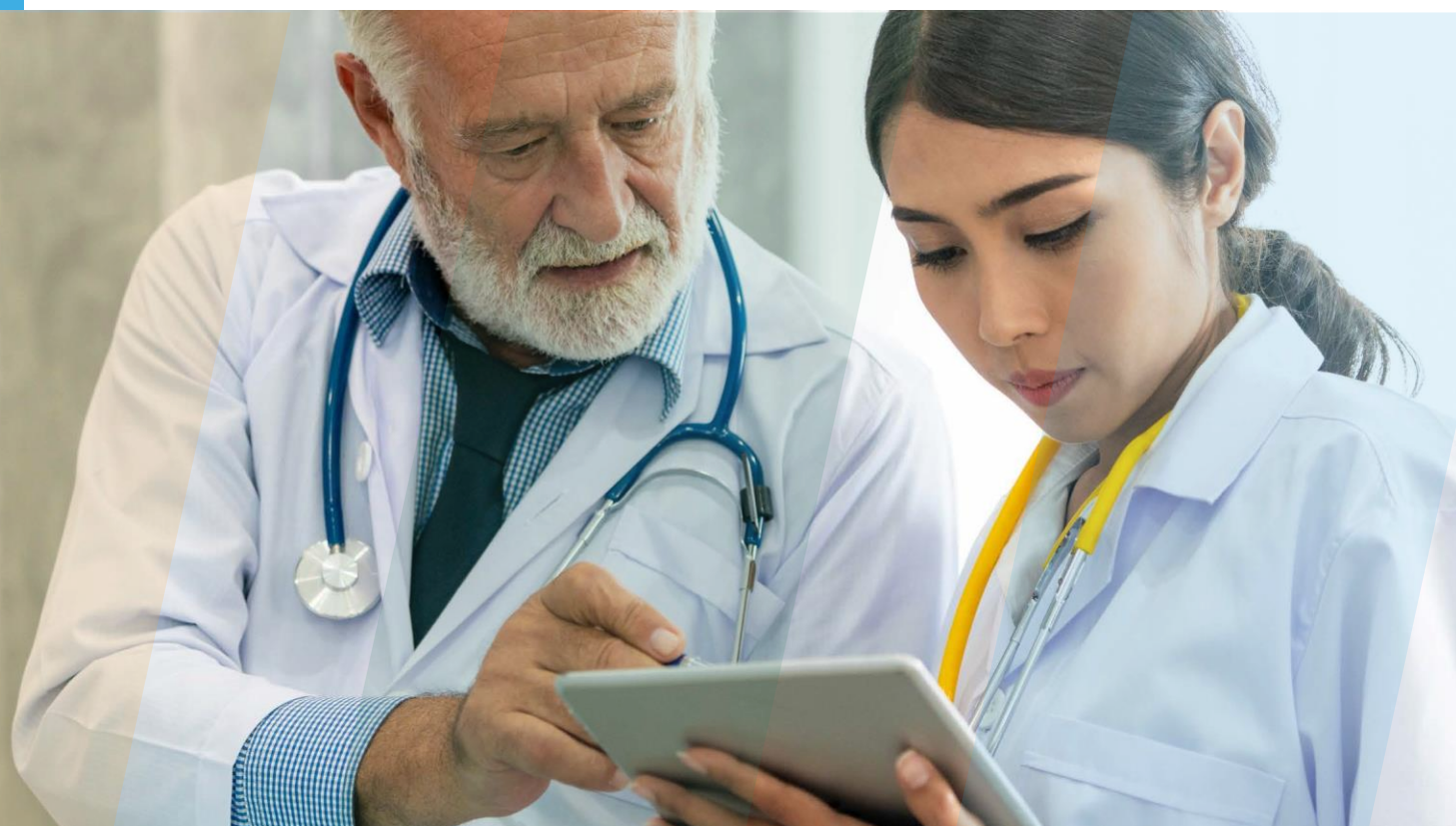


Terminology Mapping and Report Toolkit



Summary

The purpose of the Terminology Mapping and Reporting Toolkit is to support Cerner hospitals in Ontario to map clinical concepts to Systematized Nomenclature of Medicine – Clinical Terms (SNOMED CT) and develop a report to measure standard adherence. This initiative is part of Evidence2Practice (E2P) Ontario, a cross-sector collaborative in partnership with North York General Hospital, the Centre for Effective Practice, and the eHealth Centre of Excellence. E2P aims to improve provider experience and enhance patient care through digital interventions that integrate evidence and quality standards into frontline clinical systems, beginning with heart failure.

SNOMED CT is a systemically organized computer processable collection of medical terms. These coded terms can be used within Health Information Systems to capture, record, and share clinical data. As hospitals have different Health Information Systems (e.g., Cerner, EPIC, and Meditech) that have different concepts for clinical terms that have the same (or similar) meaning, mapping clinical concepts to the same SNOMED CT code provides a common link that enables comparison.

This toolkit will include:



Steps to set up terminology mapping in Cerner



Steps to map terminology to SNOMED CT in CoreCodeBuilder



A list of heart failure terminology and the corresponding SNOMED CT Code, codeset, and code value extension



An example of a Heart Failure Standard Adherence report output



A downloadable report that can be leveraged to measure standard adherence

The Value of SNOMED CT Mapping and Reporting

Standardized reporting that pulls from clinical concepts mapped to SNOMED CT codes enables comparison of standard adherence across different hospitals and different health information systems, equips organizations with valuable data that drives quality improvement initiatives, and provides the opportunity to learn from peer hospitals. The objective of this toolkit is to significantly reduce the work effort needed by individual hospitals to choose SNOMED CT codes and create a standard adherence report for heart failure.

Overall Approach

The E2P Ontario team identified key reporting metrics for heart failure, using measures of success from the Quality Standards and Quality Based Procedures as the foundation. The key reporting metrics aided the team in scoping out the clinical concepts for heart failure to be mapped to a SNOMED CT code. Once identified, working sessions between St. Mary's General Hospital and North York General Hospital, and consultations with Canada Health Infoway and the Digital Health Information Exchange were underway with the objective of selecting the most appropriate SNOMED CT code for each clinical concept through the SNOMED CT browser. After all the concepts were mapped, Clinical Informaticians with reporting expertise developed a report for Cerner.

Before You Start

Depending on the organization, this toolkit will serve as a guide for Cerner database administrators responsible for codesets and Cerner Command Language (CCL) report writing. Modifications may need to be made to the report at each hospital level. The project timeframe may vary across hospitals depending on available resources and state of readiness. The hospitals that participated in the initial SNOMED CT Mapping and Reporting went live within 5 months of initiation.

TABLE OF CONTENTS

Terminology Mapping Pre-Setup

How to create the contributor source alias: E2P_SNOMED	5
How to create the code value extension: E2P	6

Terminology Mapping

Pre-requisite	7
Mapping steps	7

Viewing Mapped SNOMED CT Code and Semantic Tags

SNOMED CT code	9
Semantic tag	9

Terminology Mapping File

Semantic tag/code value extension definitions	10
Terminology mapping table	12

Standard Adherence Report

Standard Adherence Report CCL Script	15
Standard Adherence Report Example	15



Purpose
Contributor source alias and semantic tags are to be used in translation reports



IDEA
Design drawn from how NHS structured their SNOMED CT mapping

CONTRIBUTOR SOURCE Alias (E2P_SNOMED): used to map the SNOMED CT code

HOW TO CREATE THE CONTRIBUTOR SOURCE ALIAS: E2P_SNOMED

Step 1: Create CDF Meaning

Open Core Code Builder 1.1

Search for code set **73** 1.2

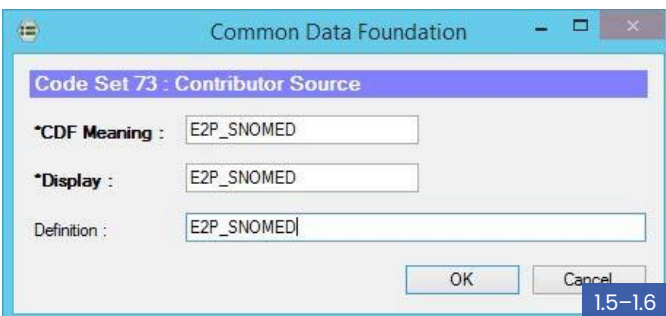
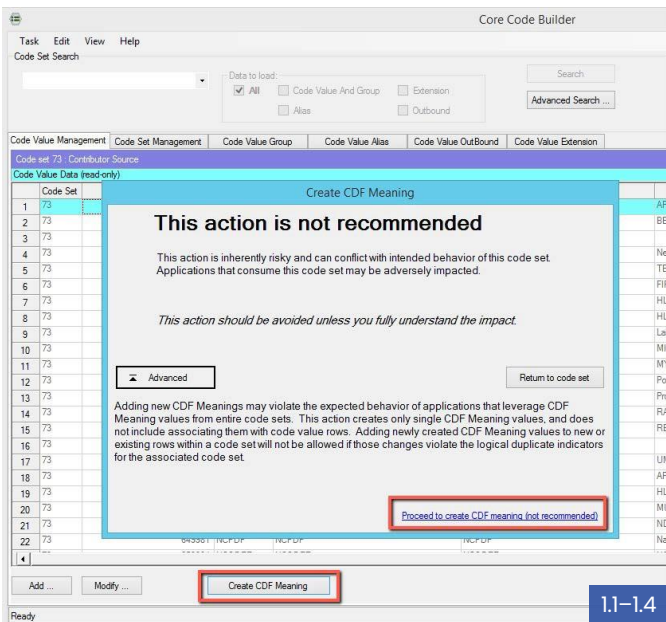
Select **Create CDF Meaning** 1.3

This opens a new window with a Create CDF meaning warning

Select **Proceed to create CDF meaning (not recommended)** 1.4

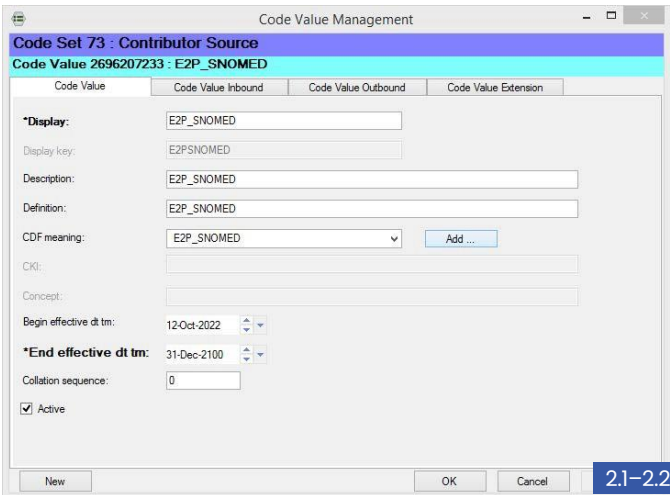
Enter **E2P_SNOMED** for CDF Meaning, display and definition. 1.5

Select **OK** 1.6



Codesets used

72 Event code **200** Orders **4001** Route



Step 2: Create a new alias codevalue in codeset 73: Contributor Source

Open Corecodebuilder ^{2.1}

Create the codevalue **E2P_SNOMED** and attach the created CDF meaning of **E2P_SNOMED** ^{2.2}

HOW TO CREATE THE CODE VALUE EXTENSION: E2P

Open Corecodebuilder

Load the codeset (i.e., **72**)

Click on the **Code Value Extension** tab

Click **Code Set Extension** button

Type:
Field Name: **E2P**
Field Type: **AlphaNumeric**

Select

Codesets used

72 Event code

200 Orders

4001 Route

PRE-REQUISITE

Step 1: [See table](#) with the terminology, corresponding SNOMED CT code, and semantic tags

MAPPING STEPS

Step 2: Follow the steps below to execute terminology mapping to SNOMED CT in Cerner

Open CoreCodeBuilder ^{1.1}

Load the codeset where the term is found (e.g., **72**) ^{1.2}

On the **Code Value Management** tab: ^{1.3}

Search for the code value that requires SNOMED CT code mapped and double click to open the Code Value Management window ^{1.4}

Click on **Code Value Outbound** tab ^{1.5}

MAPPING STEPS continued on page 8

Codesets used

72

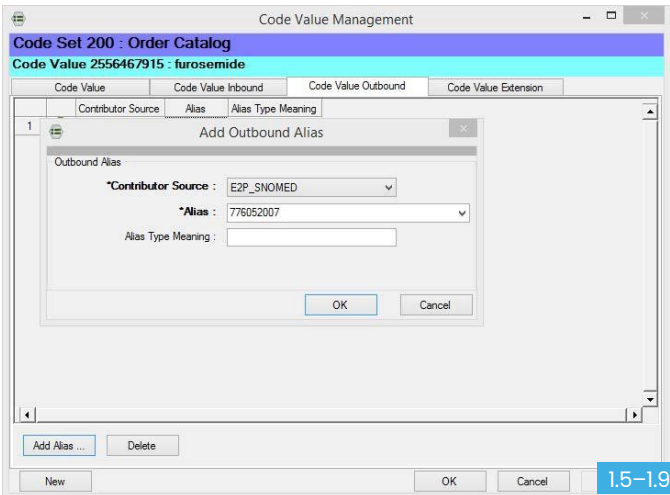
Event code

200

Orders

4001

Route



MAPPING STEPS (continued)

Click **Add Alias** 1.6

Contributor Source:
Select 1.7

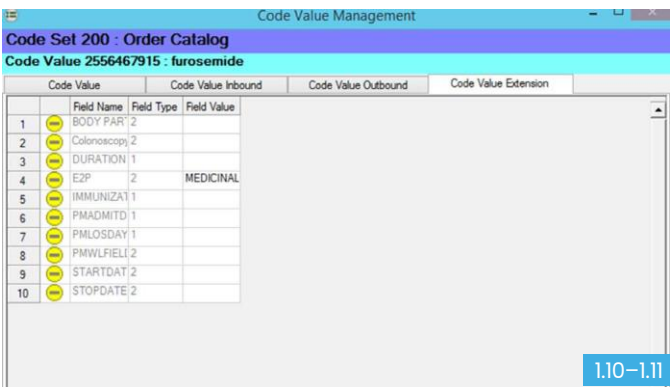
Alias: type in the SNOMED CT Code 1.8

Select 1.9

Click on the **Code Value Extension** tab 1.10

On the E2P row, map the semantic tag on the Field Value 1.11

Select to close the Code Value Management window 1.12



Viewing mapped codes and semantic tags can be easily viewed in the main window of corecodebuilder

Contributor Source	Alias	Code Value	Code Value Display	CDF Meaning	Act
1 E2P_SNOMED	363808001	4154120	Weight Measured		
2 E2P_SNOMED	364202003	710254	Urine Voided		
3 E2P_SNOMED	364202003	2557317227	Nephrostomy Tube Output:		
4 E2P_SNOMED	364202003	2567001607	Urinary Catheter Total Output		
5 E2P_SNOMED	423475008	3362628	Heart Failure Education Topics		
6 E2P_SNOMED	721917003	2820588	Discharge Summary		

1.1-1.4

Code Value	Code Value Display	E2P
1 2820588	Discharge Summary	RECORD ARTIFACT
2 3362628	Heart Failure Education Topics	PROCEDURE
3 2557317227	Nephrostomy Tube Output:	OBSERVATION
4 710254	Urine Voided	OBSERVATION
5 4154120	Weight Measured	OBSERVATION
6 2567001607	Urinary Catheter Total Output	OBSERVATION

2.1-2.2

VIEWING SNOMED CT CODE

Load the codeset 1.1

Click on the **Code Value Outbound** tab 1.2

Filter by Contributor Source:
E2P_SNOMED 1.3

Click on the Alias column to sort the codes to the top 1.4

VIEWING SEMANTIC TAG

Click on the **Code Value Extension** tab 2.1

Click on the E2P Column to sort the semantic tags to the top 2.2

Choosing the SEMANTIC tag

Consulted with Canada Health Infoway (CHI) and referenced 2-ELP0025_ContentHierarchyIntroduction to understand each hierarchy's content for correct semantic tag use. [See appendix](#) for the guide to understand the hierarchy

Choosing the CODESET

Selected codesets based on clinical workflow and report output

QUALIFIER

Qualifier values represent the values of some of the SNOMED CT attributes, where those values are not subtypes of another top-level concept. For example, 'left', 'severe', or 'capsule'. Qualifier values are used in health record to define the laterality of a diagnosis or procedure (such as 'left', 'right' or 'bilateral'), the severity of a condition (for example, 'severe'), the priority of a procedure (for example 'emergency'), a medication dose form (like 'tablet' or 'capsule') and a route of administration (such as 'oral' or 'topical').

MEDICINAL_PRODUCT

Pharmaceutical/biologic products are medication products or drugs. They include concepts that describe a type of medication at various levels of detail. The MEDICINAL_PRODUCT hierarchy falls under the Pharmaceutical/biologic products hierarchy.

PROCEDURE

Procedures represent activities performed in the provision of health care. This includes not only surgical procedures (such as Appendectomy), but also the administration of medicine (such as the administration of anesthesia), imaging (such as 'x-rays' and 'ultrasounds'), education (such as diabetic care education), therapies (like physiotherapy) and administrative procedures (like 'admission' or 'discharge'). Procedures are frequently documented in a health record. The most common reasons to do so are to record the procedures that have been performed (for example during a hospital stay), to record the procedures that are planned (such you may find in a care plan), or to record a procedure that is being ordered or requested.

OBSERVATION

Observable entities are things that can be observed. They represent a question or an assessment, which can produce an answer or result. Observable Entities and Clinical Findings often work together, because the Observable Entity represents the question, while the Clinical Finding represents the answer. Examples of observable entities include 'systolic blood pressure', 'color of iris', and 'gender'. Concepts in this hierarchy are used to represent the name or type of an observation. Other code systems, such as LOINC, can also be used for this purpose.

THERAPY

Regime/therapy (subtype of procedure): set of procedures focused on a single purpose on one patient over time (e.g. repeated administration of drug in a small dose for an indefinite period of time).

RECORD_ARTIFACT

Record artifacts represent content that is created to provide people with information about record events or states of affairs. Examples include a 'patient held record', a 'discharge summary', a 'record entry', a 'family history section on a report', and a 'birth certificate'. Record artifact concepts are used in health records to document the type of identification used by a patient, or to specify the type of document used or required.

Terminology Mapping File

TERMINOLOGY MAPPING TABLE

Item or Concept	SNOMED CT (EP2)	Sample HIS Term	CODESET	Code Value Extension or Semantic Tag
IV furosemide	255560000	IV	4001	QUALIFIER
	776052007	Furosemide	200	MEDICINAL_PRODUCT
Patient weight	39857003	Weight	200	PROCEDURE
	363808001	Weight (kg)	72	OBSERVATION
Intake and output	63061008	Intake and Output	200	PROCEDURE
	364202003	Urine Voided Urine Catheter Intermittent Catheterization	/2	OBSERVATION
Sodium intake	437421000124105	Low Sodium 87 mmol diet	200	THERAPY
	437421000124105	Low Sodium 44 mmol diet	200	THERAPY
	437421000124105	Heart healthy/ low sodium diet	200	THERAPY
	437421000124105	CHF Diet	200	THERAPY
	38441000087103	Heart Healthy Diet	200	
Laboratory results	26604007	CBC	200	PROCEDURE
	271061004	Glucose Random	200	PROCEDURE
	273967009	Urea (once per encounter)	200	PROCEDURE
	396451008	PT	200	PROCEDURE
	440685005	INR	200	PROCEDURE
	390917008	BNP (NT pro-BNP) (once)	200	PROCEDURE
Serum electrolytes	20109005	Potassium	200	PROCEDURE
	20109005	Sodium	200	PROCEDURE

Terminology Mapping File

TERMINOLOGY MAPPING TABLE (continued)

Item or Concept	SNOMED CT (EP2)	Sample HIS Term	CODESET	Code Value Extension or Semantic Tag
Serum electrolytes	20109005	Chloride	200	PROCEDURE
	20109005	CO2	200	PROCEDURE
Serum creatinine	113075003	Creatinine Serum	200	PROCEDURE
Serum troponin	166794009	Troponin T	200	PROCEDURE
	166794009	High sensitivity Troponin I	200	PROCEDURE
Chest X-ray	399208008	Chest X-Ray	200	PROCEDURE
Electrocardiogram	29303009	ECG	200	PROCEDURE
2D echocardiogram	40701008	Echocardiogram	200	PROCEDURE
ACE inhibitor	777395009	Ramipril	200	MEDICINAL_PRODUCT
	777142001	Perindopril	200	MEDICINAL_PRODUCT
	775039005	Captopril	200	MEDICINAL_PRODUCT
	775758007	Enalapril	200	MEDICINAL_PRODUCT
	776550005	Lisinopril	200	MEDICINAL_PRODUCT
Beta-1 agenergic antagonist	776770001	Metoprolol	200	MEDICINAL_PRODUCT
	774880006	Bisoprolol	200	MEDICINAL_PRODUCT
	775077004	Carvedilol	200	MEDICINAL_PRODUCT
	774685003	Atenolol	200	MEDICINAL_PRODUCT
Angiotension II receptor antagonist	775028007	Candesartan	200	MEDICINAL_PRODUCT
	777913008	Valsartan	200	MEDICINAL_PRODUCT
	776392004	Irbesartan	200	MEDICINAL_PRODUCT
	777696003	Telmisartan	200	MEDICINAL_PRODUCT

Terminology Mapping File

14

TERMINOLOGY MAPPING TABLE (continued)

Item or Concept	SNOMED CT (EP2)	Sample HIS Term	CODESET	Code Value Extension or Semantic Tag
Angiotension II receptor antagonist	776982004	Olmesartan	200	MEDICINAL_PRODUCT
	776577001	Losartan	200	MEDICINAL_PRODUCT
ARNI	777480008	Sacubitril-valsartan	200	MEDICINAL_PRODUCT
MRA	777603002	Spironolactone	200	MEDICINAL_PRODUCT
	775795007	Eplerenone	200	MEDICINAL_PRODUCT
SGLT2 inhibitor	775447002	Dapagliflozin	200	MEDICINAL_PRODUCT
	775025005	Canagliflozin	200	MEDICINAL_PRODUCT
	775752008	Empagliflozin	200	MEDICINAL_PRODUCT
Patient discharge summary	38451000087100	Patient Discharge Summary	72	RECORD_ARTIFACT
Provider discharge summary	721917003	Discharge Summary	72	RECORD_ARTIFACT
Communication/ Education at Discharge	423475008	CHF Education Package Given	72	PROCEDURE
Follow-up in Heart Function Clinic	134440006	Referral/Follow Up to Heart Function Clinic (Cardiology Only)	200	PROCEDURE
Consult to Home and Community Care	417511005	Consult to Home and Community Care	200	PROCEDURE
	417511005	Refer to Home and Community Care	200	PROCEDURE
	417511005	Refer to ICC	200	PROCEDURE
Referral to Cardiac Rehab Program	704050007	Referral to Cardiovascular Rehab Clinic	200	PROCEDURE

Standard Adherence Report

STANDARD ADHERENCE REPORT CCL SCRIPT

Double click [here](#) to download the .txt file. This report can be used in your own program to measure heart failure standard adherence. The report will need to be validated to ensure that the variables are set up appropriately and pulling from the correct data source. The programmer at your organization may need to modify the report. Click [here](#) to download a .txt file that contains a more comprehensive script that can be used for data validation and internal auditing after the report is run.

STANDARD ADHERENCE REPORT EXAMPLE

<i>Percentage of patients with a diagnosis of heart failure who had a:</i>	<i>Baseline percentage (FY21-22)</i>	
	<i>NYGH</i>	<i>St. Mary's</i>
Heart failure admission order set ordered	63.91%	44.97%
Daily patient weight ordered	91.90%	95.62%
Weight measured daily for the first 3 days	15.90%	55.36%
Intake and output measurement ordered	80.89%	59.42%
Intake and output documented at least once a day for 3 days	19.72%	46.10%
Low sodium intake ordered	87.92%	89.45%
Chest x-ray resulted once in the first 3 days	66.97%	94.16%
Intravenous furosemide given at least twice daily during the during the first 3 days of admission	73.39%	76.79%
Initial labs resulted (CBC, electrolytes, glucose, creatinine, PT and/or INR) within the first 24h	32.87%	81.98%

Blood urea nitrogen resulted once during the admission	81.19%	97.24%
BNP resulted once during the admission	80.89%	87.18%
First serum troponin resulted within the first 24h of admission and the second troponin resulted within 8 hours of the first	37.31%	44.32%
Electrocardiogram performed once during admission within the first 3 days	87.61%	96.75%
Echocardiogram ordered during admission	31.65%	60.39%

Content Hierarchy Guide

[Link](#)

Mapping Guides/Tooling/Browser

<https://confluence.ihtsdotools.org/display/DOCSTART/12.+Mapping>

SNOMED CT Basics

<https://confluence.ihtsdotools.org/display/DOCSTART/4.+SNOMED+CT+Basics>


SNOMED CT Starter Guide

[https://confluence.ihtsdotools.org/display/DOCSTART/SNOMED+CT+Starter+Guide?src=breadcrumbs\[1\]parent](https://confluence.ihtsdotools.org/display/DOCSTART/SNOMED+CT+Starter+Guide?src=breadcrumbs[1]parent)


<https://confluence.ihtsdotools.org/display/DOCSTART/15.+Learning+More+About+SNOMED+CT>


Understanding SNOMED-CT Concept Model Hierarchies

<https://confluence.ihtsdotools.org/display/DOCSTART/6.+SNOMED+CT+Concept+-+Model>



SNOMED CT Content Hierarchy Overview






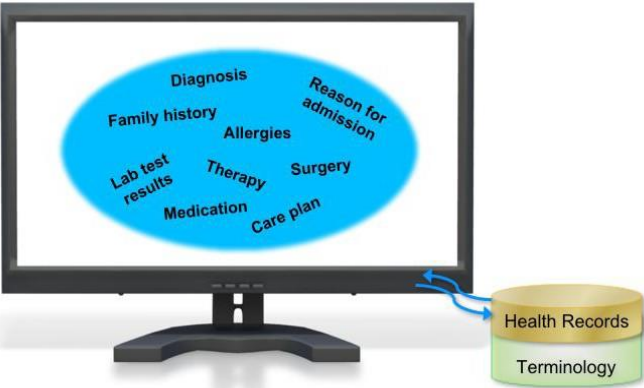
The global language of healthcare

Dr. Linda Bird
Head of Education & Product Support


Hello. Welcome to this presentation. My name is Linda Bird and I will be presenting an overview of the main SNOMED CT Content Hierarchies.



SNOMED CT in Electronic Health Records





SNOMED CT is used to record clinical data in Electronic Health Records. It may be used to record a diagnosis, a family history, allergies, the reason for admission into hospital, a laboratory test result, medications, therapies, surgery or a care plan. In this presentation, we will look at all the different types of concepts that can be found in SNOMED CT, including the ones that can be used in an Electronic Health Record, and the ones that are used as part of the infrastructure (or metadata) for the terminology itself.



SNOMED CT Content Hierarchies

- ▼ SNOMED CT Concept
 - ▶ 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)
 - ▶ Stages and scales (staging scale)
 - ▶ Substance (substance)

SNOMED CT covers a wide range of clinical concepts, including Body structures, Clinical findings, Environment or geographical locations, Events, Observable entities, Organisms, Pharmaceutical / biologic products, Physical forces, Physical objects, Procedures, Qualifier values, Record artefacts, Situations with explicit context, SNOMED CT Model Components, Social contexts, Special concepts, Specimens, Staging and scales, and Substances. These main hierarchies provide a way of organizing the concepts in SNOMED CT, so it's important to understand how this is done. For the rest of this presentation, we're going to look at each of these hierarchies, and give you a brief introduction to the types of concepts you'll find inside them, and how these concepts may be used to record clinical data in an electronic health record.

Body Structure

- ▼ SNOMED CT Concept
 - ▶ **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)

Body structure
Normal and abnormal anatomical structures

Examples:

- femur |
- mitral valve structure |
- adenocarcinoma |


Used for:

- Symptom location
- Disorder location
- Procedure site
- Site of administration


The first hierarchy you'll see, in an alphabetically ordered list, is 'Body structure'. Body structures represent both normal and abnormal anatomical structures. [\[click\]](#)

So this includes concepts for normal anatomical structures like 'femur' and 'mitral valve structure' as well as abnormal morphological structures like

'adenosarcoma'. [click] Body structures are used in health records in a number of places, such as the location of a symptom (such as a rash on the arm), the location of a disorder (such as arthritis of the knee), the site of a procedure (for example, an x-ray of the left shoulder), and also the site at which a medication or therapy was administered (for example, eye drops, which were administered in the right eye). In these examples, the arm, the knee, the left shoulder and the right eye are the body structures.



Clinical Finding



- SNOMED CT Concept
- Body structure (body structure)
- Clinical finding (finding)**
- Environment or geographical 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)

Clinical finding

The result of a clinical observation, assessment or judgement and includes normal and abnormal clinical states.

Examples:

- asthma
- headache
- normal breath sounds


Used for:

- Reason for admission
- Diagnosis
- Signs and symptoms
- Laboratory test results
- Assessment results


One of the most commonly used hierarchies in SNOMED CT is the 'Clinical finding' hierarchy. This hierarchy contains concepts which represent the result of clinical observations, assessments or judgements. And this includes both normal and abnormal clinical states [\[click\]](#)

Such as disorders like 'asthma', symptoms like 'headache' and clinical signs like 'normal breath sounds'. [\[click\]](#)

Clinical findings are used throughout the health record for a variety of purposes, such as the reason for admission to a hospital, diagnoses, signs and symptoms, laboratory test results and the results of assessments, such as Activities of Daily Living assessment.



Environment or Geographical Location



- SNOMED CT Concept
- Body structure (body structure)
- Clinical finding (finding)
- Environment or geographical 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)

Environment or geographical location

Types of environments or named locations, such as countries, states and regions.

Examples:


- intensive care unit
- academic medical centre
- Denmark

Used for:


- Care setting
- Birth country
- Living environment
- Event location type

The next hierarchy is not used quite so often. It is the 'Environment or geographical location' hierarchy. This hierarchy contains concepts which represent types of environments, as well as named location such as countries, states and regions. [\[click\]](#)

It includes concepts such as 'intensive care unit', 'academic medical centre' and 'Denmark', [\[click\]](#) and these concepts may be used in a health record to record the care setting of a patient, their birth country, their living environment at home or the type of location in which an event occurred.



Event



- SNOMED CT Concept
- 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)

Event

Occurrences excluding procedures and interventions

Examples:

- flood
- earthquake
- fall from ladder
- exposure to communicable disease


Used for:

- Reason for admission
- Past history


The next hierarchy is the Event hierarchy. Events represent things that occur, which are not procedures or interventions (and we'll talk more about those later). [\[click\]](#)

So Events include concepts like a 'flood', an 'earthquake', a 'fall from a ladder', or an 'exposure to a communicable disease'. [\[click\]](#)

Events may be used as the Reason for admission to a hospital, or as part of the Past History of a patient.



Observable Entity



- SNOMED CT Concept
- 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)

Observable entity

A question or assessment which can produce an answer or result.

Examples:

- systolic blood pressure
- color of iris
- gender



Used for:

- Observation names

The next hierarchy is the Observable Entity hierarchy. Observable entities are things that can be observed. They represent a question or an assessment, which can produce an answer or result. Observable Entities and Clinical Findings often work together, because the Observable Entity represents the question, while the Clinical Finding represents the answer. [\[click\]](#)

Examples of observable entities include 'systolic blood pressure', 'color of iris', and 'gender'. [\[click\]](#)

Concepts in this hierarchy are used to represent the name or type of an observation. Other code systems, such as LOINC, can also be used for this purpose.

Organism

- SNOMED CT Concept
- 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)

Organism

Organisms of significance in human and animal medicine, including microorganisms, animals and plants

Examples:

- human papillomavirus |
- streptococcus pyogenes |
- acacia |
- texon cattle breed |



Used for:

- Microorganism susceptibility
- Cause of disease / infection

The Organism hierarchy includes concepts that represent a variety of organisms which are significant in human and animal medicine. [click]

These include microorganisms, animals and plants, such as 'human papillomavirus', 'streptococcus pyogenes', 'acacia', and 'texon cattle breed'. [click]

There are a number reasons why organisms are included in health records – for example, as the microorganism which is being tested for susceptibility to a medication (such as an antibiotic), or as the cause of a disease or infection. Organisms can also be associated with allergens, or vaccine ingredients – however it is usually the Substance concept (such as 'cat dander', 'pollen', or 'Polio virus antibody' that is used for these purposes, rather than the Organism itself.

Pharmaceutical / Biologic Product

- SNOMED CT Concept
- Body structure (body structure)
- Clinical finding (finding)
- Environment or geographical location (environment / location)
- Event (event)
- Observable entity (observable entity)
- Organism (organism)
- Pharmaceutical / biologic product**
- Physical force (physical force)
- Physical object (physical object)
- Procedure (procedure)
- Qualifier value (qualifier value)
- Record artifact (record artifact)
- Situation with explicit context (situation)
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- Substance (substance)

Pharmaceutical / biologic product

Medication products

Examples:


- human plasma, blood product |
- paracetamol + codeine |
- amoxicillin 250 mg oral capsule |

Used for:


- Medication lists

Pharmaceutical / biologic products are medication products or drugs. They include concepts that describe a type of medication at various levels of detail [click] such as [human plasma, blood product], [paracetamol + codeine], and [amoxicillin 250 mg oral capsule]. [click]

The main use for these concepts are in medication lists. This could be a 'current medication list', a 'ceased medication list' or a 'prescribed, dispensed or administered medication list'. The international edition of SNOMED CT only includes unbranded and individual medication concepts. Branded and packaged drug concepts are always added into the national extension, in the country in which the product and packaging is registered.



Physical Force



- ▼ SNOMED CT Concept
- ▶ Body structure (body structure)
- ▶ Clinical finding (finding)
- ▶ Environment or geographical location (environment / location)
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- ▶ Observable entity (observable entity)
- ▶ Organism (organism)
- ▶ Pharmaceutical / biologic product (product)
- ▶ **Physical force (physical force)**
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- ▶ Substance (substance)

Physical force

Physical forces that can play a role as mechanisms of injury.

Examples:

- friction |
- fire |
- radiation |


Used for:

- Reason for injury


Physical forces are forces that can play a role as a mechanism of injury. [\[click\]](#)

For example, 'friction', 'fire' or 'radiation'. [\[click\]](#)

Physical forces aren't used for many purposes in a health record. The most common reason for recording a physical force is as the reason for injury.



Physical Object



- ▼ SNOMED CT Concept
- ▶ Body structure (body structure)
- ▶ Clinical finding (finding)
- ▶ Environment or geographical location (environment / location)
- ▶ Event (event)
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- ▶ Substance (substance)

Physical object

Natural and man-made physical objects.

Examples:


- vena cava filter |
- stent |
- bandage |
- walking frame |
- bed |

Used for:


- Orders & supply of devices
- Procedure device
- Stock inventory

The 'Physical object' hierarchy contains concepts representing natural and man-made physical object. [\[click\]](#) For example a 'vena cava filter' or 'stent', a 'bandage', a 'walking frame' or a 'bed'. [\[click\]](#)

Physical objects are used for orders and supply of medical devices, such as a walking frame. They are used as procedure devices - which may be the device (like a stent) being implanted or another device (like a cardiac pacemaker) being removed. Physical objects may also be used for stock inventory or ward management.



Procedure



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- Substance (substance)

Procedure

Activities performed in the provision of health care.

Examples:


- appendectomy |
- administration of anesthesia |
- x-ray |, | ultrasound |
- diabetic care education |
- physiotherapy |
- discharge |

Used for:


- *Procedures performed*
- *Planned procedures*
- *Requested procedures*

The next hierarchy is the 'Procedure hierarchy'. Procedures represent activities performed in the provision of health care. [\[click\]](#) This includes not only surgical procedures (such as Appendectomy), but also the administration of medicine (such as the administration of anesthesia) , imaging (such as 'x-rays' and 'ultrasounds'), education (such as diabetic care education), therapies (like physiotherapy) and administrative procedures (like 'admission' or 'discharge'). [\[click\]](#)

Procedures are frequently documented in a health record. The most common reasons to do so are to record the procedures that have been performed (for example during a hospital stay), to record the procedures that are planned (such you may find in a care plan), or to record a



Qualifier Value



- SNOMED CT Concept
- Body structure (body structure)
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- Substance (substance)

Qualifier value

The values of some SNOMED CT attributes, where those values are not subtypes of other top level concepts.

Examples:

- left |
- severe |
- capsule |


Used for:

- *Laterality*
- *Severity*
- *Priority*
- *Medication dose form*
- *Route of administration*


Qualifier values represent the values of some of the SNOMED CT attributes, where those values are not subtypes of another top level concept. [\[click\]](#)

For example, 'left', 'severe', or 'capsule'. [\[click\]](#)

Qualifier values are used in health record to define the laterality of a diagnosis or procedure (such as 'left', 'right' or 'bilateral'), the severity of a condition (for example, 'severe'), the priority of a procedure (for example 'emergency'), a medication dose form (like 'tablet' or 'capsule') and a route of administration (such as oral or topical).



Record Artifact



- SNOMED CT Concept
- Body structure (body structure)
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- Substance (substance)

Record artifact

Content created for the purpose of providing other people with information about record events or states of affairs.

Examples:

- patient held record |
- discharge summary |
- record entry |
- family history section |
- birth certificate |


Used for:

- *Type of identification*
- *Document types*


Record artifacts represent content that is created to provide people with information about record events or states of affairs. [\[click\]](#)

Examples include a 'patient held record', a 'discharge summary', a 'record entry', a 'family history section on a report', and a 'birth certificate'. [\[click\]](#)

Record artifact concepts are used in health records to document the type of identification used by a patient, or to specify the type of document used or required.



Situation With Explicit Context



- SNOMED CT Concept
- Body structure (body structure)
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Situation with explicit context

Clinical findings or procedures that explicitly declare their context.

Examples:

- endoscopy arranged |
- family history of glaucoma |
- past history of myocardial infarction |

Used for:

- *Family history*
- *Past history*
- *Care plans*

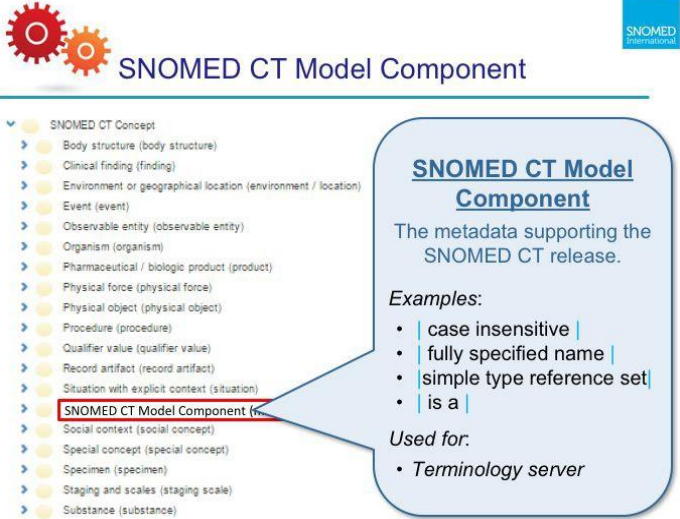
The 'Situation with explicit context' hierarchy is a special hierarchy that is used to represent clinical findings or procedures that explicitly declare their context. They may refer to clinical findings about a family member of the patient, procedures that have not yet occurred, or procedures or findings that have occurred some time in the past. [\[click\]](#)

Examples of Situations with Explicit Context include 'endoscopy arranged', 'family history of glaucoma', and 'past history of myocardial infarction'. [\[click\]](#)

'Situation with explicit context' concepts are used throughout health records for things like 'family histories', 'past histories' and 'care plans'. In some cases, the context is explicitly captured in the health record structure itself

(like in a 'family history' section on a report), and then not included in the recorded concept. In other cases, the explicit context is included in the concept recorded in the health record, to ensure that queries over the data don't mistakenly assume that the default context applies. More information on the 'Situation with explicit context' hierarchy is available in a separate

presentation on this topic.



SNOMED CT Model Component

- SNOMED CT Concept
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 - Substance (substance)

SNOMED CT Model Component

The metadata supporting the SNOMED CT release.

Examples:

- case insensitive
- fully specified name
- simple type reference set
- is a


Used for:

- Terminology server


The 'SNOMED CT Model Component' hierarchy is another special hierarchy - but in this case it is purely used to support the SNOMED CT release itself. It provides the metadata that helps to document SNOMED CT concepts, relationships, descriptions and reference sets. [\[click\]](#)

This hierarchy contains concepts like 'case insensitive', and 'fully specified name' which may help to document a Description; 'simple type reference set' which provides the type of a reference set, and 'is a', which is used as a relationship type. [\[click\]](#)

'SNOMED CT Model Component' concepts are not intended to be recorded in a health record. Instead these concepts belong in the terminology server to document the characteristics of the terminology components. When we get to the end of the list of top-level hierarchies, we're going to come back to this one and look a bit deeper at what it contains.



Social Context



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- Body structure (body structure)
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Social context

Social conditions and circumstances significant to health care.

Examples:


- construction worker |
- grandparent of subject |

Used for:


- Occupations
- Family history relationships

The social context hierarchy includes social conditions and circumstances that are significant to health care. [\[click\]](#)

For example, occupations, such as 'Construction worker', which may be associated with particular health risks. Social contexts also include family relationships which can be used to support detailed recording of family history. For example, indicating that the 'Grandparent of subject' had a particular medical condition.



Special Concept



- SNOMED CT Concept
- Body structure (body structure)
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Special concept

Special concepts that should never be stored in an Electronic Health Record, but which may be useful for specific use cases.

Examples:

- duplicate concept |
- alternative medicine poisoning |

Used for:

- Searching / Navigation


The Special concept hierarchy contains concepts that should never be stored in an Electronic Health Record, but which may be useful for specific use cases. [\[click\]](#)


It contains two subhierarchies. The first is called 'inactive concept', with children such as 'duplicate concept'. When the first release format (RF1) was used, inactivated content was moved into this hierarchy. However, this approach is no longer used in the current release format (RF2). The other subhierarchy of 'Special concept' is called 'navigational concept'. This subhierarchy contains concepts such as 'alternative medicine poisoning', which may be used by an Association or Ordered Association Reference Set to group concepts for a specific use case. These groupings are not included

in the main hierarchies because the groupings are not always true, as is

required to be a defining property. [click]

Special concepts should not be recorded in health records, but instead tend to only be used when searching, navigation or grouping is required for specific use cases.





Specimen

- SNOMED CT Concept
- 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)
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- Substance (substance)

Specimen

Entities that are obtained (usually from a patient) for examination or analysis.

Examples:

- urine specimen |
- blood specimen |
- skin biopsy sample |

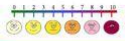
Used for:


- Pathology test specimen
- Biopsy specimen

Next is the Specimen hierarchy. Specimens are entities that are obtained (usually from a patient) for examination or analysis. [\[click\]](#)

For example, urine specimen, blood specimen, and skin biopsy sample. [\[click\]](#)

Specimen concepts are recorded in a health record as the Collected specimen for a pathology test, or the specimen removed during a biopsy.





Staging and Scales

- SNOMED CT Concept
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- Substance (substance)

Staging and scales

Assessment scales and tumor staging systems

Examples:

- Glasgow Coma Scale |
- FIGO staging system of gynecological malignancy |


Used for:

- Assessments
- Stage of a disease

The 'Staging and scales' hierarchy contains concepts that represent assessment scales and tumour staging systems. [\[click\]](#)

For example the 'Glasgow Coma Scale', and the 'FIGO staging system of gynaecological malignancy'. [\[click\]](#)

In health records, these concepts are used to record types of assessments and the staging system used to describe the progression of a disease.



Substance

- SNOMED CT Concept
 - 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)
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 - Substance (substance)**

Substance

General substances, the chemical constituents of pharmaceutical/biologic products, body substances, dietary substances and diagnostic substances

Examples:


- methane |
- insulin |
- paracetamol |
- albumin |

Used for:

- Allergies / adverse reactions
- Medication ingredients
- Diagnostic substance

And the last main hierarchy in SNOMED CT (when ordered alphabetically) is the 'Substance hierarchy'. Substance concept represent general substances, the chemical constituents of pharmaceutical/biologic products, body substances, dietary substances and diagnostic substances. [click]

Examples of substances include 'methane', 'insulin', 'paracetamol' and 'albumin'. [click] Substances are recorded in health records for a variety of purposes - the most common of which is for allergies and adverse reactions, as the ingredients in medications, and as the diagnostic substance for a pathology test.



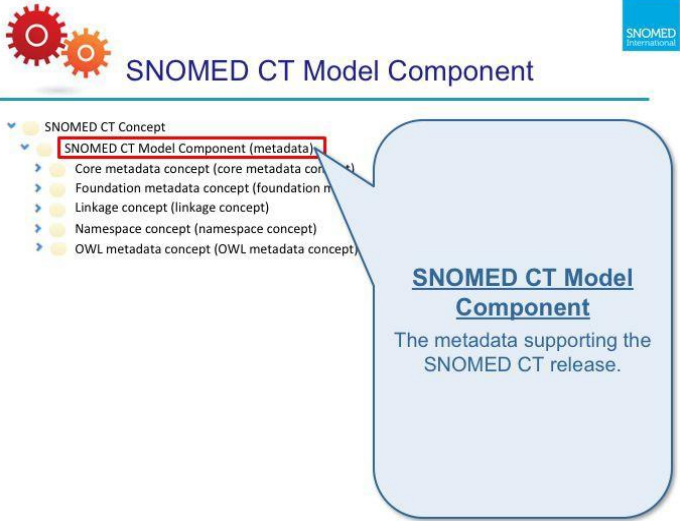
SNOMED CT Model Component

- SNOMED CT Concept
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SNOMED CT Model Component

The metadata supporting the SNOMED CT release.

Now that we have reviewed all the content hierarchies, we're going to come back to the SNOMED CT Model Component hierarchy, and have a bit of a closer look at the types of concepts contained in this hierarchy.



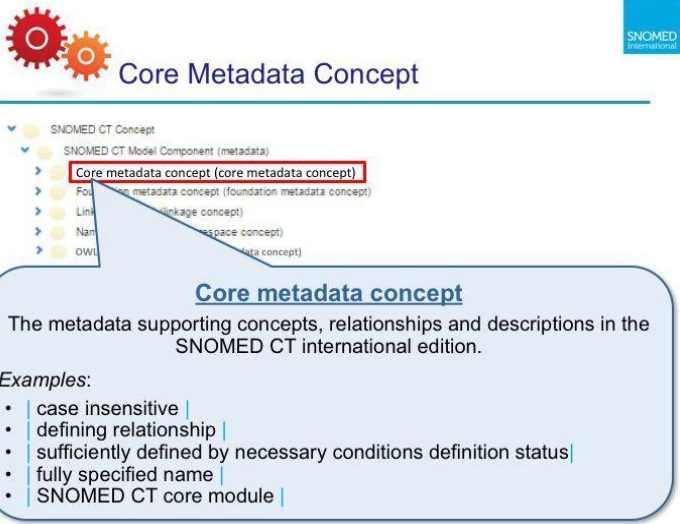
SNOMED CT Model Component

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)**
 - Core metadata concept (core metadata concept)
 - Foundation metadata concept (foundation metadata concept)
 - Linkage concept (linkage concept)
 - Namespace concept (namespace concept)
 - OWL metadata concept (OWL metadata concept)

SNOMED CT Model Component
The metadata supporting the SNOMED CT release.

There are five main subhierarchies of 'SNOMED CT Model Component' – 'Core metadata concept', 'Foundation metadata concept', 'Linkage concept', 'Namespace concept' and 'OWL metadata concept'

In the next few slides, we'll look at each of these subhierarchies in turn.



Core Metadata Concept

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)
 - Core metadata concept (core metadata concept)**
 - Foundation metadata concept (foundation metadata concept)
 - Linkage concept (linkage concept)
 - Namespace concept (namespace concept)
 - OWL metadata concept (OWL metadata concept)


Core metadata concept
The metadata supporting concepts, relationships and descriptions in the SNOMED CT international edition.

Examples:

- | case insensitive |
- | defining relationship |
- | sufficiently defined by necessary conditions definition status |
- | fully specified name |
- | SNOMED CT core module |

The 'Core metadata concept' hierarchy contains the metadata needed to support concepts, relationships and descriptions in the SNOMED CT international edition. This includes a number of sets of enumerated values that can be used to populate the attributes of a concept, a relationship or a description. [click]

So, for example, the 'case significance' of a Description may be |case insensitive|; the 'characteristic type' of a relationship may be |defining relationship|. The 'definition status' of a concept may be |sufficiently defined by necessary conditions definition status|, the 'description type' of a Description may be |fully specified name|, and the module of any type of component may be |SNOMED CT core module|.



Foundation Metadata Concept

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)
 - Core metadata concept (core metadata concept)
 - Foundation metadata concept (foundation metadata concept)**
 - Linkage concept (linkage concept)
 - Namespace concept (namespace concept)
 - OWL metadata concept (OWL metadata concept)

Foundation metadata concept


The metadata supporting SNOMED CT reference sets.

Examples:

- simple type reference set
- language type reference set
- map target
- acceptability

The 'Foundation metadata concept' hierarchy contains the metadata needed to support reference sets in the SNOMED CT international edition. [\[click\]](#)

This includes different types of reference sets, such as a 'simple type reference set' or a 'language type reference set'; and it also includes concepts representing each of the attributes defined in the standard reference set types, such as 'map target' and 'acceptability'; and the enumerated values of those attributes whose value is a concept.



Linkage Concept

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)
 - Core metadata concept (core metadata concept)
 - Foundation metadata concept (foundation metadata concept)
 - Linkage concept (linkage concept)**
 - Namespace concept (namespace concept)
 - OWL metadata concept (OWL metadata concept)

Linkage concept


Concepts intended to link two or more other concepts to each other to express compositional meanings.

Examples:

- is a
- finding site
- laterality

The 'Linkage concept' hierarchy contains the concepts that are intended to link two or more other concepts to each other to express compositional meanings. So this means that all the concepts that can be used as a Relationship Type are included. [\[click\]](#)

The linkage concepts that are approved for use are the 'is a' concept (which defines the hierarchy in SNOMED CT) and the 'Concept model attributes', such as 'finding site' and 'laterality'. The use of the other linkage concepts is regarded as non-standard.



Namespace Concept

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)
 - Core metadata concept (core metadata concept)
 - Foundation metadata concept (foundation metadata concept)
 - Linkage concept (linkage concept)
 - Namespace concept (namespace concept)**
 - OWL metadata concept (OWL metadata concept)

Namespace concept


The concepts that represent the core namespace and each extension namespace that has been assigned by SNOMED International.

Examples:

- | Core Namespace |
- | Extension Namespace {1000000} |
- | Extension Namespace {1000175} |

Next, the 'Namespace concept' subhierarchy contains concepts that represent the core namespace and each extension namespace that has been assigned by SNOMED International. [\[click\]](#)

The identifier of each of the extension namespaces is used when creating new concepts in that extension, to ensure that the resulting concept identifier is always globally unique.



OWL Metadata Concept

- SNOMED CT Concept
 - SNOMED CT Model Component (metadata)
 - Core metadata concept (core metadata concept)
 - Foundation metadata concept (foundation metadata concept)
 - Linkage concept (linkage concept)
 - Namespace concept (namespace concept)
 - OWL metadata concept (OWL metadata concept)**

OWL metadata concept

Concepts used by |OWL expression type reference sets| as the referenced component for some OWL expressions.

Examples:

- | general concept inclusion axiom |
- | OWL ontology header |
- | OWL ontology namespace |

The last SNOMED CT Model Component subhierarchy is called 'OWL metadata concept'. This subhierarchy includes concepts that are used by OWL expression type reference sets, such as the |OWL axiom reference set| and the |OWL ontology reference set|. These concepts are used as the referenced component for some OWL expressions, where no other suitable referenced component is available, [\[click\]](#) such as for general concept inclusion axioms, OWL ontology headers and OWL ontology namespace definitions.


Summary

- ▼ SNOMED CT Concept
 - ▶ Body structure (body structure)
 - ▶ Clinical finding (finding)
 - ▶ Environment or geographical location (environment / location)
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 - ▶ Observable entity (observable entity)
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 - ▶ Specimen (specimen)
 - ▶ Stages and scales (staging scale)
 - ▶ Substance (substance)

So, in summary, this presentation has explored the wide range of clinical concepts that can be found in SNOMED CT – including body structures, clinical findings, procedures and substances. SNOMED CT also contains metadata concepts that are used to help define the terminology itself.

Links to Further Information

- SNOMED CT editorial guide
 - <http://snomed.org/eg>
- SNOMED CT starter guide
 - <http://snomed.org/sq>



Thank-you very much for listening! I hope this presentation has given you an appreciation for the breadth of clinical concepts contained within SNOMED CT. If you'd like to learn more about the SNOMED CT content hierarchies, there are a range of other presentations available that go into more detail. You can also read the relevant sections of the Editorial Guide and the SNOMED CT Starter Guide.

Thank-you! Good bye!

Related references

- <http://snomed.org/eg>
- SNOMED CT editorial guide
 - <http://snomed.org/eg-hierarchy>
- <http://snomed.org/sq>



