

BLUSNO Tool for SNOMED CT Visualization and QA Support

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Introduction

- SNOMED CT is a very large and complex medical terminology
- Difficult to visualize an entire SNOMED CT hierarchy using “node and edge” diagrams
- Summarize SNOMED CT’s content and structure to help see the “big picture”

Motivation

From Mark Shafarman, “Getting to know SNOMED CT”
IHTSDO Implementation Showcase 2012

“... it wasn’t easy arriving at the **‘big picture.’** I knew about lots of details [about SNOMED CT], but they weren’t fitting together”

“... I could not get a ‘feel’ for SNOMED CT by paging through a code book or viewing simple linear files”

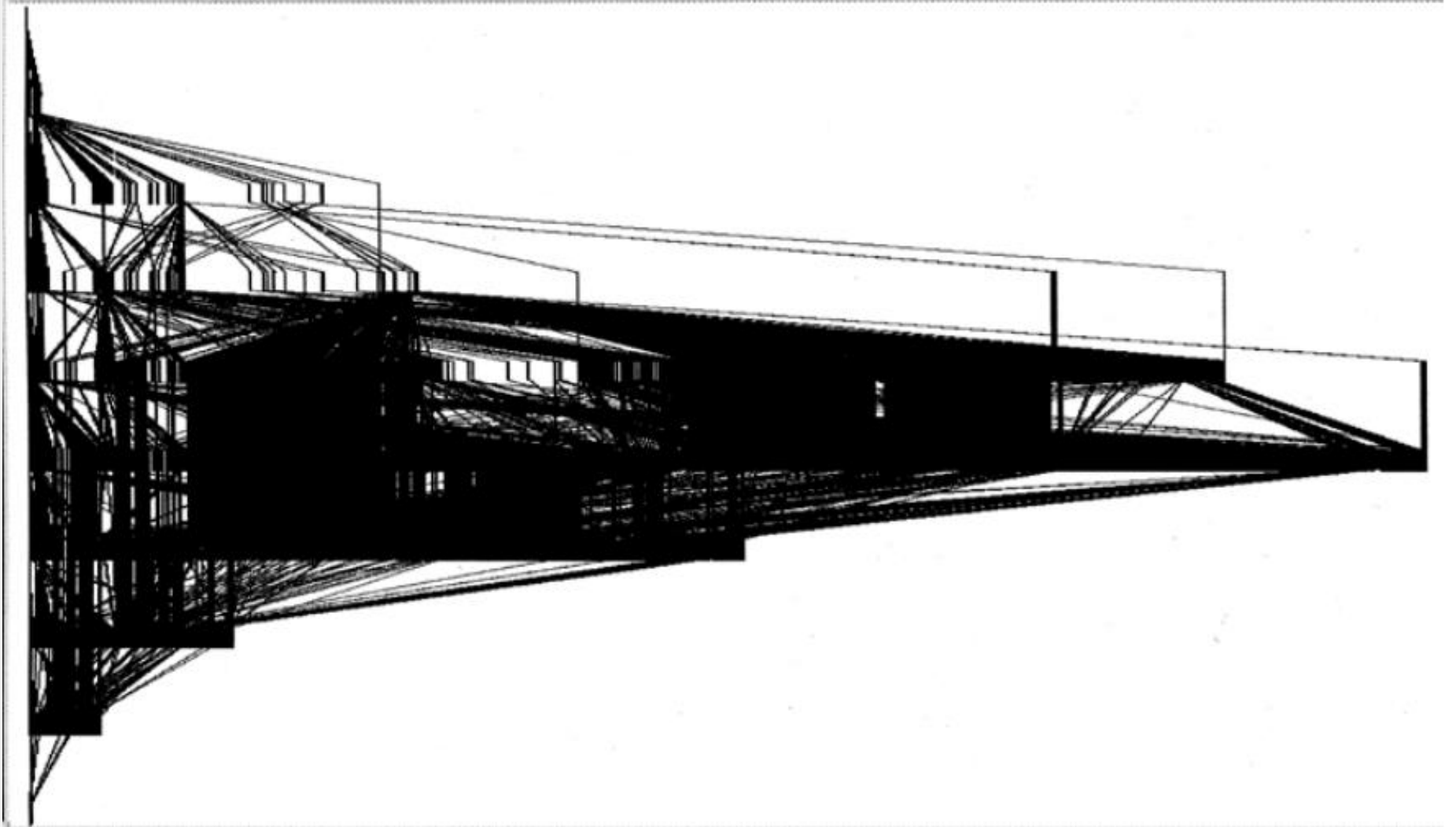
“... experimenting with one of the publicly available SNOMED CT browsers was a good place to start putting together all the bits and pieces”

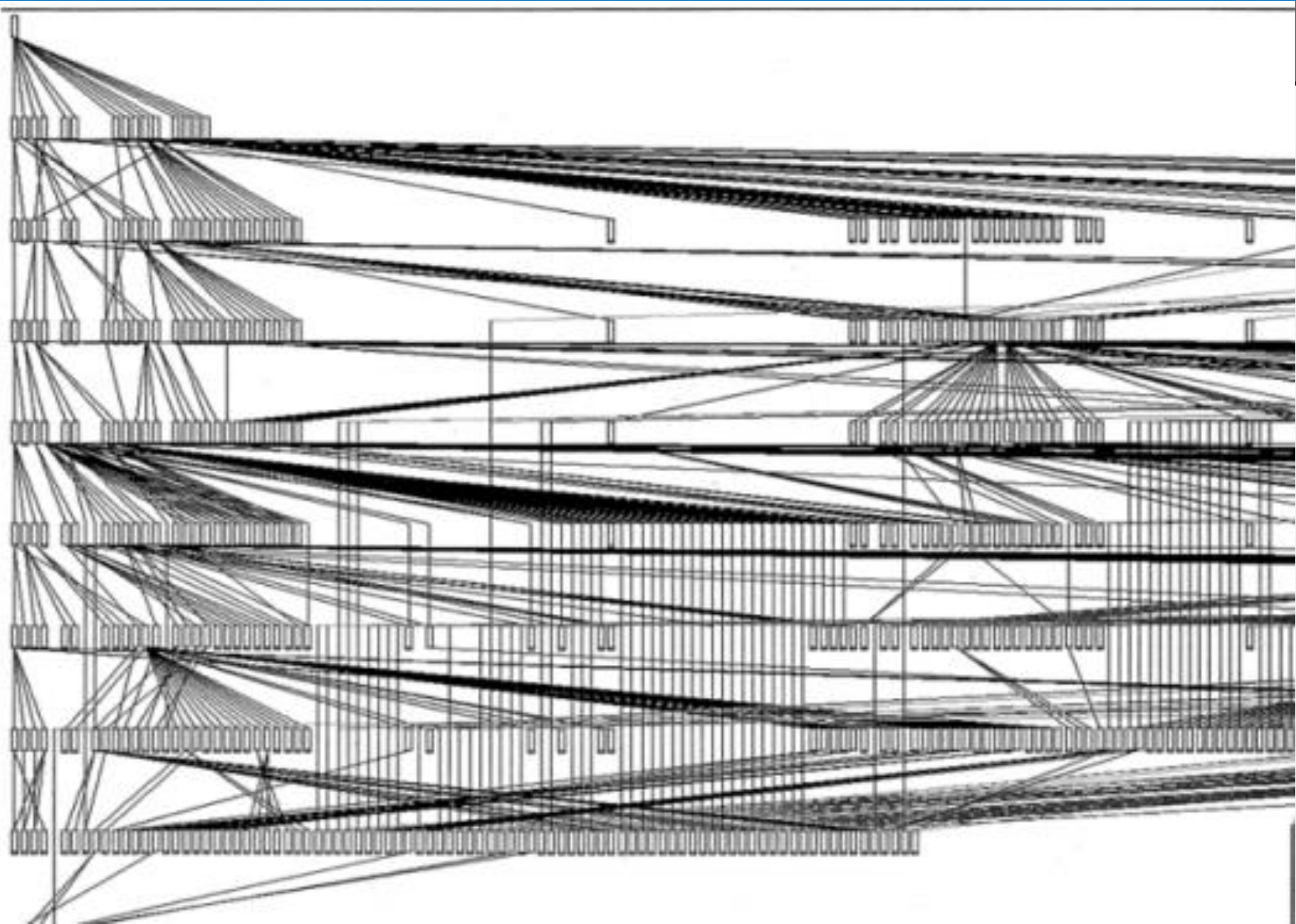
The “Big Picture” of SNOMED CT

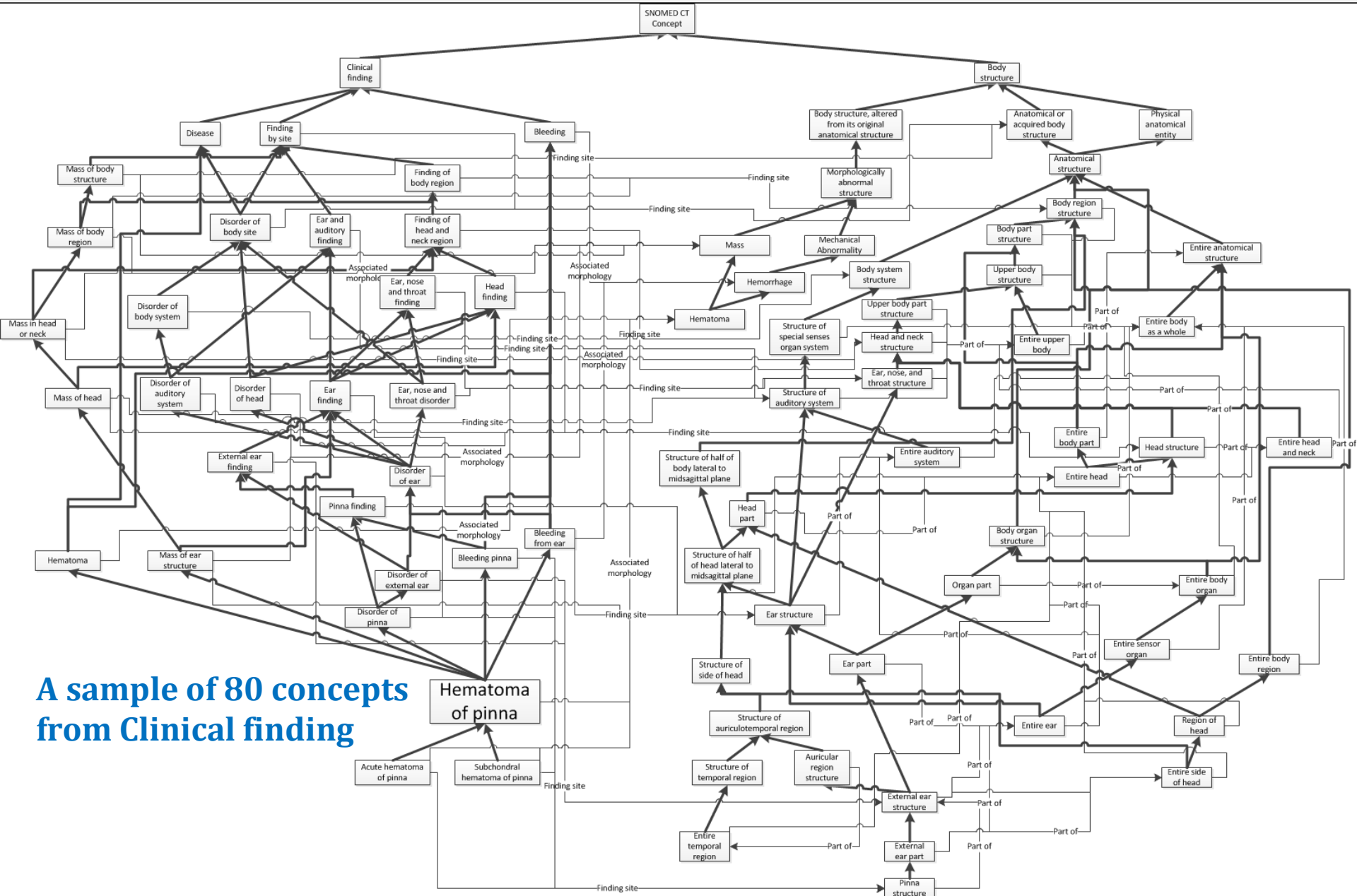
What is in SNOMED CT and how is it structured?

- Browsing and searching
- Integration into applications
- Extending, reusing, and cross mapping
- Quality assurance

A Hierarchy of 2500 Concepts







**A sample of 80 concepts
from Clinical finding**

**Hematoma
of pinna**

CliniClue Browser

Concept Id: 88050005 **hematoma of pinna**
(Type:= clinical finding)

Description Id: 145963019

Words - any order

Find: hematoma of pinna

- P hematoma of pinna
- S chronic hematoma of pinna
- P acute hematoma of pinna
- ... more matches ...

Hierarchy: Subtype hierarchy

- bleeding from ear
- disorder of pinna
- bleeding pinna
- mass of ear structure
- hematoma
 - hematoma of pinna
 - acute hematoma of pinna
 - subchondral hematoma of pinna

Concept Status: **current**

- Descriptions
 - Lang: en-US
 - hematoma of pinna (disorder)
 - hematoma of pinna
 - hematoma of auricle
- Definition: Fully Defined as ...
 - is a
 - bleeding from ear
 - is a
 - bleeding pinna
 - is a
 - mass of ear structure
 - is a
 - hematoma
 - is a
 - disorder of pinna
 - Group
 - associated morphology
 - hematoma
 - finding site
 - pinna structure
- Qualifiers
 - severity
 - severities
 - episodicity
 - episodicities
 - clinical course
 - courses
- Codes

UTS Browser

Search Tree Recent Searches

SNOMED CT Version: 2013_01_31

Term ConceptID DescriptionID

hematoma of pinna

Go

Active concepts only:

Restrict results to: --None--

Search Results (7)

- [88050005](#) Hematoma of pinna (disorder)
- [172617009](#) Drainage of hematoma of pinna (procedure)
- [302906000](#) Acute hematoma of pinna (disorder)
- [286943000](#) Deformity/hematoma of pinna (disorder)
- [446563000](#) Subchondral hematoma of pinna (disorder)
- [28072004](#) Cauliflower ear (disorder)
- [172619007](#) Drainage of hematoma of pinna and insertion

Report View

Concept ID	Concept Name	Relationship (1)	Current (0)
145964013	Hematoma of auricle	Synonym (2)	Current (0)

Parents (5)

Children (2)

Acute hematoma of pinna [[302906000](#)]

Subchondral hematoma of pinna [[446563000](#)]

Relationships from *this* concept (10)

Hematoma of pinna | [Associated morphology](#) | [Hematoma](#) (Defining)

Hematoma of pinna | [Finding site](#) | [Pinna structure](#) (Defining)

Hematoma of pinna | [Is a](#) | [Bleeding from ear](#) (Defining)

Hematoma of pinna | [Is a](#) | [Bleeding pinna](#) (Defining)

Hematoma of pinna | [Is a](#) | [Disorder of pinna](#) (Defining)

Hematoma of pinna | [Is a](#) | [Hematoma](#) (Defining)

Hematoma of pinna | [Is a](#) | [Mass of ear structure](#) (Defining)

Hematoma of pinna | [Clinical course](#) | [Courses](#) (Qualifier)

Hematoma of pinna | [Episodicity](#) | [Episodicities](#) (Qualifier)

Hematoma of pinna | [Severity](#) | [Severities](#) (Qualifier)

Relationships to *this* concept (3)

IHTSDO Workbench

File Edit Collaborate Database Subversion ChangeSet IDE Window

Expansion complete for Acquired body structure
Fetched 13 children

taxonomy data checks empty

- Relevant Auxiliary Concept
- Terminology Auxiliary concept
- SNOMED CT concept
 - Body structure
 - Acquired body structure
 - SNOMED CT Concept
 - body structure
 - Morphologically altered structure
 - Morphologically abnormal structure
 - Mechanical abnormality
 - Amputation stump
 - Application site
 - Donor site
 - Excision site
 - Operative site
 - Post-surgical anatomy
 - Recipient site
 - Scar
 - Surgical margins
 - Trigger point
 - Trigger zone
 - Triper flap
 - Anatomical organisational pattern
 - Anatomical site notations for tumour staging
 - Morphologically altered structure
 - Non-specific site

SNOMED CT Concept (SNOMED RT+CTV3)

Concept attributes:

defined	status	version	path
True	current	2003.01.31.00:00:00	SNOMED Core

Descriptors:

text	Type	case	lang	status	version	path
SNOMED CT Concept (SNOMED RT+CTV3)	fully specified name	false	en	current	2003.01.31.00:00:00	SNOMED Core
E0202 College of American Pathologists	synonym	false	en	current	2003.01.31.00:00:00	SNOMED Core
SNOMED CT has been created by combining SNOMED RT and a computer based nomenclature and classification known as Read Codes Version 3, which was created on behalf of the U.K. Department of Health and is a Crown copyright.	synonym	false	en	current	2003.01.31.00:00:00	SNOMED Core
SNOMED CT has been created by combining SNOMED RT and a computer based nomenclature and classification known as Read Codes Version 3, which was created on behalf of the U.K. Department of Health and is a Crown copyright.		true			2004.01.31.00:00:00	
SNOMED CT Concept	preferred term	false	en	current	2003.01.31.00:00:00	SNOMED Core
		true			2004.01.31.00:00:00	
SNOMED CT January 2003 Release: 30030131 [S]	synonym	false	en	current	2003.01.31.00:00:00	SNOMED Core
				retired	2004.01.31.00:00:00	

score query → corneal + abrasion-

is a child of → exclude matches [x] [PRINT] Terminology Auxiliary concept

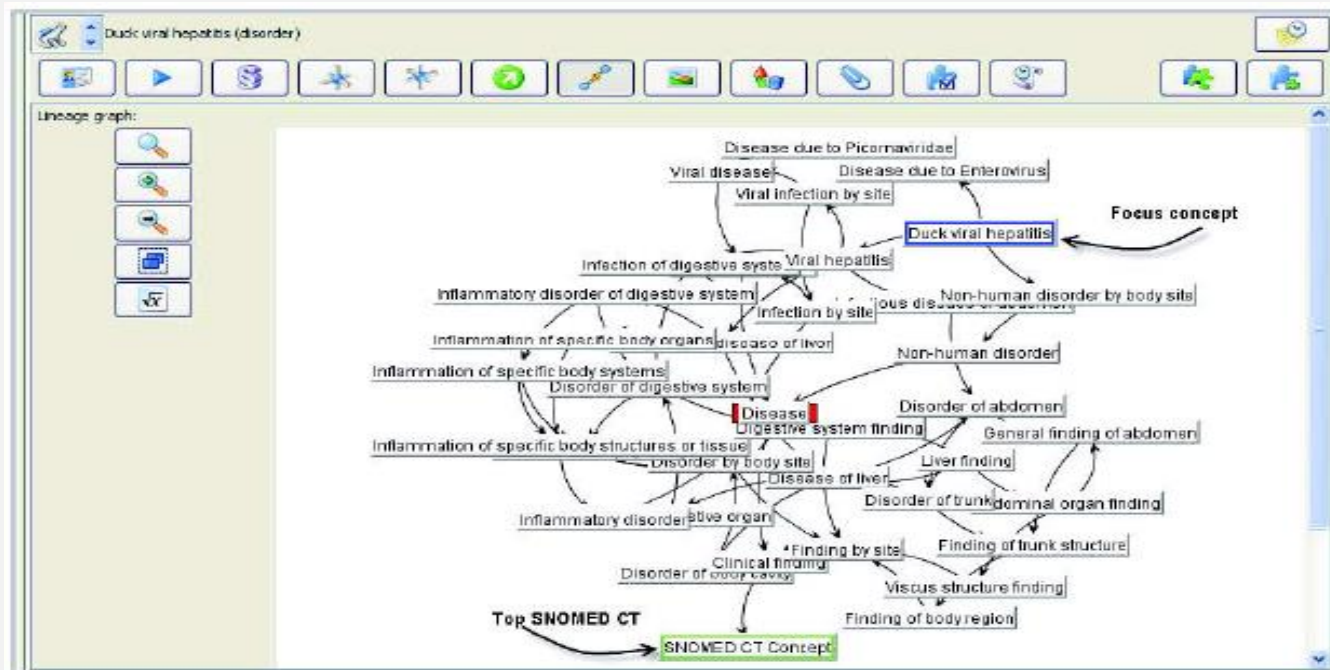
score	text	type
0.9485292	Abrasion of corneal epithelium	synonym
0.9485292	Abrasion of corneal epithelium	synonym
0.9485292	CA - Corneal abrasion	synonym
0.9485292	Corneal abrasion	preferred term
0.9485292	Corneal abrasion	synonym

Selected SNOMED CT Concept

cancel commit

Visualizing SNOMED CT is Difficult

- Node/edge figures show the “big picture” for many concepts at a time.
- Benefits of such figures are lost as the number of concepts increases.

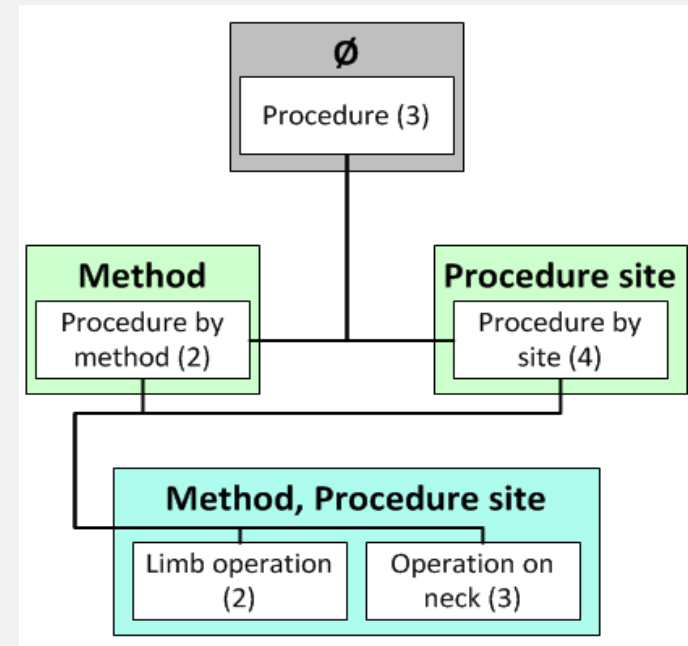
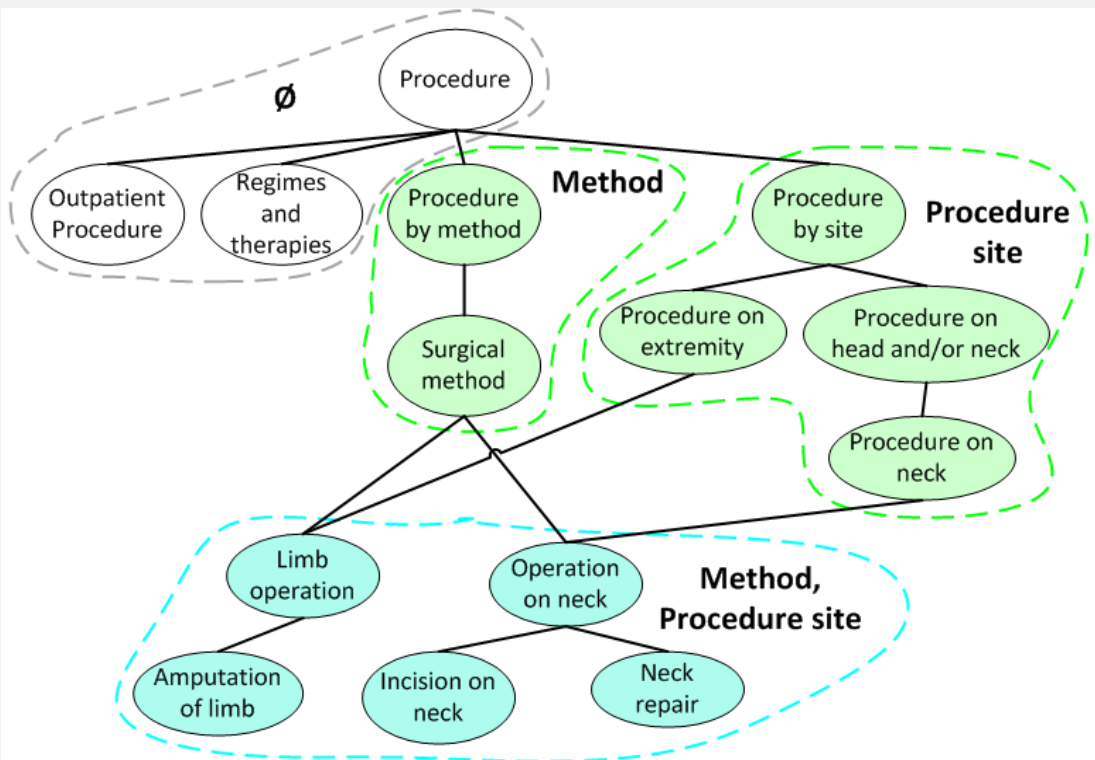


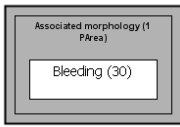
Summarizing SNOMED CT

Partial-area Taxonomy Summarization

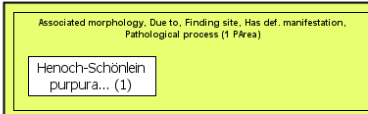
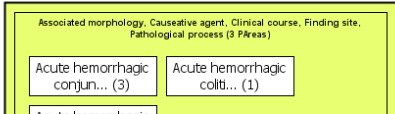
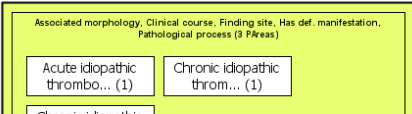
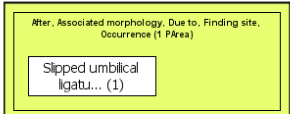
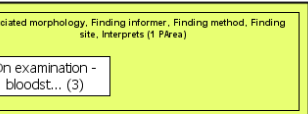
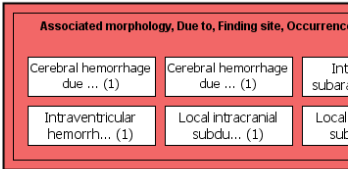
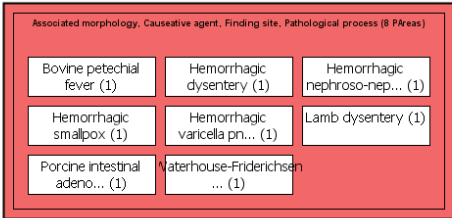
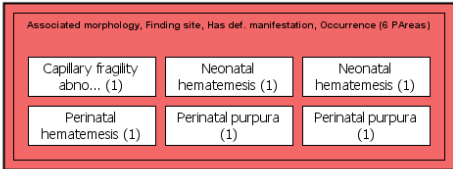
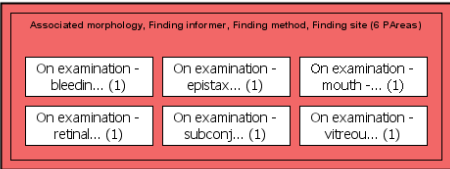
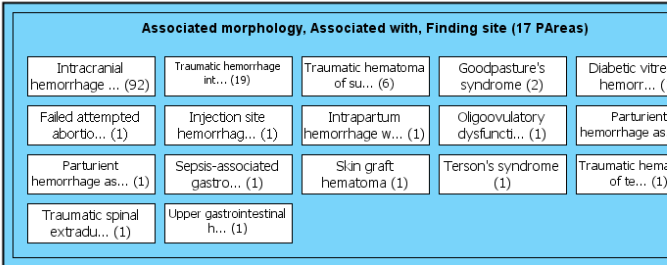
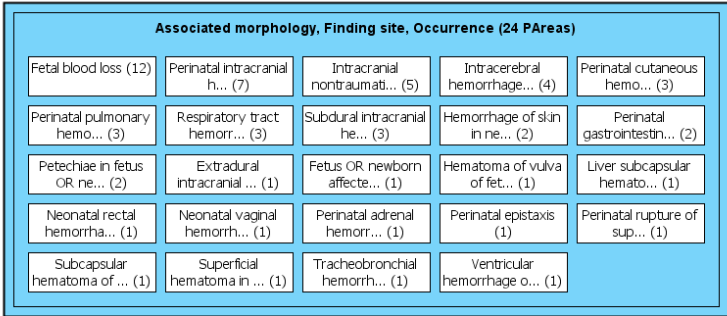
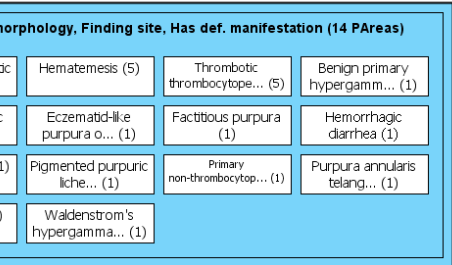
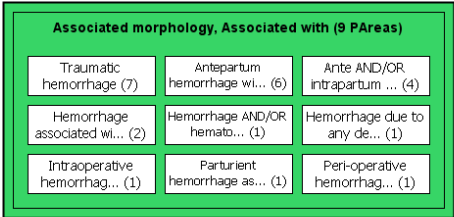
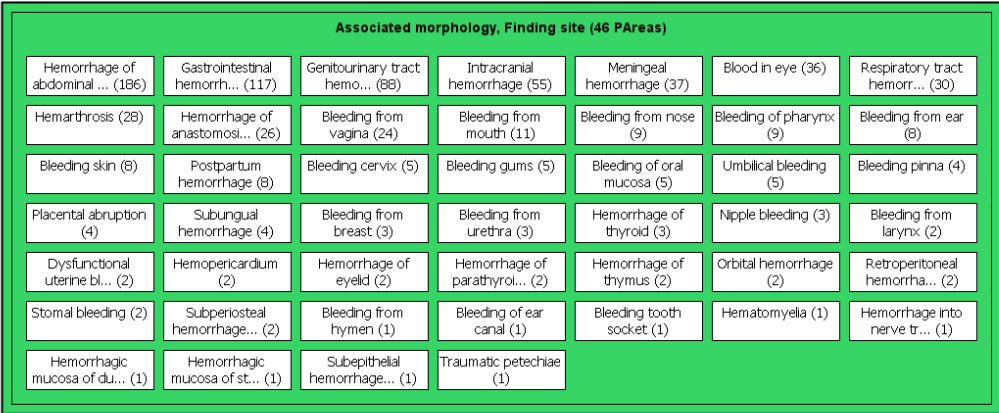
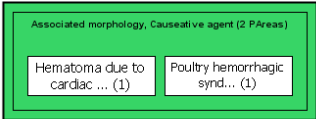
Area: Group of concepts with the same relationships

Partial-area: Hierarchically related concepts in an area





Summarization shows the "Big Picture" for hundreds of concepts



BLUSNO

- The **B**iomedical **L**ayout **U**tility for **SNOMED CT**
- A software tool for **creating, visualizing, and exploring** SNOMED CT partial-area taxonomy summarizations
- An interactive environment for viewing SNOMED CT through the lens of taxonomies
- Every summarizing element provides information about the underlying terminology
- Integrated hybrid text-diagram concept browser

Select an Abstraction Network

SNOMED CT Partial-area Taxonomy

1: Select a SNOMED CT Version

Available SNOMED CT Versions:

Jan 2013 International

Jan 2013 International

March 2013 US Extension

Jan 2012 International

July 2011 International

Jan 2011 International

July 2010 International

July 2009 International

July 2008 International

2: Select a SNOMED CT Hierarchy

 Body structure	 Clinical finding	 Pharmaceutical	 Event	 Linkage concept
 Observable entity	 Organism	 Pharmaceutical	 Physical force	 Physical object
 Procedure	 Qualifier value	 Record artifact	 Situation with explicit context	 Social context
 Special concept	 Specimen	 Staging and scales	 Substance	

NOTE: certain hierarchies do not have any relationships in the AREA paradigm. Therefore it is not possible to partition these hierarchies using the AREA and PARTIAL AREA paradigm. BLUSNO is Beta software and is provided AS-IS. If you encounter any bugs or issues please contact Christopher Ochs at cro3@njit.edu.

Open New
Concept-centric
Browser Window

BLUSNO includes a fully integrated concept-centric browser. To use this browser click on "Open New Concept-centric Browser Window" to the right.

Taxonomy Exploration Window

Jan 2013 International | Hierarchy: Specimen (specimen) □ □ □

Collapse All **Area Report** **Level Report** Areas: 22 | Partial-areas: 419 | Concepts: 1422 **Return to Root** **Save As Image** **Options** **Create Subtaxonomy** **Search**

Edit Abstraction Network **Explore Abstraction Network** **Text-Diagram Hybrid View**

∅

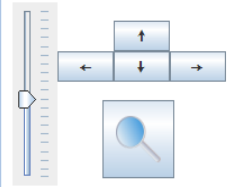
Specimen (29)

Topography (23 PAreas)

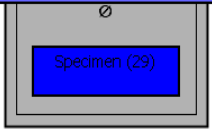
Specimen from trunk (128)	Specimen from head and n... (53)	Specimen from digestive ... (50)	Respiratory sample (36)	Soft tissue sample (19)
Musculoskeletal sample (15)	Cardiovascular sample (12)	Endocrine sample (9)	Bone marrow specimen (8)	White blood cell sample (8)
Dermatological sample (7)	Specimen from central ne... (7)	Lymph node sample (5)	Specimen from nerve (4)	Amnion cytologic materia... (2)
Erythrocyte specimen (2)	Fetus specimen (2)	Specimen from lower limb... (2)	Body parts for identific... (1)	Chorion cytologic materi... (1)
Ligament sample (1)	Specimen from trophoblas... (1)	Specimen from upper limb... (1)		

Substance (11 PAreas)

Body substance sample (56)	Fluid sample (45)	Blood specimen (25)	Food specimen (13)
Drug specimen (6)	Gaseous material specime... (4)	Nucleic acid specimen (3)	Microbial isolate specim... (2)
Fungal isolate specimen (1)	Mushroom specimen (1)	Plant specimen (1)	



Respiratory sample (specimen)



4 Concepts

(7)	Biopsy sample (4)
Sample (1)	Specimen obtained by lav... (1)

Topography (255 Concepts)

Specimen from trunk (128)	Specimen from head and n... (53)	Specimen from digestive ... (50)	Respiratory sample (36)	Soft tissue sample (19)
Musculoskeletal sample (15)	Cardiovascular sample (12)	Endocrine sample (9)	Bone marrow specimen (8)	White blood cell sample (8)
Dermatological sample (7)	Specimen from central ne... (7)	Lymph node sample (5)	Specimen from nerve (4)	Amnion cytologic materia... (2)
Erythrocyte specimen (2)	Fetus specimen (2)	Specimen from lower limb... (2)	Body parts for identific... (1)	Chorion cytologic materi... (1)
Ligament sample (1)	Specimen from trophoblas... (1)	Specimen from upper limb... (1)		

Substance (103 Concepts)

Body substance sample (56)	Fluid sample (45)	Blood specimen (25)	Food specimen (13)
Drug specimen (6)	Gaseous material specime... (4)	Nucleic acid specimen (3)	Microbial isolate specim... (2)
Fungal isolate specimen (1)	Mushroom specimen (1)	Plant specimen (1)	

Procedure, Topography (294 Concepts)

Swab from pelvis (33)	Soft tissue biopsy sampl... (24)	Swab from abdomen (21)	Upper respiratory swab s... (10)	Swab from lower limb (6)	Bone biopsy sample (3)	Lymph node aspirate (3)	Skin swab (3)
Ant biopsy sample (2)	Nerve biopsy sample (2)	Rectal scrape sample (2)	Specimen from adrenal gl... (2)	Specimen from bone marro... (2)	Specimen from bone marro... (2)	Specimen from eye region... (2)	Specimen from pleura obt... (2)
Thyroid fine needle aspi... (2)	Tracheal biopsy sample (2)	Breast direct smear samp... (1)	Bronchial brushings samp... (1)	Buccal smear sample (1)	Cartilage biopsy sample (1)	Cervical smear sample (1)	Corneal scraping sample (1)
Embryo biopsy sample (1)	Esophageal biopsy sample... (1)	Esophageal brushings sam... (1)	Gastric brushings sample... (1)	Gastrointestinal direct ... (1)	Ligament biopsy sample (1)	Liver direct smear sampl... (1)	Lung direct smear sample... (1)
Nasal smear	Oral swab (1)	Sigmoid colon	Slit skin smear (1)	Specimen from	Specimen from	Specimen from	Specimen from

Topogra

Tissue specimen from dig... (23)	Tissue specimen from gen... (15)	Joint fluid specimen (12)	Urolog samp
Tissue specimen from uri... (7)	Breast fluid sample (5)	Female genital fluid spe... (5)	Prod concept
Bile specimen (3)	Blood specimen obtained ... (3)	Body substance specimen ... (3)	Lymph r samp
Lacrimal fluid sample (2)	Pericardial fluid specim... (2)	Pleural fluid specimen (2)	Semi speci
Tissue specimen	Adipose tissue	Articular tissue	Bone

Partial Area Information For: Respiratory sample (specimen)

Partial Area Details Hierarchical View (Graphical)

Partial Area Name: *Respiratory sample (specimen)*
Root Concept ID: [258603007](#)
Total Concepts in Partial Area: 36
Total Primitive Concepts in Partial Area: 1
Total Parent Partial Areas: 1
Total Child Partial Areas: 21
Partial Area Relationships:
Specimen source topography (attribute)+

Partial-area Root Concept Parents

Root Parent Concept: *Specimen (specimen)* ([123038009](#))
Parent Partial-area: Specimen (specimen)
Parent Partial-area Relationships:

Concepts in Partial-area (Alphabetical)

Accessory sinus cytologic material (specimen) ([110904004](#))
Bronchial cytologic material (specimen) ([110912007](#))
Cytologic material from left main bronchus (specimen) ([110922001](#))
Cytologic material from right main bronchus (specimen) ([110924000](#))
Epiglottic cytologic material (specimen) ([110907006](#))
Laryngeal cytologic material (specimen) ([110908001](#))
Left lower lobe bronchus cytologic material (specimen) ([110923006](#))
Left pleural cytologic material (specimen) ([110917001](#))
Left upper lobe bronchus cytologic material (specimen) ([110918006](#))
Lower respiratory sample (specimen) ([258606004](#))

Child Partial-areas

Body fluid specimen obtained via chest tube (specimen) (1 concepts) ([447375004](#))
Specimen procedure (attribute)*
Specimen source topography (attribute)*
Specimen substance (attribute)*
Bronchial brushings sample (specimen) (1 concepts) ([309176002](#))
Specimen procedure (attribute)*
Specimen source topography (attribute)*
Laryngectomy sample (specimen) (1 concepts) ([309183009](#))

Partial Area Information For: Respiratory sample (specimen)

Partial Area Details

Hierarchical View (Graphical)

Partial-area Root (NOTE: Shortest path distance is used for calculation)

Respiratory sample

Children of Root

Lower respiratory sample Pleural cytologic materia... Specimen from pleura Upper respiratory sample

Grandchildren of Root Concept

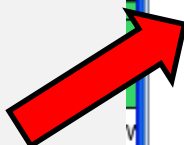
Left pleural cytologic ma... Lower respiratory tract c... Right pleural cytologic m... Specimen from bronchus Specimen from internal no... Specimen from larynx
Specimen from lung Specimen from nasal sinus... Specimen from throat Specimen from trachea Upper respiratory tract c...

Great-Grandchildren of Root Concept

Accessory sinus cytologic... Bronchial cytologic mater... Laryngeal cytologic mater... Lung cytologic material Pharyngeal cytologic mate... Specimen from nasal fossa...
Specimen from nasopharyng... Specimen from tonsil Specimen obtained by bron... Tracheal cytologic materi...

Great-Great-Grandchildren of Root Concept

Cytologic material from l... Cytologic material from r... Epiglottic cytologic mate... Left lower lobe bronchus ... Left upper lobe bronchus ... Nasopharyngeal cytologic ...
Right lower lobe bronchus... Right middle lobe bronchu... Right upper lobe bronchus... Vocal cord cytologic mate...



Subtaxonomies for Large Hierarchies

- Procedure and Clinical finding are the largest (and most important) hierarchies.
- Taxonomy summarizations can be created for these hierarchies
- Useful to look at subsets of large hierarchies instead of the whole hierarchy

Procedure Hierarchy Taxonomy

The screenshot displays a software interface for managing a procedure hierarchy taxonomy. At the top, the window title is "Jan 2013 International | Hierarchy: Procedure (procedure)". Below the title bar, there are several control elements:

- A "Collapse All" checkbox.
- Buttons for "Area Report", "Level Report", "Return to Root", "Save As Image", "Options", "Create Subtaxonomy", and "Search".
- Summary statistics: "Areas: 739 | Partial-areas: 10828 | Concepts: 53147".
- Navigation tabs: "Edit Abstraction Network", "Explore Abstraction Network", and "Text-Diagram Hybrid View".

The main area of the interface is dominated by a large, multi-level tree structure of procedure areas. Each node in the tree is represented by a small table or grid. The nodes are color-coded by level or category, with colors including green, blue, red, yellow, and cyan. On the left side, there is a vertical scrollbar and a set of navigation controls, including a magnifying glass icon and directional arrows. At the bottom of the interface, there is a long, horizontal list of small, individual procedure area nodes, each with its own small table representation.

Collapse All

Area Report

Level Report

Areas: 8 | Partial-areas: 1015 | Concepts: 18071

Return to Root

Save As Image

Options

Create Subtaxonomy

Edit Abstraction Network

Explore Abstraction Network

Text-Diagram Hybrid View

Area	Partial-Areas	Concepts
Area 1	Partial-Areas 1	Concepts 1
Area 2	Partial-Areas 2	Concepts 2
Area 3	Partial-Areas 3	Concepts 3
Area 4	Partial-Areas 4	Concepts 4
Area 5	Partial-Areas 5	Concepts 5
Area 6	Partial-Areas 6	Concepts 6
Area 7	Partial-Areas 7	Concepts 7
Area 8	Partial-Areas 8	Concepts 8

Concept ID	Concept Name	Parent Concept ID	Parent Concept Name	Relationship
100000000000000001	Procedure			
100000000000000002	Procedure site	100000000000000001	Procedure	is-a
100000000000000003	Procedure site - Direct	100000000000000002	Procedure site	is-a
100000000000000004	Procedure site - Indirect	100000000000000002	Procedure site	is-a
100000000000000005	Procedure morphology	100000000000000001	Procedure	is-a
100000000000000006	Procedure device	100000000000000001	Procedure	is-a
100000000000000007	Procedure method	100000000000000001	Procedure	is-a
100000000000000008	Procedure site - Direct	100000000000000003	Procedure site - Direct	is-a
100000000000000009	Procedure site - Indirect	100000000000000004	Procedure site - Indirect	is-a

Concept ID	Concept Name	Parent Concept ID	Parent Concept Name	Relationship
100000000000000010	Procedure site - Direct	100000000000000005	Procedure morphology	is-a
100000000000000011	Procedure site - Indirect	100000000000000006	Procedure device	is-a
100000000000000012	Procedure site - Direct	100000000000000007	Procedure method	is-a
100000000000000013	Procedure site - Indirect	100000000000000008	Procedure site - Direct	is-a
100000000000000014	Procedure site - Indirect	100000000000000009	Procedure site - Indirect	is-a

Create Subtaxonomy

Search

Show only areas in this hierarchy containing atleast one of the following relationships:

- Measurement method (attribute)
- Method (attribute)
- Priority (attribute)
- Procedure device (attribute)
- Procedure morphology (attribute)
- Procedure site (attribute)
- Procedure site - Direct (attribute)
- Procedure site - Indirect (attribute)
- Property (attribute)
- Recipient category (attribute)
- Revision status (attribute)
- Route of administration (attribute)
- Scale type (attribute)
- Surgical approach (attribute)
- Using access device (attribute)

Check All Uncheck All Display Hierarchy

Select a group and view all of its descendants.

Associated morphology (1 PArea)
Bleeding (30)

Associated morphology, Interprets (1 PArea)
Hematochezia (3)

Associated morphology, Causative agent (2 PAreas)	
Hematoma due to cardiac ... (1)	Poultry hemorrhagic synd... (1)

Associated morphology, Finding site (46 PAreas)						
Hemorrhage of abdominal ... (186)	Gastrointestinal hemorrh... (117)	Genitourinary tract hemo... (68)	Intracranial hemorrhage (55)	Meningeal hemorrhage (37)	Blood in eye (36)	Respiratory tract hemorrh... (30)
Hemarthrosis (28)	Hemorrhage of anastomosi... (26)	Bleeding from vagina (24)	Bleeding from mouth (11)	Bleeding from nose (9)	Bleeding of pharynx (9)	Bleeding from ear (8)
Bleeding skin (8)	Postpartum hemorrhage (8)	Bleeding cervix (5)	Bleeding gums (5)	Bleeding of oral mucosa (5)	Umbilical bleeding (5)	Bleeding pinna (4)
Placental abruption (4)	Subungual hemorrhage (4)	Bleeding from breast (3)	Bleeding from urethra (3)	Hemorrhage of thyroid (3)	Nipple bleeding (3)	Bleeding from larynx (2)
Dysfunctional uterine bl... (2)	Hemopericardium (2)	Hemorrhage of eyelid (2)	Hemorrhage of parathyroi... (2)	Hemorrhage of thymus (2)	Orbital hemorrhage (2)	Retropertoneal hemorrha... (2)
Stomal bleeding (2)	Subperiosteal hemorrhage... (2)	Bleeding from hymen (1)	Bleeding of ear canal (1)	Bleeding tooth socket (1)	Hematomyelia (1)	Hemorrhage into nerve tr... (1)
Hemorrhagic mucosa of du... (1)	Hemorrhagic mucosa of st... (1)	Subepithelial hemorrhage... (1)	Traumatic petechiae (1)			

Associated morphology, Associated with (9 PAreas)		
Traumatic hemorrhage (7)	Antepartum hemorrhage wi... (6)	Ante AND/OR intrapartum ... (4)
Hemorrhage associated wi... (2)	Hemorrhage AND/OR hemato... (1)	Hemorrhage due to any de... (1)
Intraoperative hemorrhag... (1)	Parturient hemorrhage as... (1)	Peri-operative hemorrhag... (1)

After, Associated morphology, Finding site (1 PArea)
Postoperative hemorrhage (1)

Associated morphology, Finding site, Has def. manifestation (14 PAreas)			
Vascular hemostatic dise... (7)	Hematemesis (5)	Thrombotic thrombocytopen... (5)	Benign primary hypergamm... (1)
Cryoglobulinemic purpura... (1)	Eczemato-like purpura o... (1)	Factitious purpura (1)	Hemorrhagic diarrhea (1)
Itching purpura (1)	Pigmented purpuric liche... (1)	Primary non-thrombocytopen... (1)	Purpura annularis telang... (1)
Purpuric rash (1)	Waldenstrom's hypergamma... (1)		

Associated morphology, Finding site, Occurrence (24 PAreas)				
Fetal blood loss (12)	Perinatal intracranial h... (7)	Intracranial nontraumat... (5)	Intracerebral hemorrhage... (4)	Perinatal cutaneous hemo... (3)
Perinatal pulmonary hemo... (3)	Respiratory tract hemorr... (3)	Subdural intracranial he... (3)	Hemorrhage of skin in ne... (2)	Perinatal gastrointest... (2)
Petechiae in fetus OR ne... (2)	Extradural intracranial ... (1)	Fetus OR newborn affecte... (1)	Hematoma of vulva of fet... (1)	Liver subcapsular hemato... (1)
Neonatal rectal hemorrha... (1)	Neonatal vaginal hemorrh... (1)	Perinatal adrenal hemorr... (1)	Perinatal epistaxis (1)	Perinatal rupture of sup... (1)
Subcapsular hematoma of ... (1)	Superficial hematoma in ... (1)	Tracheobronchial hemorrh... (1)	Ventricular hemorrhage o... (1)	

Associated morphology, Associated with, Finding site (17 PAreas)				
Intracranial hemorrhage ... (92)	Traumatic hemorrhage int... (19)	Traumatic hematoma of su... (6)	Goodpasture's syndrome (2)	Diabetic vitreous hemorr... (1)
Failed attempted abortio... (1)	Injection site hemorrhag... (1)	Intrapartum hemorrhage w... (1)	Oligovulatory dysfunc... (1)	Parturient hemorrhage as... (1)
Parturient hemorrhage as... (1)	Sepsis-associated gastro... (1)	Skin graft hematoma (1)	Terson's syndrome (1)	Traumatic hematoma of te... (1)
Traumatic spinal extradu... (1)	Upper gastrointestinal h... (1)			

Associated morphology, Causative agent, Finding site, Has def. manifestation (2 PAreas)	
Dermite ore of Favre (1)	Stasis purpura (1)

Associated morphology, Finding informer, Finding method, Finding site (6 PAreas)		
On examination - bleedin... (1)	On examination - epistax... (1)	On examination - mouth ... (1)
On examination - retinal... (1)	On examination - subconj... (1)	On examination - vitreou... (1)

Associated morphology, Finding site, Has def. manifestation, Occurrence (6 PAreas)		
Capillary fragility abno... (1)	Neonatal hematemesis (1)	Neonatal hematemesis (1)
Perinatal hematemesis (1)	Perinatal purpura (1)	Perinatal purpura (1)

Associated morphology, Causative agent, Finding site, Pathological process (8 PAreas)		
Bovine petechial fever (1)	Hemorrhagic dysentery (1)	Hemorrhagic nephroso-nep... (1)
Hemorrhagic smallpox (1)	Hemorrhagic varicella pn... (1)	Lamb dysentery (1)
Porcine intestinal adeno... (1)	Waterhouse-Friderichsen ... (1)	

Associated morphology, Due to, Finding site, Occurrence (6 PAreas)		
Cerebral hemorrhage due ... (1)	Cerebral hemorrhage due ... (1)	Intracranial subarachnoi... (1)
Intraventricular hemorrh... (1)	Local intracranial subdu... (1)	Local intracranial subdu... (1)

Associated morphology, Finding informer, Finding method, Finding site, Interprets (1 PArea)
On examination - bloodst... (3)

After, Associated morphology, Due to, Finding site, Occurrence (1 PArea)
Slipped umbilical ligatu... (1)

Associated morphology, Clinical course, Finding site, Has def. manifestation, Occurrence (3 PAreas)	
Acute idiopathic thrombo... (1)	Chronic idiopathic throm... (1)
Chronic idiopathic throm... (1)	

Associated morphology, Causative agent, Clinical course, Finding site, Pathological process (3 PAreas)	
Acute hemorrhagic conjun... (3)	Chronic idiopathic colit... (1)
Acute hemorrhagic colit... (1)	

Associated morphology, Due to, Finding site, Has def. manifestation, Pathological process (1 PArea)
Henoch-Schönlein purpura... (1)

After, Associated morphology, Clinical course, Finding site, Has def. manifestation, Pathological process (1 PArea)
Acute hemorrhagic leukoc... (1)

After, Associated morphology, Due to, Finding site, Has def. manifestation, Pathological process (1 PArea)
Postinfective Henoch-Sch... (1)

Associated morphology, Clinical course, Due to, Finding site, Has def. manifestation, Pathological process (1 PArea)
Acute hemorrhagic edema ... (1)

BLUSNO Usage Example

- A medical doctor is treating a boxer who has a recurring hematoma of the pinna due to many hits to the ear
- He or she uses an EHR backed by SNOMED CT to report the patient's **chronic hematoma of the pinna** but cannot find the diagnosis under **Hematoma of pinna**



Finding Pinna Diagnoses

14 | Concepts: 99440

Return to Root

Save As Image

Options

Create Subtaxonomy

Search

Anomaly of placenta (40)	Urinary fistula (40)	Hepatic fibrosis (39)	Liver regener... (38)		
Chondrocalcinosis (24)	Demyelinating disease of... (24)	Dystrophia unguium (24)	Retained p... of con...		
Mucosal ulcer (15)	Rupture of intestine (15)	Vaginal lesion (15)	Abnormalit shap...		
Extravasation of urine (10)	Glass in trunk (10)	Lesion of breast (10)	Metal foreign in tr...		
Lesion of female perineu... (8)	Neurological lesion (8)	Peritoneal fibrosis (8)	Postpartum hemorrhage (8)	Scleral staphylococci (8)	Trachionis
Cranial somatic dysfunct... (6)	Deformity of orbit prope... (6)	Disorder of filtering bl... (6)	Displacement of cervical... (6)	Enlargement of tonsil or... (6)	Exostosis o
Corneal scar (5)	Degenerative disorders o... (5)	Enamel hypoplasia (5)	Fibrosis of bile duct (5)	Fibrous dysplasia of bon... (5)	Fistula of ga (5)
Atrophy of salivary glan... (4)	Bleeding pinna (4)	Cholangiectasis (4)	Degenerative disorder of... (4)	Edema of pharynx (4)	Female pe bruise
Placental abruption (4)	Rupture of bladder (4)	Rupture of kidney (4)	Rupture of ovary (4)	Scar of face (4)	Sebace hyperpla

Concept Area Partial Area

Search Anywhere in Name

pinna

Search Results

- Acute infection of pinna (disorder)
- Bleeding pinna (finding)**
- Chronic perichondritis of pinna (disorder)
- Deformity of pinna (disorder)
- Infection of pierced pinna (disorder)
- Lesion of pinna (finding)

Investigating Bleeding pinna

Partial Area Information For: Bleeding pinna (finding)

Partial Area Details | Hierarchical View (Graphical)

Partial Area Name: *Bleeding pinna (finding)*
Root Concept ID: [300101002](#)
Total Concepts in Partial Area: 4
Total Primitive Concepts in Partial Area: 2
Total Parent Partial Areas: 2
Total Child Partial Areas: 0
Partial Area Relationships:
Associated morphology (attribute)*
Finding site (attribute)*

Partial-area Root Concept Parents

Root Parent Concept: *Bleeding (finding)* ([131148009](#))
Parent Partial-area: Bleeding (finding)
Parent Partial-area Relationships:
Associated morphology (attribute)+

Root Parent Concept: *Pinna finding (finding)* ([247236008](#))
Parent Partial-area: Finding by site (finding)
Parent Partial-area Relationships:
Finding site (attribute)+

Concepts in Partial-area (Alphabetical)

Acute hematoma of pinna (disorder) [primitive] ([302906000](#))
Bleeding pinna (finding) ([300101002](#))
Hematoma of pinna (disorder) ([88050005](#))
Subchondral hematoma of pinna (disorder) [primitive] ([446563000](#))

Partial Area Details | Hierarchical View (Graphical)

Partial-area Root (NOTE: Shortest path dista

Bleeding pinna

Children of Root

Hematoma of pinna ←

Grandchildren of Root Concept

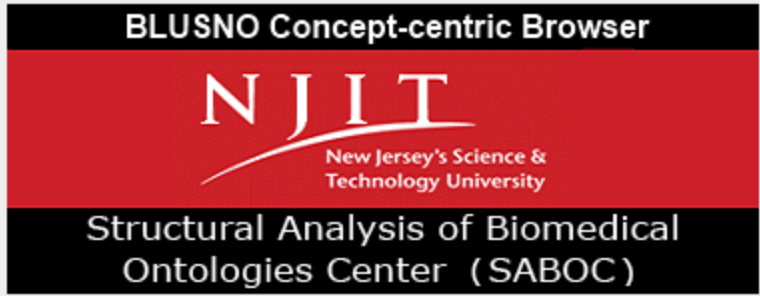
Acute hematoma of pinna Subchondral hematoma of p...

Concept Browser

The screenshot displays the BLUSNO Concept-centric Browser interface. The top left features the NJIT logo and the center's name. The main content area is divided into several panels:

- PARENTS (5):** Lists parent concepts such as "Bleeding from ear (disorder) (26322001)", "Bleeding pinna (finding) (300101002)", "Disorder of pinna (disorder) (41663005)", "Hematoma (disorder) (385494008)", and "Mass of ear structure (finding) (300850006)".
- FOCUS CONCEPT:** Displays the selected concept: "Hematoma of pinna (disorder) 88050005".
- CHILDREN (2):** Lists child concepts: "Acute hematoma of pinna (disorder) [primitive] (302906000)" and "Subchondral hematoma of pinna (disorder) [primitive] (446563000)".
- SYNONYMS (5):** Lists synonyms like "Hematoma of pinna", "Hematoma of auricle", "Haematoma of pinna", "Haematoma of auricle", and "Hematoma of pinna (disorder)".
- PARTIAL-AREA DETAILS:** Shows a hierarchy of clinical findings with associated areas and partial-areas. A red arrow points to the "Details" and "View" buttons for "Bleeding from ear (disorder)".
- CONCEPT RELATIONSHIPS (5) and SIBLINGS (87):** Lists relationships such as "Severity (attribute) => Severities (qualifier value)", "Episodicity (attribute) => Episodicities (qualifier value)", "Clinical course (attribute) => Courses (qualifier value)", "Associated morphology (attribute) => Hematoma (morphologic abnormality)", and "Finding site (attribute) => Pinna structure (body structure)".

Navigation buttons include "Back", "Root", and "Forward". A search bar is located in the top right corner.



Using SNOMED version: Jan 2013 International

- SYNONYMS (5)
- Hematoma of pinna
 - Hematoma of auricle
 - Haematoma of pinna
 - Haematoma of auricle
 - Hematoma of pinna (disorder)

PARTIAL-AREA DETAILS

Hierarchy: Clinical finding (finding)
Area:

- Associated morphology
- Finding site

Partial-areas:

Bleeding from ear (disorder) 8 concepts	Loading...	View
Bleeding pinna (finding) 4 concepts	Details	View
Mass of body structure (finding) 7010 concepts	Details	View

Partial Area Information For: Bleeding from ear (disorder)

Partial Area Details | Hierarchical View (Graphical)

Partial Area Name: *Bleeding from ear (disorder)*

Root Concept ID: [26322001](#)

Total Concepts in Partial Area: 8

Total Primitive Concepts in Partial Area: 6

Total Parent Partial Areas: 2

Total Child Partial Areas: 0

Partial Area Relationships:

- Associated morphology (attribute)*
- Finding site (attribute)*

Partial-area Root Concept Parents

Root Parent Concept: *Bleeding (finding)* ([131148009](#))

Parent Partial-area: Bleeding (finding)

Parent Partial-area Relationships:

- Associated morphology (attribute)+

Root Parent Concept: *Disorder of ear (disorder)* ([25906001](#))

Concepts in Partial-area (Alphabetical)

- Acute hematoma of pinna (disorder) [primitive] ([302906000](#))
- Bleeding from ear (disorder) ([26322001](#))
- Hematoma of pinna (disorder) ([88050005](#))
- Hematotympanum (disorder) [primitive] ([111536009](#))
- Injury of head with otorrhagia (disorder) [primitive] ([95848000](#))
- Otitis media with effusion - sanguinous (disorder) [primitive] ([232256002](#))
- Subchondral hematoma of pinna (disorder) [primitive] ([446563000](#))

Child Partial-areas

Searching for Concepts

artial-areas: 10614 | Concepts: 99440

Return to Root

Save As Image

Options

Create Subtaxonomy

Search

View

Associated morphology, Finding site (1147 PAreas)

Swelling of body structu... (141)	Distention of blood vess... (131)	Acquired musculoskeletal... (121)	Gastrointestinal hemorrh... (117)	F		
Respiratory obstruction (47)	Foreign body in genitour... (46)	Bile duct proliferation (45)	Ulcer of lower extremity... (43)	Tea		
Hemorrhage of anastomosi... (26)	Inflammation of vulva (26)	Nonallopathic lesion of ... (26)	Pleural effusion (26)	Ulcer of mouth (26)	Prolapse of female genit... (25)	S
Lesion of vulva (16)	Malposition of uterus (16)	Ruptured membranes (16)	Acquired deformity of he... (15)	Developmental anomaly of... (15)	Dissociated strabismus (15)	Hy
Stenosis of lacrimal sys... (11)	Aphthous ulceration of s... (10)	Bone marrow hyperplasia (10)	Bronchiectasis (10)	Cerebral herniation (10)	Corneal deformity (10)	Dy
Deformity of pinna (8)	Discharge from nipple (8)	Edema of larynx (8)	Fibrosis of mediastinum (8)	Finding of nasal deformi... (8)	Fissure of nipple (8)	H

Concept Area Partial Area

Search Anywhere in Name

hematoma of pinna

Search Results

Acute hematoma of pinna (disorder) {Acute he

Acute hematoma of pinna (disorder) {Acute he

Chronic hematoma of pinna {Cauliflower ear (

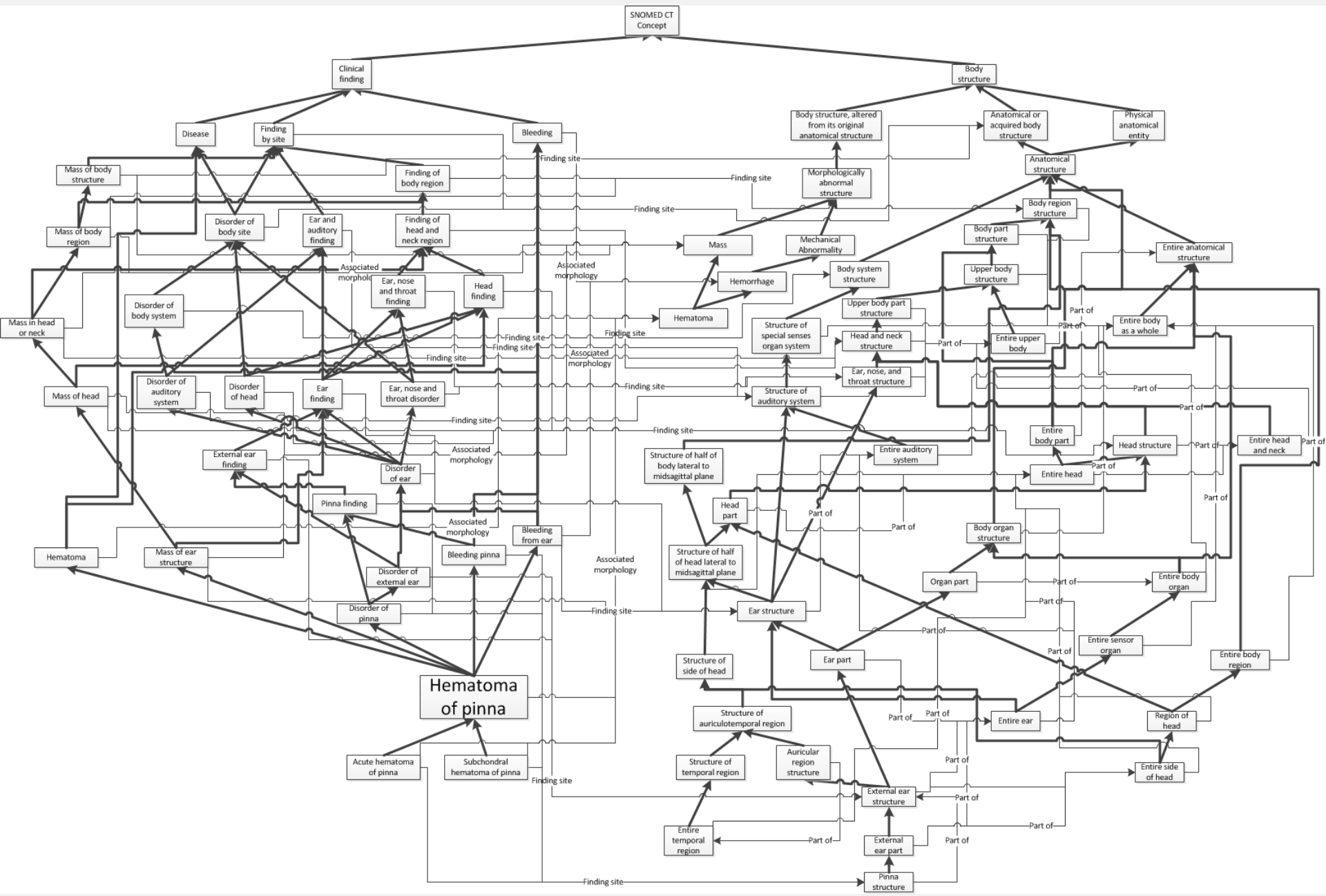
Chronic hematoma of pinna {Cauliflower ear (

Chronic hematoma of pinna {Cauliflower ear (

Deformity/hematoma of pinna {Deformity/hem

Taxonomies for Quality Assurance

- Nearly eight years of research has shown taxonomies support QA of SNOMED CT.
- BLUSNO supports QA by enabling identification of groups of concepts more likely to have errors.
 - Small partial-areas
 - Concepts that overlap between two or more partial-areas



Chronic hematoma of pinna?

- Exists in SNOMED CT but as a synonym for Cauliflower ear
- Uncovered using the taxonomy when reviewing SNOMED CT's bleeding concepts
- Hematoma of pinna is an overlapping concept in small groups

Corneal scar (5)	Degenerative disorders o... (5)
Atrophy of salivary gland... (4)	Bleeding pinna (4)
Placental abruption (4)	Rupture of bladder (4)

Cholesteatoma (11)	Lumbar c (1)
Bleeding from ear (8)	Bleeding
Nonallopathic lesion of ... (7)	Patho resorptic

Identifying overlapping concepts

Hemorrhage of abdom... (39)	Intracranial hemorrh... (32)	Genitourinary tract ... (30)	Gastrointestinal hem... (22)	Respiratory tract he... (14)	Meningeal hemorrhage... (14)	Bleeding from mouth (6)	Bleeding skin (5)	Bleeding from ear (5)
Postpartum hemorrhag... (4)	Umbilical bleeding (4)	Bleeding gums (3)	Bleeding cervix (3)	Bleeding of pharynx (2)	Subungual hemorrhage... (2)	Bleeding from nose (2)	Bleeding of oral muc... (1)	Bleeding pinna (1)
Hematoma of kidney (5)	Bladder hemorrhage (4)	Placenta previa with... (3)	Third stage hemorrha... (3)	Hematoma of uterus (3)	Vaginal hematoma (2)	Hematometra (2)	Hemorrhage of prosta... (2)	Hematoma of seminal ... (2)
Hemorrhage of kidney... (2)	Hematoma of fallopia... (1)	Non-menstrual vagina... (1)	Hemorrhage from uret... (1)	Concealed accidental... (1)	Hematoma of prostate... (1)	Hematoma of bladder ... (1)	Partial placenta pre... (1)	Couvellaire uterus (1)
Hematoma of vas defe... (1)	Hematoma of vagina d... (1)	Marginal placenta pr... (1)	Hemorrhage of semina... (1)	Hemorrhage of vas de... (1)	Intervillous hemorrh... (1)	Hemorrhage into ovar... (1)	Hematoma of ureter (1)	Hematoma of broad li... (1)
Hemorrhage of fallop... (1)	Marginal placental h... (1)	Mixed accidental hem... (1)	Transplacental hemor... (1)	Gastric hemorrhage (18)	Lower gastrointestin... (16)	Duodenal hemorrhage (13)	Hematoma of anus (2)	Hematoma of ileum (1)
Hemorrhagic duodenit... (1)	Rectal hematoma (1)	Stomach hematoma (1)	Gastric ulcer with h... (1)	Hemorrhagic gastroen... (1)	Duodenal hematoma (1)	Acute gastric ulcer ... (1)	Small intestinal hem... (1)	Chronic lower gastro... (1)
Canine hemorrhagic g... (1)	Hematoma of jejunum (1)	Gastric ulcer with h... (1)	Gastric ulcer with h... (1)	Colonic hematoma (1)	Cecal hematoma (1)	Appendix hematoma (1)	Acute gastric ulcer ... (1)	Duodenal ulcer with ... (1)
Acute gastric ulcer ... (1)	Mallory-Weiss syndro... (1)	Peripancreatic hemato... (1)	Subarachnoid intracr... (6)	Hemorrhage of intrac... (4)	Subdural intracrania... (2)	Subdural intracrania... (2)	Epidural intracrania... (2)	Epidural intracrania... (2)
Cerebromeningeal hem... (1)	Non-traumatic intrac... (1)	Subpial intracranial... (1)	Hemorrhage in optic ... (1)	Non-traumatic extrad... (1)	Delayed AND/OR secon... (3)	Atonic postpartum he... (1)	Hematoma of prepuce (1)	Gastrointestinal ana... (1)
Esophageal anastomot... (1)	Epistaxis (6)	Pharyngeal hemorrhag... (6)	Bronchial anastomot... (1)	Nasal septal hematom... (1)	Vocal cord hematoma (1)	Hemorrhage from aden... (1)	Hematoma of gingivae... (1)	Hematoma of intraora... (1)
Hemorrhagic stomatit... (1)	Hematoma of buccal m... (1)	Subungual hematoma, ... (1)	Subungual hematoma, ... (1)	Hematoma of pinna (3)				

Domain Experts Weight In

- *Chronic hematoma of pinna* should not be a synonym of Cauliflower ear
 - Cauliflower ear is a physical deformity, potentially caused by a hematoma of the pinna
 - Not a hematoma of the pinna, which is why it is (correctly) not hierarchically related to hematoma of pinna
- Proposed solution: Create a *Chronic hematoma of pinna* concept and relate Cauliflower ear to it

Future Work

- Implement new types of summarizations for SNOMED CT
 - Hierarchies without relationships
 - Large partial-areas
- Enhanced functionality
 - Provide more information about the taxonomy
 - Highlight concepts more likely to contain errors
- Public release
 - Access is currently by request or invite

Conclusions

- Partial-area taxonomies summarize the content and structure of SNOMED CT.
- BLUSNO is a tool for creating, visualizing, and exploring partial-area taxonomies
- BLUSNO can support QA of SNOMED CT

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