

Using Snoflake to access SNOMED CT

An Introduction to SNOMED CT

SNOMED CT – the Systematized Nomenclature of Medicine Clinical Terms - is a comprehensive and precise clinical reference terminology designed to make healthcare information useable and accessible. Global in scope SNOMED CT provides a **common language** of great depth that enables a consistent way of capturing, sharing and aggregating health data across clinical specialties and sites of care.

The product is a result of a collaboration between SNOMED International, a division of the College of American Pathologists, and the National Health Service. SNOMED CT brings together the content and structure of SNOMED RT V1.0 with the NHS Clinical Terms Version 3 (Read Codes or CTV3). SNOMED CT delivers unmatched content and expressivity for clinical documentation and reporting, and provides a means of medical communication that spans languages, clinical specialties and geographic borders.

SNOMED CT contains concepts linked to clinical knowledge to enable unambiguous recording of data. The terminology's content also includes terms or synonyms relating to clinical concepts, each with their own unique identifier. Links, or semantic relationships, between clinical concepts provide formal definitions. The SNOMED CT structure makes possible interoperability across software applications that relate to diseases, treatments, etiologies, clinical findings, therapies, procedures and outcomes. The breadth and depth of the terminology, as well as its computer-readable hierarchies, enable faster, reliable and consistent retrieval of robust clinical information. Concepts included in SNOMED CT with multiple levels of granularity including those illustrated below...

Body structure
Context-dependent category
Event
Environments/location
Finding
Linkage concept
Observable entity
Organism
Physical force
Physical object
Procedure
Product
Qualifier value
Record artefact
Social context
Special concept
Specimen
Staging and scales
Substance

This depth allows health care organisations to use their clinical information to their advantage. Users can record data just once, at the level of specificity they choose, then mine it repeatedly for decision support, statistical reporting, outcomes measurement, treatment guidelines and cost analysis. Cases can be retrieved based on numerous different criteria, including clinical and laboratory findings, causative agents, anatomical structure and therapeutic procedures.

SNOMED CT offers several structural advantages over Read Codes. A critical improvement for clinical decision support is the capacity to allow any coded disorder to 'belong to' more than one class of disorder. For example, in Read Version 2, "bacterial meningitis" is classed as an "inflammatory disease of the central nervous system", but due to technical constraints within the Read Version 2 coding scheme, it cannot also be classed as a "bacterial disease". For clinical decisions, the fact that "bacterial meningitis" is, in reality, both a nervous system disease and a bacterial disease cannot be ignored.

The 300,000+ concepts available when coding using SNOMED CT not only offer the facility to provide greater detail about a patient than was present in previous coding schemes, but also allow for additional context information to be coded and associated with the patient. For example, if a patient reports a family history of asthma, current clinical systems use varying methods to record this information. Some systems have the context of "family history" embedded into their structure and the *asthma* code is selected and added to this field; some use a specific code of *family history of asthma*; while others apply the context of *family history* to asthma using free text. Multiple methods of representing identical patient information, in particular free text, present immense challenges for clinical decision support.

A very important aspect of SNOMED CT is that its applicability is almost limitless. Clinicians and researchers can mine health information in ways that until the advent of SNOMED CT were not possible. SNOMED CT works through implementation in software applications, representing clinically relevant

information in a reliable, reproducible manner is a natural and valid solution for a wide range of applications, some of which are listed below...

SNOMED CT can be seamlessly integrated with existing systems and although comprehensive on its own, it also cross-maps to other widely used legacy medical classifications, such as ICD-9-CM, ICD-O3, ICD-10, Laboratory LOINC and OPCS-4, making it easier to avoid duplicate data capture. In addition, SNOMED CT is aligned with numerous key health care standards such as HL7, DICOM, ANSI and ISO.

SNOMED CT also provides a framework to manage language dialects, clinically relevant subsets, qualifiers and extensions, such as the US and UK drug extensions of proprietary drug concepts and terms unique to these particular localities. This allows users to take advantage of its broad coverage while integrating their own specific codes, leading to easier adaptation to local needs.

The nature of SNOMED CT has, however, some practical problems regarding its use.

1. Size. The English language version used by the NHS contains 400,000 concepts, around 1 million terms and 1.6 million relationships.
2. Complexity. If SNOMED CT concept relationships followed the simple hierarchical parent-child model, where all concepts have a single parent and each parent can have multiple children, there would not be a problem, because its concepts could be logically envisaged using an Explorer. Although many SNOMED CT concept relationships are of the parent-child type, some are poly-hierarchical in that a concept may have multiple parents and multiple children.

Because of this property, an alternative visualisation model was required, and the **Snoflake Browser** was specifically developed to provide the solution.

Electronic medical records
 Problem lists and disease templates
 Physician order entry for laboratory
 Imaging and other investigations
 Public health reporting
 Electronic prescribing
 3-D image labelling and auto indexing
 Telemedicine
 Literature encoding
 Laboratory information systems
 Data warehousing
 Genetic databases
 Therapeutic decision support
 Cancer registry reporting
 Case report forms for clinical research
 Emergency room charting

The Snoflake Browser

Registration

Snoflake is an online SNOMED CT Browser, with support for SNOMED RT and ICD10 codes.

Snoflake uses a variety of techniques to find, sort and retrieve codes, including a multi parent/child relationship viewer, to make it easier to traverse SNOMED CT relationships.

As a first-time user of Snoflake, you will be required to register.

This is done by completing and submitting the simple [registration form](#).

On submission of the completed form an email containing login credentials will be dispatched immediately.

The screenshot shows the registration form for the Snoflake Browser. The form is titled "Register" and includes the following fields and options:

- Username: "Please enter a username (up to 20 characters) *"
- Email: "Email address *"
- Organization: "What is the name of your organisation?"
- Source: "How did you find this website?" (dropdown menu)
- Password: "Password *"
- Confirm Password: "Confirm password *"
- Full Name: "What is your full name? *"
- Residence: "What is your current country of Residence? * -Please Select:" (dropdown menu)
- Phone Number: "What is your phone number?"
- Terms: "I have read and agree to the terms & conditions and IHTSDO sub-license agreement *"
- Newsletter: "Keep me informed about SNOMED related news, products and services from Dataline Software." (checkbox)

At the bottom of the form is a "Register" button. Below the form, there are social media sharing options for Facebook, Twitter, LinkedIn, Blogger, WordPress, Google+, and Email. The footer contains copyright information for Dataline Software Ltd (2009-2013) and contact details.

The Search/Browse opening screen

The left hand side contains the Snoflake Search mechanism which enables a user to locate a required concept.

The right hand frame displays both the detail of a chosen concept, and Snoflake, the multi-parent, multi-child viewer.

The screenshot shows the Snoflake Browser interface. On the left, there is a search bar and several filters: 'suffix 0', 'subset 0 0', 'favourite 0 0', and 'extensions 0'. Below these is an 'add to favourite' button. The main content area displays the details for SNOMED CT Concept 138875005 (SNOMED RT+CTV3). The concept is highlighted in green. Below the concept name, there is a list of 19 associated concepts, each with a red arrow pointing up to the parent concept and a grey arrow pointing down to the child concept. The associated concepts include: Social context (social concept) [48176007], Procedure (procedure) [71388002], Linkage concept (linkage concept) [106237007], Body structure (body structure) [123037004], Specimen (specimen) [123038009], Situation with explicit context (situation) [243796009], Staging and scales (staging scale) [254291000], Environment or geographical location (environment / location) [308916002], Observable entity (observable entity) [363787002], Pharmaceutical / biologic product (product) [373873005], Record artifact (record artifact) [419891008], Physical force (physical force) [78621006], Substance (substance) [105590001], Physical object (physical object) [260787004], Event (event) [272379006], Qualifier value (qualifier value) [362981000], Special concept (special concept) [370115009], Clinical finding (finding) [404684003], and Organism (organism) [410607006]. At the bottom of the list, it says '[19 associated concepts]'. The footer contains copyright information for Dataline Software Ltd (2009-2014), contact details, and a list of links: Home, What is Snomed?, The Snoflake Browser, Snomobile for iPhone, SnAPI, Downloads & Links, Terms and Conditions, and Contact. The Dataline logo is also present in the bottom right corner.

The relationships between the parent and its children are represented by the light grey lines and the arrow preceding each concept label, red up for parent and grey down for child concepts.

Whenever Snoflake is opened the default root, displayed in green text for clarity, is the SNOMED CT Concept and its 19 child concept types – e.g. Procedure, Clinical finding, Organism, and so on.

Note: In some cases when searching, the SNOMED Parent can have a large number of child relationships and for clarity the number of these displayed is controlled by the application. If there are more children a clickable [Next](#) button is displayed in the bottom RH corner of the frame.

If this is clicked the user is taken to the next page of relationships where another [Next](#) button is displayed if more child options are available, and a [Previous](#) button provided to return the user to the previous view.

Navigation

The right hand frame provides a useful navigation tool. If one of the associated concept labels is clicked, the screen redraws to display that particular concept as the root and its child and parent concepts mapped and displayed complete with the appropriate red (parent) and grey (child) arrows.

The screenshot shows the Snoflake Browser interface. On the left, a search bar contains the term 'larynx'. Below it are buttons for 'suffix', 'subset', 'favourite', and 'extensions', each with a '0' count. A table lists search results with columns for 'Code' and 'Description'. On the right, a concept map is displayed for the selected concept: 'SNOMED CT Concept (SNOMED RT+CTV3) [138875005]'. The map shows the selected concept at the center, with arrows pointing to its parent and child concepts. The parent concepts are 'Social context (social concept) [48176007]' and 'Procedure (procedure) [71388002]'. The child concepts include 'Physical force (physical force) [78621006]', 'Substance (substance) [105590001]', 'Linkage concept (linkage concept) [106237007]', 'Body structure (body structure) [123037004]', 'Specimen (specimen) [123038009]', 'Situation with explicit context (situation) [243796009]', 'Staging and scales (staging scale) [254291000]', 'Physical object (physical object) [260787004]', 'Event (event) [272379006]', 'Environment or geographical location (environment / location) [308916002]', 'Qualifier value (qualifier value) [362981000]', 'Observable entity (observable entity) [363787002]', 'Special concept (special concept) [370115009]', 'Pharmaceutical / biologic product (product) [373873005]', 'Clinical finding (finding) [404684003]', 'Organism (organism) [410607006]', and 'Record artifact (record artifact) [419891008]'. The interface also includes a footer with copyright information and a dataline logo.

In the example above the term **Larynx** has been entered causing the list of concepts to be displayed below. The first concept has been clicked and has become the root in the RH frame and displayed in green text at centre screen and its Parent and Child concepts, two each in this particular case, are displayed with the appropriate arrows.

Finding a Snomed CT Concept

In the left hand frame of the screen you will find the Keyword Search mechanism.

For example, when the term **Larynx** is typed into the keywords field a list of concepts containing the term larynx is displayed as illustrated right:

Note: Depending on the search mode (see below) multiple keywords can be entered to reduce or increase the result set. The number of items listed will depend upon the return number selected (indicated on the specified button). The results will begin to appear as you type into the search box & words are recognised by the system.

As part of the v4.0 update there are now several more filter & search options available as well as some that are recognisable from previous versions of Snoflake:

Search field: Enter one or more terms, e.g. Larynx, on which to search.

Increase search box: The small icon in the top RH corner of the Search field is used to increase the size of the search field. When text input is complete, click the green tick to resume normal size and perform search.

Search icon: Click to search. Note that the application will automatically begin searching as the search text is being input.

Search mode:

Snippet (**sni**) will match concepts that match all the search terms entered. This means the more terms input, the smaller the result set.

Sentence (**sen**) will match concepts that contain some or all the words supplied, delivering an expanding result set as input grows.

Search type:

Full word search (**wor**) or prefix search (**pre**).

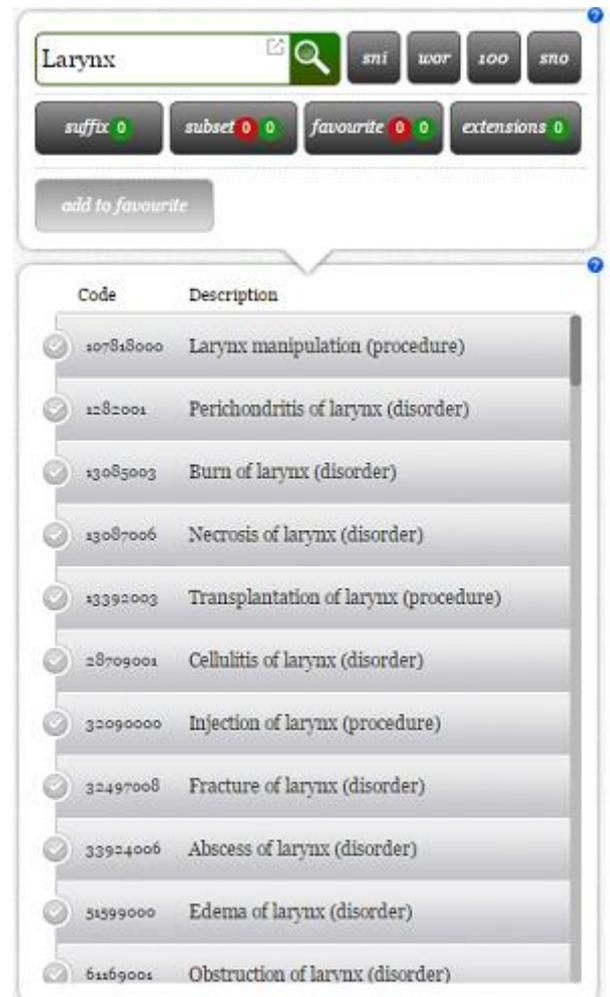
Results:

Maximum number of results to return.

Snomed or ICD10:

Choose which code-set to search on, Snomed CT (**sno**) or ICD10 (**icd**).

suffix filter: Include single or multiple suffixes in search.



subset

Include or exclude single or multiple subset filters in search.

favourite

Include or exclude single or multiple favourite filters in search. The specific concepts in a favourite can also be viewed.

UK Extensions

Include/exclude UK extensions.

add to favourite

Will become highlighted when green tick is clicked on a concept in the search results list (per concept). When the **add to favourite** button is clicked, an existing favourite folder can be selected or a new one created. In either case selected (ticked) concepts can be saved.

The Search Results

Once you have typed search words then a list of concepts will begin to appear, this list will change as you type more words or prefixes.

The result list normally has 3 columns:

Tick This is used to indicate a concept that you wish to save in a favourite folder.

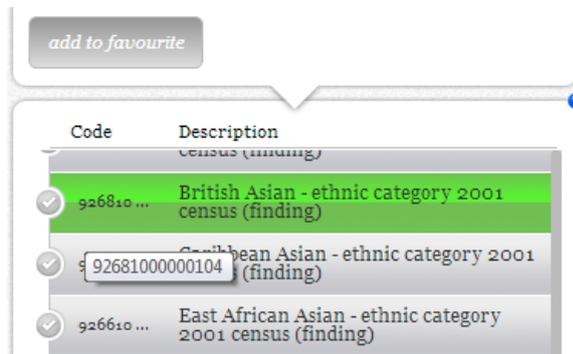
Code (ID): Some codes are longer than the column width and are shortened. The full length ID can be displayed (see upper screenshot) by moving the cursor over the concept code column.

Description: This is the text description of concept. Click on this element to display the concept and its associated concepts in the RH pane.

For this example, see right, the concept selected is 107828000 Larynx manipulation (procedure).

As described above, to view a concept description move the cursor over the relevant results row, it highlights in green and the description is displayed (see right). When clicked, the highlighted concept is displayed in the right hand frame of the Snoflake browser.

Note. Each Term used as a concept description has its own SNOMED CT code as shown & every entity within the SNOMED CT thesaurus has a code.



The Snoflake Tree

In the Snoflake Tree the selected, or root, concept is displayed in green text. The example below has 2 child concepts indicated by the grey **Down** arrows, and 2 parent concepts with red **Up** arrows). Clicking on any of the concept labels will cause the browser to refresh to display the newly selected node as the new root with its own associated parent and child concepts.



In the area above the Snoflake tree the details of the root concepts are displayed. The detail panel includes:

1. The full concept description, and its status, which is **current** in this case example.
2. The concept ID (number)
3. The descriptive terms used to describe the concept, in this example there are two, each preceded by its type, which are signified as follows:

P = Preferred term

S = Synonym

H = Homonym

F = Fully specified

U = Unspecified

In the example above the Preferred (P) and Full (F) types are indicated to be in use.

Filtering Subset, Suffix & Favourites

One or more Subsets and Favourites can be included or excluded from any search, and one or more Suffix can be included in any search.

To include a subset, click on the **Subset** button to display a list of all subsets.

To include a subset, click on its **Green +** symbol. Multiple subsets can be included in the fashion.

To exclude a subset, click on the **Red --** symbol. As before, multiple subsets can be excluded from a search.

A number is displayed on the appropriate button to indicate how many inclusions or exclusions are being applied to the filter.

To release any inclusion/exclusion, just click on its green/red symbol again.



Note: When searching specific words or phrases via the search field, the returned result set will filter on your exclusions/inclusions.

Favourite Concepts – Creation & Adding

Users can create a library system where often used, i.e. favourite concepts, can be stored and maintained for quick and easy access.

These favourite lists can then be used to filter other searches, as well as being used as is to search when needed.

Returning to the search and selection stage as described earlier and again illustrated here, the tick to the left of the displayed concept can be clicked, upon which it will change to .

At this point the **Add to Favourite** button becomes active & when clicked it opens the favourite section to enable the addition of the selected concepts

A concept or concepts, when more than one tick is green, can be added to an existing (named) favourite folder by selecting it from the dropdown list and then clicking the **Save** button.

To create a new favourite folder, select **New Favourite** in the dropdown, type a new name and click **Save**, the favourite and selected concepts will be saved



Favourite Management & Filtering

To edit favourites click on the **Favourite** button and select the required favourite folder from the list.

Note that clicking on the name rather than the **+** or **-** buttons will display all the favourites in the folder.

To remove a favourite concept from the favourite folder click the  adjacent to the Concept ID and the concept will be removed from the list of items.

To change a favourite folders name, edit the name displayed above the search results, and click **Save**. To delete a favourite, click **Delete**. This will delete the favourite folder and its contents.

ICD10 Search

Clicking on the **sno** button enables the switching between the Snomed and ICD10 modes.

ICD10 Search works in the same manner as Snomed, however the **suffix**, **subset** and **favourite** functionalities are not active in this mode.

Account Management

Users can edit their account details by clicking on the **Account** tab on the main menu.

The following details can be edited when required:

- Name
- Organisation
- Email
- Phone
- Country
- Change password

When editing has been completed click the **Save** button.

Your Details

Username:

You registered with snoflake on: 21/02/2012

Name:

Organisation:

Email:

Phone:

Country: