



British Columbia Health Concerns and Diagnosis Value Set

EMR User Guide for SNOMED-CT®

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Maintenance

This document is a living document. The content may require edits, additions and/or maintenance as actual implementations provide the necessary technical validation. Additional adjustments may be required over time to reflect requirements in British Columbia.

Comments

Questions and/or feedback on this initiative in BC can be directed to the Ministry of Health at:

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1.0 SNOMED CT® Overview

1.1 Current Use of Clinical Coding in EMRs

Over the last few decades, the International Classification of Diseases (ICD-9) have been widely used in electronic medical record systems for such purposes as the entry of the problem list, family history, encounter diagnoses used to meet billing requirements (i.e. all claims submitted to the BC Medical Services Plan must include a diagnostic code – currently coded using ICD-9), indications for drugs, orders (including referral) or procedures. Much of this coding is done by clinicians rather than Medical Office Assistants or health information management professionals.

However, the level of specificity of classifications are suited to statistical analysis for such things as health trends or national reporting. They are not suited to clinical data entry and retrieval at a level of detail appropriate to clinical record keeping. Additionally, difficulties with the implementation of ICD-9 has resulted in EMR vendor and user workarounds to manage the use of the inadequate classification codes and poorly designed user interfaces. Not surprisingly, this has led to user frustration and a general skepticism regarding the value of the use of coding for clinical records.

When the appropriate coding systems are selected for a given clinical purpose and implemented in a user-friendly manner, the value is immediately apparent, and the user experience becomes much more positive. A more flexible, comprehensive, and adaptable clinical terminology is required to meet point of care and broader digital health requirements.

1.2 What is SNOMED CT®?

By now, most healthcare organizations recognize some of the challenges associated with aggregating and sharing clinical information in a machine-readable format. Adoption and use of standard terminologies within health IT systems is fundamental to these movements. Systematized Nomenclature MEDicine Clinical Terms (SNOMED CT®) serves as part of this solution.

SNOMED CT provides a more flexible, comprehensive, and adaptable clinical terminology required to meet today's broader digital health requirements. It is a comprehensive international clinical terminology that is used in over fifty countries.

When implemented in electronic health solutions, SNOMED CT® can be used to represent clinically relevant information consistently as an integral part of producing electronic health information. Specifically, SNOMED CT®:

- enables the data entry and retrieval of multi-disciplinary, cross sector records and communication of information without loss of detail or change to meaning;
- is a means of recording /displaying information (by naming and identification of those concepts relevant to healthcare) not possible in paper records;
- provides content standards for clinical elements of electronic records that provide better quality of care;
- supports the aggregation of individual level data to support population analyses; and
- maps to other terminologies / classifications (e.g., ICD-9, ICD-10-CA).

SNOMED CT® seeks to establish how language is used by clinicians to reduce ambiguity, but not to control the way a phrase is used.

1.3 Key Characteristics

SNOMED CT® is unique in its breadth and depth of coverage. Key characteristics include:

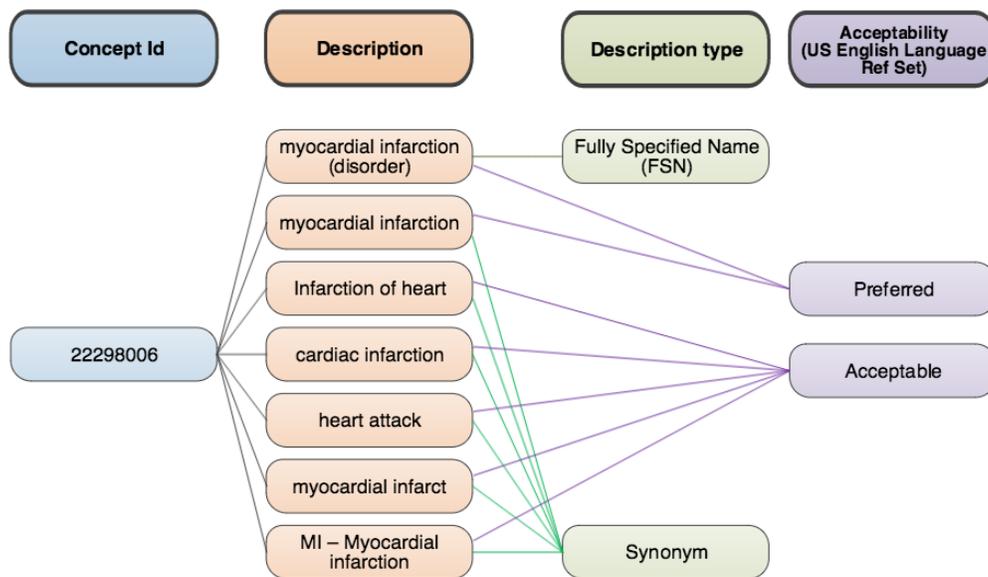
- It is the most comprehensive, multilingual clinical healthcare terminology in the world designed for use at the point of care – with more than 350,000 concepts and 1.2 million synonyms;
- Includes health concerns and diagnoses, signs, symptoms, procedures, body structures, organisms and substances;
- Is a resource with scientifically validated clinical content;
- Ensures quality clinical content in electronic health records;
- Has mappings to other international standards including ICD-10 and ICD-9-CM.

1.3.1 Components

SNOMED CT® is a terminology that contains concepts with unique meanings and formal logic based definitions organized into hierarchies. This provides the ability to see that a ‘pneumonia’ can be categorized as an infection and as a lung problem. SNOMED CT® content is represented using three types of components:

1. **Concepts** representing clinical meanings that are organized into hierarchies.
2. **Descriptions** which link appropriate human readable terms to concepts.
3. **Relationships** which link each concept to other related concepts.

The diagram below illustrates the three types of components using the representation of a heart attack:



Refer to the Glossary in Appendix A for more information on Concepts, Descriptions and Relationships.

Below is an excerpt from the BC Health Concerns and Diagnosis Value Set illustrating the Concept ID, the Fully Specified Name as the Preferred Term and associated Synonyms. Note: The value set has been evolving, so this may not be representative of the most current list of terms or synonyms.

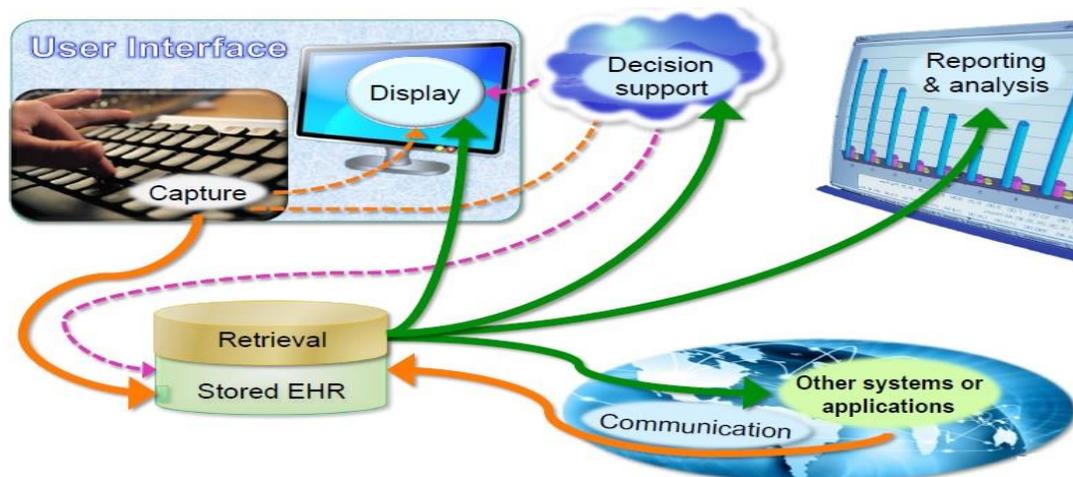
SNOMED ID	SNOMED Term	SNOMED SYNONYMS
21258007	Thrombosis of lateral venous sinus (disorder)	Thrombosis of transverse sinus, Cerebral venous thrombosis of lateral sinus
21279007	Lingual thyroid (disorder)	Sublingual thyroid gland
21321009	Ambiguous genitalia (disorder)	
21350002	Colloid cyst of third ventricle (disorder)	Paraphyseal cyst, Neuroepithelial cyst
21441000	Open wound of back with complication (disorder)	
21454007	Subarachnoid intracranial hemorrhage (disorder)	Subarachnoid hemorrhage, Subarachnoid haemorrhage, SAH - Subarachnoid haemorrhage, SAH - Subarachnoid hemorrhage, Subarachnoid intra
21522001	Abdominal pain (finding)	douleur abdominale, AP - Abdominal pain
21639008	Hypervolemia (disorder)	Volume excess, Fluid volume excess, Fluid overload, Fluid excess, Hypervolaemia
21647008	Amphetamine dependence (disorder)	Amphetamine dependence
22268004	Legal problem (finding)	
22298006	Myocardial infarction (disorder)	infarctus du myocarde, Infarction of heart, Cardiac infarction, Heart attack, MI - Myocardial infarction, Myocardial infarct
22323009	Acute bowel infarction (disorder)	infarctus aigu de l'intestin, Acute intestinal infarction
22325002	Abnormal gait (finding)	Gait problem, Gait difficulty
22343003	Pneumonitis caused by fumes AND/OR vapors (d	Pneumonitis due to fumes AND/OR vapors, Chemical pneumonia, Chemical pneumonitis, Chemical workers' lung, Pneumonitis due to fumes A
22419002	Mood disorder with mixed features due to gener	
22451001	Idiopathic torsion dystonia (disorder)	Dystonia deformans progressiva, Dystonia musculorum deformans, Schwalbe disease, Ziehen-Oppenheim disease, Primary torsion dystonia
22455005	Cytomegaloviral retinitis (disorder)	CMV retinitis, Cytomegalovirus retinitis, CMV - Cytomegalovirus retinitis
22567005	Pseudoachondroplastic spondyloepiphyseal dys	SED syndrome, Pseudoachondroplastic dysplasia, Pseudoachondroplasia

SNOMED CT® also provides a mechanism that enables clinical phrases to be represented, even when a single SNOMED CT® concept does not capture the required level of detail. For more information, refer to Appendix B – SNOMED CT® expressions.

1.4 Benefits of SNOMED CT®

EMRs that capture health concern and diagnosis data in SNOMED CT® contribute to the quadruple aim of care: enhancing the experience of care for individuals, improving the health of populations, reducing the per capita cost of health care, and improving the experience of healthcare delivery and administration for clinicians.

The diagram below illustrates how SNOMED CT® can be used for capture, searching, retrieval and reuse of clinical information for patient care, real-time decision support, systems communication and downstream research and reporting.



SNOMED CT® provides a comprehensive list of concepts that are designed for use at the point of care. SCT is maintained at the national level through the national release center and at the international level by SNOMED International.

SNOMED CT® is updated every 6 months.

SNOMED CT® benefits individuals, populations, clinicians and evidenced-based healthcare decisions.

Benefits to clients:

- Enabling clinical information to be recorded in a standardized way by clinicians which supports the effective sharing of clinical information electronically with other healthcare providers resulting in improved quality of client care.
- Enabling support systems to check the record and provide opportunities for real-time decision support.
- Allowing accurate and comprehensive analysis that identifies patients who require follow-up or changes of treatment.

Benefits to populations:

- Facilitating early identification of emerging health issues, monitoring of population health and responses to changing clinical practices.
- Enabling accurate and targeted access to relevant information, reducing costly duplications and errors.
- Enabling the delivery of relevant data to support clinical research and contribute evidence for future improvements in treatment.
- Enhancing audits of care delivery with options for detailed analysis of clinical records to investigate outliers and exceptions.

Benefits to clinicians:

- Because SNOMED CT® was designed for use at the point of care, it facilitates the easy capture of data about the multi-faceted needs of their patients.
- Enabling the sharing of vital information consistently within and across healthcare settings.
- Enabling effective retrieval, aggregation and analysis of clinical information.
- Supporting recording at a level of detail appropriate to clinical record keeping.
- Preventing imprecise use of clinical language.
- Maps to classifications to support allocation of classification codes and avoiding double entry for clinical and classification/reporting purposes.
- Level of clinical detail is aligned to the needs of clinical decision making and clinical decision support systems.
- SNOMED CT® is updated every 6 months.

Benefits to healthcare system:

- Administration and management cost savings.
- Standardized SNOMED to ICD maps and software help automate coding processes – reducing health information management costs.
- Reductions in costs to acquire to develop and maintain local terminology products (e.g. value sets).
- Reduction in costs to acquire or to develop and maintain clinical criteria used to identify patient cohorts with clinical decision support and performance monitoring systems.
- Reduction in costs associated with duplicate or unnecessary investigations (e.g., lab tests or imaging studies).



SNOMED CT® itself is only a part of the solution to addressing the requirements for effective electronic clinical records. A terminology on its own 'does nothing'. To benefit from a terminology, it must be implemented and used as part of an application. The design of the software application in which it is used, and the objectives and motivation of its users, are key factors in determining success.

SNOMED CT® is useful for clinical documentation, as it supports the representation of detailed clinical information, in a way that can be processed automatically. Realization of the capability of SNOMED CT® to support clinical information and meaning based retrieval requires careful consideration of the actual setting, in terms of scope of use, record structure, data entry, data retrieval and communication.

1.5 Debunking SNOMED CT® Misconceptions

EMR user experiences with ICD-9 have led to some skepticism that clinical coding systems can be usable and beneficial to their practice. With ICD-9, clinicians often have difficulty finding codes they needed due to unfriendly descriptions, lack of specificity, outdated codes, poor search algorithms, and poorly designed user interfaces. The notion of the need to search through even more terms in SNOMED CT® seems daunting.

However, the use of SNOMED CT® - when implemented in a well-designed user interface (for data entry and retrieval) – can address these challenges. Below is a list of some mitigations:

- CONCERN: Difficult to find codes
 - MITIGATION: SNOMED CT® provides a comprehensive list with normal language descriptions and synonyms; easy to manage value set containing only those terms required for a given purpose (e.g. recording health concerns and diagnosis).
 - MITIGATION: There is a new release of SNOMED CT® every 6 months. EMRs can provide the ability to do updates on a regular basis and deal with deprecated concepts.
- CONCERN: SNOMED CT® is too big; searches result in too many hits
 - MITIGATION: EMRs typically provide the ability to flag specific items as ‘Preferred’. These would then appear at the top of the display list when doing a search.
 - MITIGATION: EMRs can display what was used in the past for any individual patient. This works very well since any individual patient will typically be seen multiple times for the same conditions.
 - MITIGATION: In addition to the synonyms that are already in SNOMED CT®, EMRs can provide users with the capability to create their own local synonyms.



2.0 User Guide for Clinicians

2.1 Purpose of the User Guide

The purpose of the Health Concerns and Diagnosis Value Set Guide for EMRs Users is to provide clinicians and other users of the value set with a solid understanding of the benefits of use as well as the relevant information regarding search, use and re-use approaches.

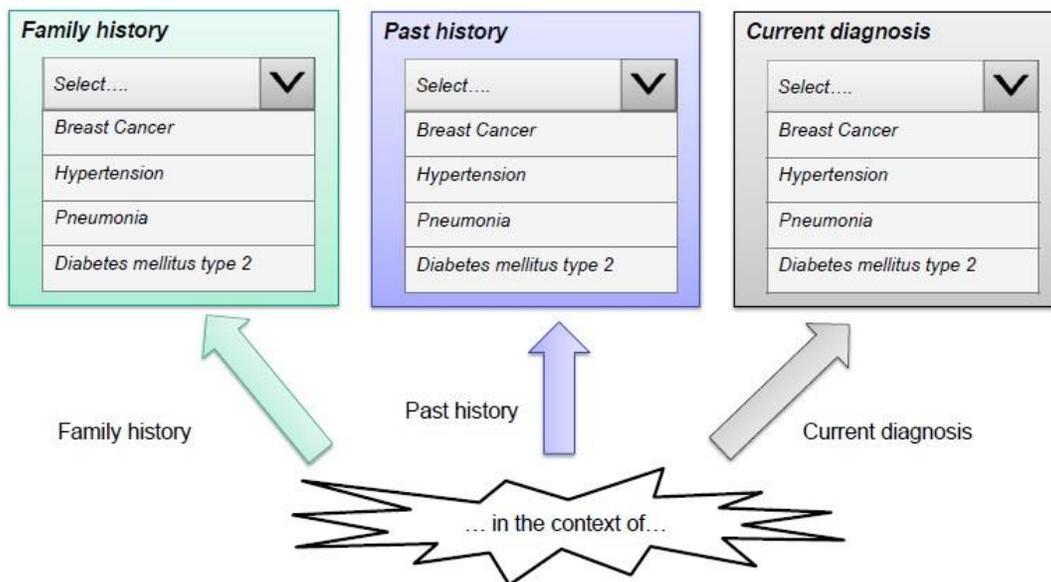
The SNOMED CT® Overview in Section 1 of this document is a pre-requisite to this guide as research has proven that clinicians need to understand the basic principles of SNOMED CT® to effectively use it.

2.2 About the Value Set

2.2.1 Purpose of the Value Set

This subset of SNOMED CT® was developed to provide users with a listing of concepts that are relevant to recording health concerns and diagnoses. This subset has about 5,400 concepts with mappings to ICD-9, ICD-10-CA and CedDxs. Concepts related to procedures and investigations are not included in this value set. These concepts will be included in other values sets.

Health concerns and diagnosis concepts may be used for such fields in a clinical record as current diagnosis, past history, family history or reason for visit. The diagram below illustrates the same value set used for multiple clinical record fields in the EMR.



Although the BC Health Concerns and Diagnosis Value Set was developed for use in British Columbia, it was developed from multiple sources - both local and international – and is therefore anticipated to be adoptable or adaptable in other jurisdictions.

2.2.2 What is a Value Set?

Value sets are a selection of codes used for documenting clinical information within health care software. Instead of sifting through the 300,000+ codes that exist within SNOMED CT®, a subset is developed to help vendors and frontline implementers know which codes to use within software fields for specific types of clinical documentation. An example of a value set is the BC Health Concerns and Diagnosis Value Set. When a clinician identifies a health concern or diagnosis, they will search and select values from a list of codes, represented in the form of a value set that encompasses most of health concern and diagnosis scenarios that may be discovered during a patient encounter. If all clinicians in BC are selecting from the same value set of codes, data can be sent and received seamlessly across health information exchanges using the standards adopted by EMR vendor systems.

Subset and value set are general terms that are not specific to SNOMED CT®. However, it is important to understand what they mean, and how they relate to SNOMED CT® reference sets. Please refer to the Glossary in Appendix A for definitions of a subset, value set and reference set.

There are a number of use cases for value sets, including constraining the permitted values for elements in a communication specification, specifying the values in a pick list on a user interface and defining the required values to use for reporting.

Even though the value set will provide enough content to meet most clinical situations, there may be times when a user has a requirement to use concepts that are not in the value set. Guidance to EMR vendors includes the requirement to enable users to search for concepts in a broader context and to select the relevant concept and mapping to an appropriate code in ICD or CedDxs. This term and mapping should subsequently be submitted as a Request for Change (RFC) to the Value Set.

2.2.3 Value Set Implementation Benefits

The use of the BC Health Concerns and Diagnosis Value Set will make it easier for clinicians to find what they want without the distraction of concepts that are not relevant to the area of interest. It will also reduce the chances of users selecting concepts from the wrong semantic area. Relevant information will be readily accessible and displayed in ways that support their work.

The mappings to ICD-9, ICD-10-CA and Ced

Dxs will also support current billing requirements and use of classifications for statistical research.

2.2.4 Comparison of Terminologies and Classifications

A **clinical terminology** is a structured vocabulary used in clinical practice to accurately describe the care and treatment of patients. Examples of clinical terminology include SNOMED CT and LOINC. Clinical terminologies enable the:

- Naming and identification of those concepts relevant to healthcare; and
- Communication of information without loss of detail or change to meaning.

Terminologies enable clinicians to record what they need at point of care data entry, to communicate across systems in a consistent manner and to assist with retrieval for planning, reporting, and research.

A **classification** is a structured way of organizing information into standard groupings. Examples include ICD-9, ICD-10, and Canadian Classification of Interventions (CCI). Classifications enable the:

- Billing of service;
- Monitoring of the incidence and prevalence of a disease;
- Observing reimbursements and resource allocation trends; and
- Retrieving those statements to express meaning at various levels of abstraction for clinicians, patients, researchers or organizations.

Classifications must have a place for all items and include categories such as 'Not Elsewhere Specified' – which would not be appropriate for clinical data entry. Classifications should generally be used after initial data entry.

For example, five SNOMED CT® concepts map to only one ICD code as below:

SNOMED CT® (Five Concepts)	International Classifications of Diseases (One Code)
29774004 Vascular myelopathy	G95.1 Vascular myelopathies Includes: <ul style="list-style-type: none"> • Acute infarction of spinal cord • Haematomyelia • Oedema of spinal cord • Subacute necrotic myelopathy
432249006 Infarction of spinal cord	
39134007 Haematomyelia	
65605001 Oedema of spinal cord	
83982007 Subacute necrotic myelopathy	

The SNOMED CT® concepts provide the specificity required at the point of care. These can be mapped to the ICD codes that can be used for billing and secondary use purposes.

The table below highlights the differences between SNOMED CT® and ICD-10-CM:

Characteristics	SNOMED CT®	International Classification of Diseases
Size	~ 300,000	14,000 for ICD-9 and 68,000 for ICD-10-CM
Scope	All of medicine, anatomy, substances, organisms, Dx, Px	Diseases, problems, interventions
Use cases	Individual longitudinal health records	Patient episodes and populations
Primarily suit to	Clinical purposes	Billing and statistical purposes
Applied by	Clinicians	Coders
Enables	Clinical data entry and retrieval, Communication, messaging, decision support	Billing, health trends, national reporting
Granularity	Specific	Sensitive
Update Cycle	Twice per year	Every three years
Context representation	Yes	No

2.2.5 How to Read: Concepts and Mappings to ICD

The use of the value set and mappings to classifications within an EMR should be seamless to the user. The complexities should be hidden in the back end of the application such that a detailed understanding of the entire value set and related mappings is not required. However, for those EMR users who are interested in reviewing the entire value set and related mappings, guidance is provided in Sections 2.2.5 and 2.2.6.

The BC Health Concerns and Diagnosis Value Set will be published in multiple formats. A table format is represented in **Appendix B** of this document. Below is an image of the primary columns.

SNOMED ID	SNOMED Term	ICD-10	ICD-10CA Term	Ced	CedDxs (ICD-10CA) Term	ICD-9	ICD-9 Term	SNOMED SYNONYMS
281004	Dementia associated with alcoholism (dis F1027)	F03	Alcohol dependence with alcohol-in	F03	Unspecified dementia	2912	Alcohol-induced persisting dementia	Alcohol-induced persisting demen
290006	Melnick-Fraser syndrome (disorder)	Q870	Congenital malformation syndrome	Q899	Congenital malformation, unspecified	7560	Anomalies of skull and face bones	Branchio-oto-renal syndrome, BO
297009	Acute myringitis (disorder)	H730	Acute myringitis	H669	Otitis media, unspecified	3840	Acute myringitis	myringite aiguë, Acute tympaniti
317006	Reactive hypoglycemia (disorder)	E161	Other hypoglycaemia	E162	Hypoglycaemia, unspecified	2512	Hypoglycemia, unspecified	Hypoglycemic reaction, Hypoglyce
355001	Hemorrhagic shock (disorder)	R571	Hypovolaemic shock	R571	Hypovolaemic shock	7855	Shock without mentions of trauma	choc hemorrhagique, Haemorrhagi
378007	Morquio syndrome (disorder)	E762	Other mucopolysaccharidoses	E889	Metabolic disorder, unspecified	2775	Mucopolysaccharidosis	mucopolysaccharidose type IV, Ch
442001	Secondary hypopituitarism (disorder)	E230	Hypopituitarism	E237	Disorder of pituitary gland, unspecifie	2532	Panhypopituitarism	
554003	2p partial trisomy syndrome (disorder)	Q922	Major partial trisomy	Q999	Chromosomal abnormality, unspecifie	7585	Other conditions due to autosomal anomalies	

The following content is captured:

SNOMED ID: This is the SNOMED CT® pre-coordinated unique Concept ID.

SNOMED Term: This is the SNOMED CT® Fully Specified Name.

ICD-10-CA Code: This is the mapped ICD-10-CA Code. Multiple SNOMED IDs may be mapped to the same ICD-10-CA code (many to one). For example, ICD-10-CA code A099 - Gastroenteritis and colitis of unspecified origin is mapped to 3 SNOMED Concepts:

SNOMED ID	SNOMED Term	ICD-10-CA Code	ICD-10-CA Term
25374005	Gastroenteritis (disorder)	A099	Gastroenteritis and colitis of unspecified origin
52457000	Ileitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin

SNOMED ID	SNOMED Term	ICD-10-CA Code	ICD-10-CA Term
64226004	Colitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin

ICD-10-CA Term: This is the corresponding term for the ICD-10-CA Code.

CedDxs Code: This is the mapped CedDxs Code. Multiple SNOMED IDs may be mapped to the same CedDxs code (many to one).

CedDxs is the Canadian Emergency Department Diagnosis Shortlist of ICD-10-CA codes published by the Canadian Institute for Health Information. They are less granular than the mapping of base ICD-10-CA codes. Because of this, the CedDxs code from ICD-10 may be different than that from the ICD-10-CA base mapping. In the example below, 2 of the 3 SNOMED concepts are mapped to a different CedDxs than the base code (i.e., to K929 instead of A099).

SNOMED ID	SNOMED Term	ICD-10-CA Code	ICD-10-CA Term	CedDxs Code	CedDxs Term
25374005	Gastroenteritis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	A099	Gastroenteritis and colitis of unspecified origin
52457000	Ileitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	K929	Disease of digestive system, unspecified origin
64226004	Colitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	K929	Disease of digestive system, unspecified origin

CedDxs: This is the corresponding term for the CedDxs Code from ICD-10.

ICD-9 Code: This is the mapped ICD-9 Code. Multiple SNOMED IDs may be mapped to the same ICD-9 code (many to one). For example, ICD-9 code 0091 - Colitis, enteritis, and gastroenteritis of presumed infectious origin is mapped to 3 SNOMED Concepts:

SNOMED ID	SNOMED Term	ICD-10-CA Code	ICD-10-CA Term	ICD-9 Code	ICD-9 Term
25374005	Gastroenteritis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	0091	Colitis, enteritis, and gastroenteritis of presumed infectious origin
52457000	Ileitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	0091	Colitis, enteritis, and gastroenteritis of presumed infectious origin
64226004	Colitis (disorder)	A099	Gastroenteritis and colitis of unspecified origin	0091	Colitis, enteritis, and gastroenteritis of presumed infectious origin

ICD-9 Term: This is the corresponding term for the ICD-9 Code.

SNOMED Synonyms: This is the list of SNOMED CT® Concepts that are identified as Synonyms of the concept identified in the first column. A SNOMED ID can have from zero to many synonyms.

SNOMED ID	SNOMED Term	SNOMED Synonyms
25374005	Gastroenteritis (disorder)	Gastro-enterite, gastroenterite, Gastroenteropathy, GE – Gastroenteritis
52457000	Ileitis (disorder)	
64226004	Colitis (disorder)	Colon inflammation

For more information on how the classifications were mapped to the SNOMED concepts, please refer to:

- Mapping of SNOMED to ICD in BC v1.0.pdf referenced in the Appendix C.

2.2.6 Searching in the Value Set

The full BC Health Concerns and Diagnosis Value Set will be published on the BC Ministry of Health website (in .xls and .pdf formats) as well as within the Canada Infoway Terminology Gateway tool. The full value set will be searchable by all potential users or implementers – from clinicians who wish to review the concepts and/or mappings to ICD-9 or 10 to terminologists who need to update mappings to developers who need to import the value set into EMR or EHR solutions.

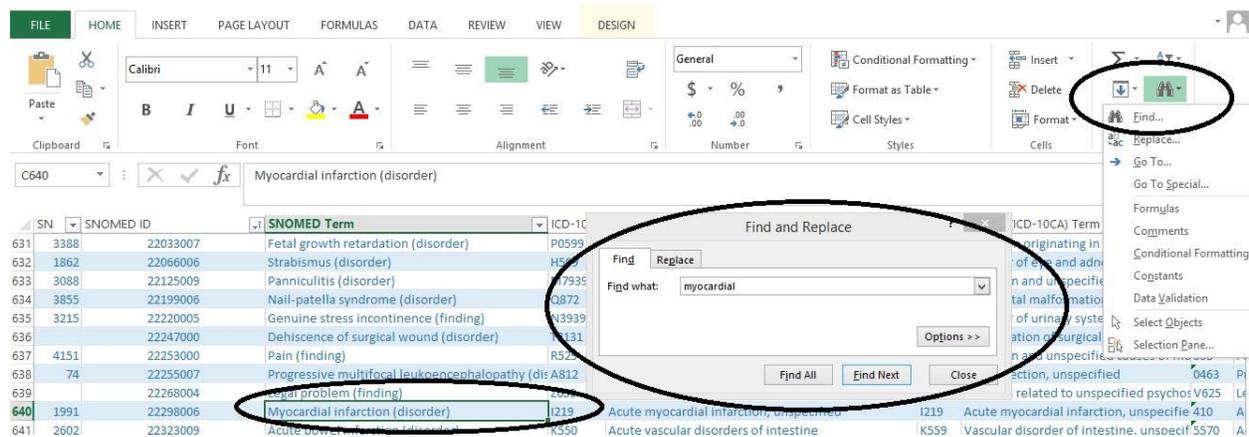
Below are some use cases for searching the value set:

- Evaluate terminology content and mappings
- Design a data entry template
- Create a query or report
- Bind the value set to information models
- Bind the value set to knowledge artifacts
- Author new content (extensions or translations)
- Update maps from SNOMED CT® to ICD-9 or 10

NOTE: For selection of a clinical meaning for data entry at point of care, clinicians will select the clinical idea from the value set through EMR user interface search and data entry mechanisms. See Section 2.4.3 for User Interface Approaches to Data Entry and Searching.

Searching in Microsoft Excel

The table format of the BC Health Concerns and Diagnosis Value Set is published in Microsoft Excel .xls format. Searching of SNOMED Terms or related ICD Terms can be done using the standard 'Find' function within Excel as illustrated in the image below. Any whole or part of a word or code can be entered. Excel will search all columns to find matches.

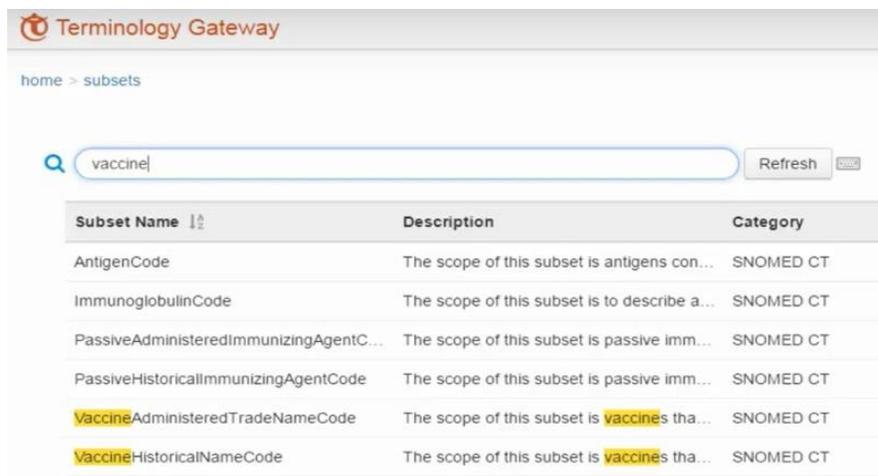


Searching in Portable Document Format (PDF)

The portable document format file of the BC Health Concerns and Diagnosis Value Set is published in .pdf format. Searching of SNOMED Terms or related ICD Terms can be done using the standard 'Find' function within PDF file. Any whole or part of a word or code can be entered. PDF will search all columns to find matches.

Searching the Infoway Terminology Gateway

Terminology Gateway is a web-based solution framework that enables the distribution and sharing of terminology concepts, subsets and concept maps, making them available for web browsing, download or real time query. The BC Health Concerns and Diagnosis Value Set will be published within the Terminology Gateway. Below is a screenshot from the tool. As illustrated, searching is based on whole or part words or phrases.



The screenshot shows the Terminology Gateway interface. At the top, there is a search bar with the text 'vaccine' and a 'Refresh' button. Below the search bar is a table with three columns: 'Subset Name', 'Description', and 'Category'. The table lists several subsets, with the last two rows highlighted in yellow.

Subset Name	Description	Category
AntigenCode	The scope of this subset is antigens con...	SNOMED CT
ImmunoglobulinCode	The scope of this subset is to describe a...	SNOMED CT
PassiveAdministeredImmunizingAgentC...	The scope of this subset is passive imm...	SNOMED CT
PassiveHistoricalImmunizingAgentCode	The scope of this subset is passive imm...	SNOMED CT
VaccineAdministeredTradeNameCode	The scope of this subset is vaccines tha...	SNOMED CT
VaccineHistoricalNameCode	The scope of this subset is vaccines tha...	SNOMED CT

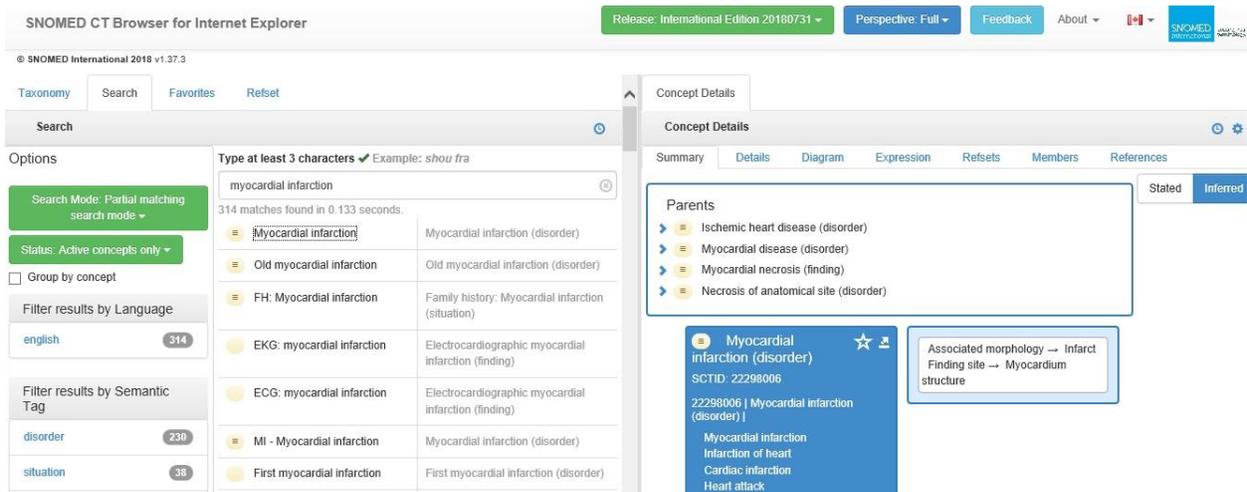
Refer to the Terminology Gateway Overview Video for a walk-through:

- <https://infocentral.infoway-inforoute.ca/en/component/edocman/presentations-and-videos/2165-terminology-gateway-overview-video>

Other SNOMED CT® Browsing Tools

SNOMED International Browser

SNOMED International's SNOMED CT® browser allows users to browse and search the SNOMED CT® International Edition to explore concepts and relationships. It also provides access to browse national extensions from SNOMED International member countries including the Canadian Edition of SNOMED CT® in English and French. The SNOMED CT® browser is provided to anyone to use for reference purposes. It is not specific to the BC Health Concerns and Diagnosis Value Set.



The screenshot shows the SNOMED CT Browser interface. At the top, it says "SNOMED CT Browser for Internet Explorer" with navigation buttons for "Release: International Edition 20180731", "Perspective: Full", "Feedback", "About", and a Canadian flag. Below this is the "SNOMED International 2018 v1.37.3" version information and tabs for "Taxonomy", "Search", "Favorites", and "Reset".

The search bar contains "myocardial infarction" and shows "314 matches found in 0.133 seconds". The search results are filtered by language to "english" (314 results) and by semantic tag to "disorder" (230 results). The results table lists various concepts such as "Myocardial infarction (disorder)", "Old myocardial infarction (disorder)", "FH: Myocardial infarction (situation)", "EKG: myocardial infarction (finding)", "ECG: myocardial infarction (finding)", "MI - Myocardial infarction (disorder)", and "First myocardial infarction (disorder)".

The "Concept Details" panel on the right shows the selected concept "Myocardial infarction (disorder)" with SCTID 22298006. It lists parents: "Ischemic heart disease (disorder)", "Myocardial disease (disorder)", "Myocardial necrosis (finding)", and "Necrosis of anatomical site (disorder)". It also shows associated morphology: "Infarct" and "Finding site → Myocardium structure".

Freeware SNOMED Browsers

In addition to the IHTSDO published browser, there are numerous freeware software SNOMED browsers available for public use. These, too, would not be specific to the BC Health Concerns and Diagnosis Value Set.

2.3 Implementation Strategies and Considerations

The extent of benefits realization depends on the effectiveness of implementation and the way SNOMED CT® is used within electronic healthcare systems (e.g., EMRs, EHR) and by users and organizations.

SNOMED CT® itself is only a part of the solution to addressing the requirements for effective electronic clinical records. To benefit from a terminology, it must be implemented and used as part of an application. The design of the software applications in which it is used, and the objectives and motivation of its users, are key factors in determining success.

The following section provides a high-level overview of the different ways in which the BC Health Concerns and Diagnosis Value Set and SNOMED CT® in general can be implemented in software applications or broader eHealth solutions. There may be differences in architectural solutions, user interface design and the scope of SNOMED CT® implemented by BC EMR vendors.

2.3.1 Scope of Implementation

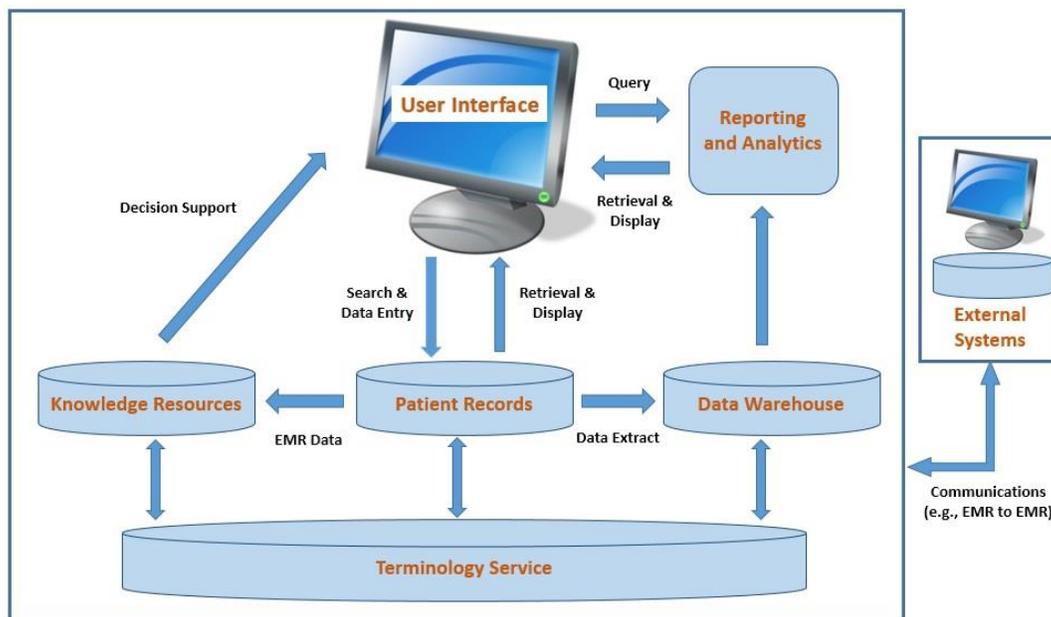
The scope of SNOMED CT® implementation is defined by four primary dimensions. Namely, the breadth of coverage, the specificity of terms, the purpose of use, and the level of functionality provided.



Breadth of Coverage: The breadth of coverage refers to the extent to which the SNOMED CT® terms will be used across organizations (e.g., from single institution to national). In the case of the BC Health Concerns and Diagnosis Value Set, the breadth of coverage is provincial with the goal of adoption or adaptation across Canada.

Specificity: Specificity refers to the extent to which the SNOMED CT® terms cover multiple disciplines or specialties. In the case of the BC Health Concerns and Diagnosis Value Set, the scope is limited to health concerns and diagnosis and not appropriate for procedures and investigations.

Purpose: The purpose of the value set and SNOMED CT® in general can range from a single use case such as clinical terminology for use at the point of care for data entry of clinical terms to an integrated solution. An integrated solution is a system in which all components are capable of using and exploiting the full features of SNOMED CT® including communications with other systems, reporting and analytics, clinical guidelines and decision support, and EHR integration. See below:



Initially, it is anticipated that the BC Health Concerns and Diagnosis Value Set will be implemented within EMR solutions for point of care clinical data entry and communications with other systems (e.g., EMR to EMR).



Functionality: Functionality can vary from one system component (e.g., data entry) to full system functionality (e.g., searching, data entry, display, retrieval, storage, etc.). The extent to which the BC Health Concerns and Diagnosis Value Set will be used functionally with likely vary across EMR vendors.

2.3.2 User Interface Approaches to Data Entry and Searching

SNOMED CT® allows a level of granularity that is rarely matched by the content of proprietary terminology systems. For this and other reasons, there may need to be modifications or enhancements to the EMR user interface and how it allows users to search, enter and express clinical ideas. Since techniques may vary across architectural solutions and vendor products, this document outlines some of the approaches that may be used.

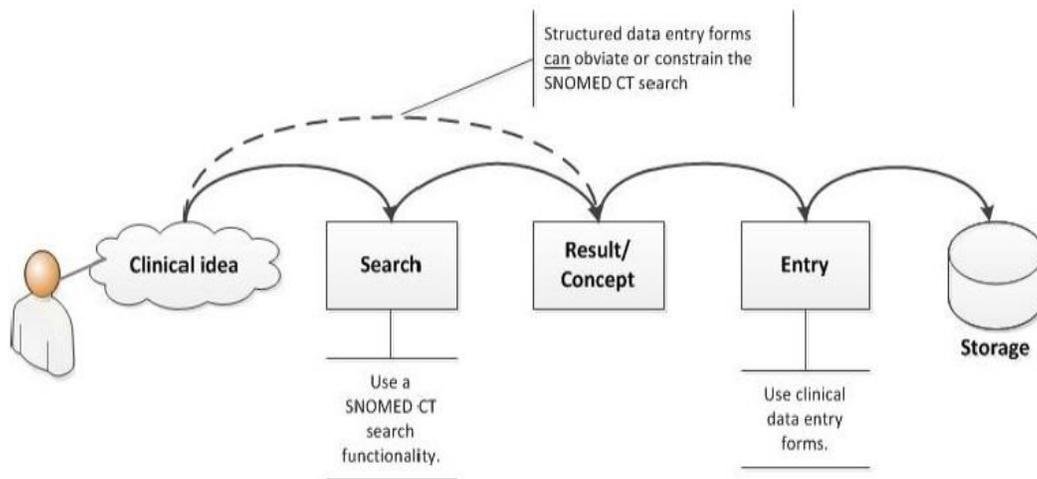
Please refer to EMR product user guides or other supporting materials to determine which specific data entry and search mechanisms have been implemented for the solution that is used in clinical practice.

Search and data entry are closely related and can be regarded as two steps in a single process. A clinical user needs to record a clinical idea (e.g. a health concern or diagnosis). The user searches for the relevant term, views the results, finds the appropriate term, selects it for data entry and the data is stored.

Search is a process by which a user finds a concept to represent a clinical idea. This functionality needs to be quick and easy for users.

Data Entry is a process by which a user submits information containing relevant SNOMED CT® concept for storage in an EMR or EHR.

The following diagram illustrates how a clinical idea (in this case a health concern or diagnosis) can be captured and stored electronically through searching and data entry of concepts within the value set:



The sections that follow further describe the importance of effective EMR approaches to searching a clinical meaning for data entry at the point of care using the BC Health Concerns and Diagnosis Value Set.

Approaches to Searching and Display

The way a search is carried out depends on the setting in which it is performed. A simple search may involve typing a part of one or more words or a phrase in a search box, getting a list of matching terms and viewing the list to identify the appropriate term. Search is an important part of the clinical information life-cycle. Effective search must make it quick and easy for users to accurately select the relevant content for data entry.

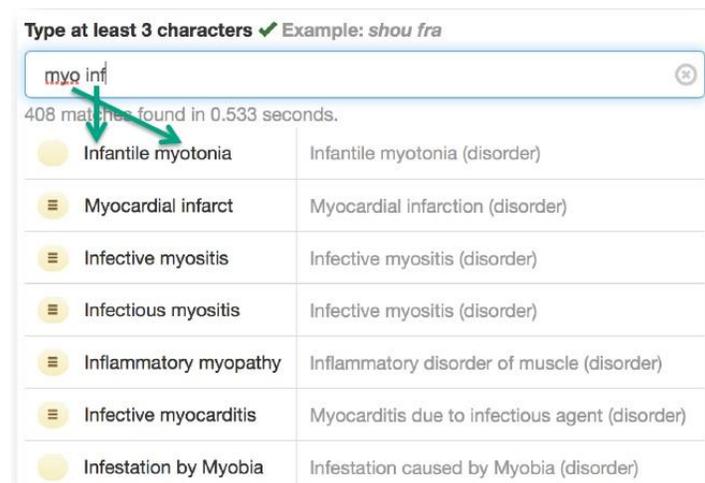
Common complaints of users of poorly design search functions include:

- Confusion as to which term to select
- Unable to find the terms
- Frustration with inconsistencies

To mitigate these concerns, the uses of Synonyms are sometimes used in conjunction search strings. For example, a user enters a search strings that can be based on one or more of the following:

- Words or parts of words in any order (e.g., Myo inf)
- Precise matching word or phrase (e.g., myocardial infarction (disorder))
- Contains a string or pattern (e.g., infarction)

And the response includes matching concepts – both Preferred Terms and Synonyms. The diagram below illustrates a search based on parts of words in any order:



Many other search techniques may be used within an EMR interface.

Please refer to EMR product user guides or other supporting materials to determine which specific search mechanisms have been implemented for the solution that is used in clinical practice.

Data Entry Techniques

Data entry is the process by which a user submits information containing relevant SNOMED CT® Concept identifiers for storage in a record system (e.g. an EMR system).

Existing data entry interfaces may be modified to incorporate SNOMED CT® in the required places, often as a direct replacement of another coding scheme (e.g. selection of terms in from the Value Set, but mapped to ICD-9 in the background). The approaches used by EMR vendors may vary.

Data entry features which may be enhanced or enabled using the BC Health Concerns and Diagnosis Value Set include:

- Search and entry of single codes
- Return results for concepts that have been used for that patient in the past
- Clinical data entry interfaces comprising numerous data items, including selection from short pick lists, and selectable single items that when checked the SNOMED CT® Identifier for the concept is stored in the clinical record (check boxes).



- Pick list can be configured by 'binding' to BC Health Concerns and Diagnosis Value Set within the interface design. This is generally only recommended when the use is context specific and the values are few.
- Auto-complete enable clinicians to type the first few letters of a word or words and the system would retrieve potential matches. This technique generally requires a wide range of

indexed tables and algorithms such as extensive keyword search mechanisms, spell check, word equivalency and synonym substitution (e.g., “lung” and “pulmonary”)

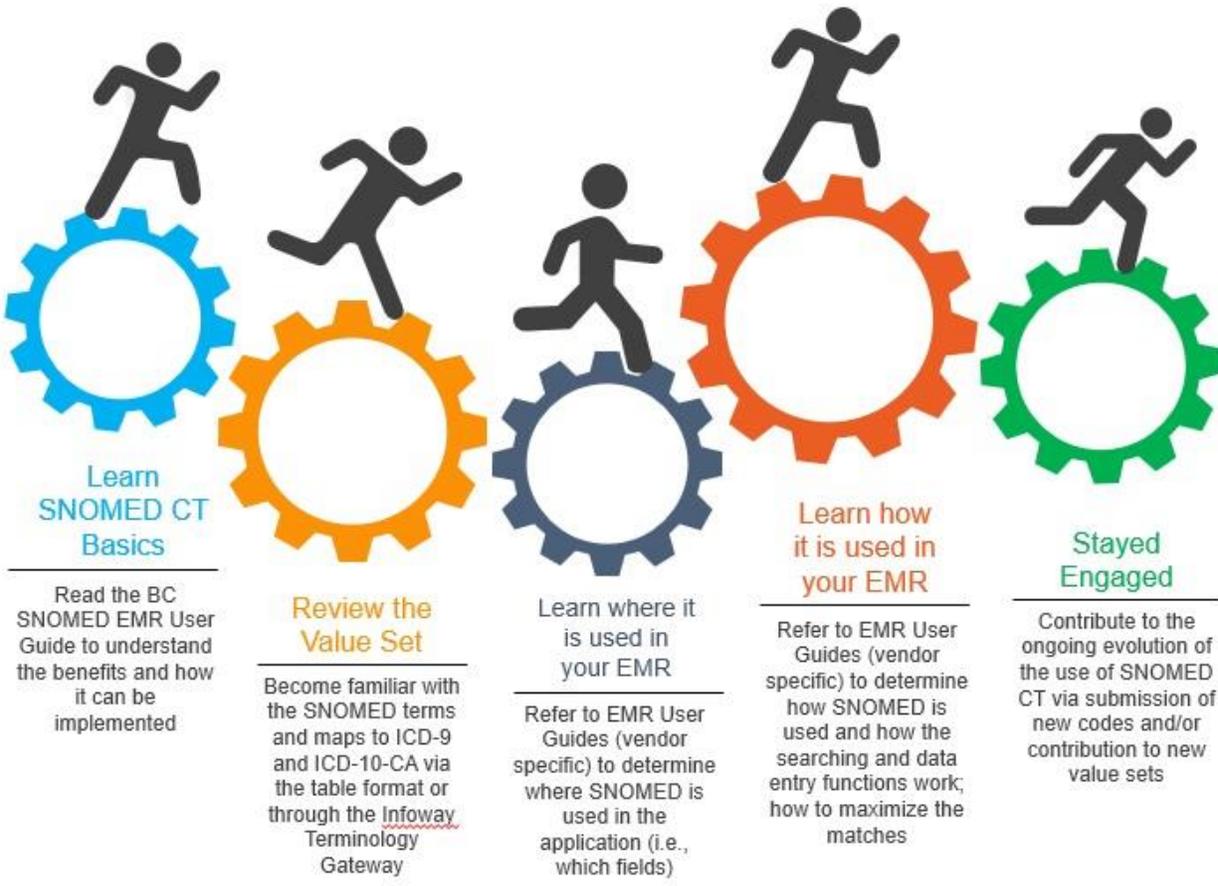
- Many other search techniques may be used within an EMR interface. **Please refer to EMR product user guides or other supporting materials to determine which specific data entry mechanisms have been implemented for the solution that is used in clinical practice.**

2.4 Quick Steps for New EMR Users of SNOMED CT®

As previously noted, EMR solutions will vary in architectural approach and user interface design for the use of SNOMED CT®. As such, this guide does not provide the steps for searching and entering clinical terms in the BC Health Concerns and Diagnosis Value Set from within an EMR solution.

Please refer to EMR product specific User Guides or supporting materials for more information on how to maximize search matches and leverage the full capability of the clinical application used in your practice.

Below are some quick steps that all new EMR users of SNOMED CT® can follow regardless of EMR used:



Step 1: Learn SNOMED CT® Basics

Research has proven that clinicians need to understand the basic principles of SNOMED CT® to effectively use it. Therefore, the first step is to learn some of the basics by reading the **BC SNOMED CT® EMR User Guide for Health Concerns and Diagnosis Value Set** (i.e., this guide). It also provides the benefits to clinicians, individuals, populations and health system administration.

Step 2: Review the BC Health Concerns and Diagnosis Value Set

Reviewing the Value Set will provide the clinician with a better understanding of the mappings to the various classifications and the level of granularity captured with SNOMED concepts.

If reviewing via the Infoway Terminology Gateway (<https://tgateway.infoway-inforoute.ca>), an Infoway account is required. If you do not have one, please register for account when prompted.

If reviewing the table format, it is available using the following link:

- <https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/health-information-standards/standards-catalogue>

Step 3: Learn where the BC Health Concerns and Diagnosis Value Set is Used in your EMR

Since the implementation of the value set across EMR applications may vary, EMR product specific User Guides or supporting materials to understand where the value set is used in the application (e.g., for past history, family history, diagnosis fields, etc.). When recording clinical information, you will know when the values are being retrieved from the value set.

Step 4: Learn how the Value Set is used in your EMR

Since the user interfaces may across EMR applications, refer to EMR product specific User Guides or supporting materials to understand how the value set is used in the application (e.g., for data entry, searching, retrieval, etc.) and how the search and display functions work. This will help to maximize search matches and leverage the full user interface functionality of the EMR.

Step 5: Stayed Engaged



Contribute to the ongoing evolution of the use of SNOMED CT® through the submission of updates to the Value Set or the development of new Value Sets.

Contact the BC Ministry of Health, HLTH.CISSupport@gov.bc.ca or refer to BC Value Set Maintenance Process (*under development*).

3.0 Appendix A – Glossary

Term	Description
Affiliate License Agreement	The agreement between an SNOMED CT® Affiliate Licensee and SNOMED International (the licensor) under which developers and implementers are permitted to use the SNOMED CT® International Release and distribute the terminology to their sub-licensees as part of a software system.
Browser	A computer application or software tool used for exploring and searching terminology content. A typical SNOMED CT® browser can locate concepts and descriptions by Identifiers and by searching the text of description terms. Various views of located concepts may be displayed including the set of related descriptions, the hierarchical relationships and other defining relationships .
Concepts	Concepts represent distinct clinical meanings and are identified by a unique numeric identifier (Concept ID) that is permanent and unchangeable, a unique human readable name (Fully Specified Name), and are associated with a set of relationships (the “logical definition”) and two or more descriptions.
Classification	A classification is a structured way of organizing information into standard groupings such as the International Classification of Disease (ICD).
Cross Mapping	The process of converting data from a representation in one code system, classification or terminology so that it is represented in another code system, classification or terminology

Term	Description
Deprecation	<p>A SNOMED CT® Concept or relationship may be deprecated. This means that one of the following situations has occurred:</p> <ul style="list-style-type: none"> • The Concept or Relationship no longer has a meaningful purpose; or • The Concept or Relationship has been replaced by a better method.
Description	<p>An association between a human-readable phrase (term) and a particular SNOMED CT® concept.</p> <p>Concept descriptions relate the terms or names of a SNOMED CT® concept to the concept itself. “Term” in this context means a phrase used to name a concept. A single description associates a single term with a single Concept ID. Descriptions are an important interface property because they give end users the flexibility to use terms that they are familiar with. The Concept ID ties terms with the same meaning together to aid consistent interpretation and retrieval.</p> <p>Description types are either indicated as a Fully Specified Name (FSN) or a Synonym. The Fully Specified Name provides an unambiguous way to name a concept. Synonyms are the rest of the names that may be used for a concept. Each description has a unique Description ID.</p> <p>The Preferred Term is the most common word or phrase used by clinicians to name a concept. This is important in the design of searches in user interfaces.</p>
EHR	Electronic Health Record

Term	Description
Electronic Health Record	A systematic collection of health information about individual patients or populations that is stored in a digital form. An Electronic health record may contain a complete and detailed record of a patient's health or may consist of a summary of information of particular relevance to continuing delivery of care.
EMR	Electronic Medical Record System
Expression	A structured combination of one or more concept identifiers used to express a clinical idea
FSN	Fully Specified Name
Fully Specified Name	A term unique among active descriptions in SNOMED CT® that names the meaning of a concept code in a manner that is intended to be unambiguous and stable across multiple contexts
Hierarchy	Concept codes linked to their more general parent concept codes directly above them in a hierarchy. Concept codes with more general meanings are usually presented as being at the top of the hierarchy and then at each level down the hierarchy code meanings become increasingly more specific or specialized.
ICD-9, ICD-10	The International Statistical Classification of Diseases and Related Health Problems 9th and 10th Revisions are coding of diseases and signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or diseases, as classified by the World Health Organization (WHO).

Term	Description
International Health Terminology Standards Development Organization (IHTSDO)	The not-for-profit organization that develops and promotes use of SNOMED CT® to support safe and effective health information exchange.
InfoRMS	Canada Health Infoway's Request Management System used for the submission of Requests for Change for Canadian Extensions to SNOMED CT®.
Metadata	SNOMED CT® content (including concepts, descriptions and relationships) that is used to describe or provide additional information about SNOMED content and derivatives (including reference sets).
Natural Language Processing	A service in which a computer system converts between human-readable text (and/or spoken languages) and formal representations of information that can be readily generated, analyzed and processed by other software applications.
Preferred Term	The term that is deemed to be the most clinically appropriate way of expressing a concept in a clinical record. The Preferred Term varies according to language and dialect
Reference Set	A standard format for maintaining and distributing a set of references to SNOMED CT® components and optionally associating referenced components with additional information.
Reference Terminology	A terminology in which each term has a formal computer processable definition that supports meaning based retrieval and aggregation. SNOMED CT® is a reference terminology

Term	Description
Relationship	Relationships are the connections between concepts in SNOMED CT®. They tie terms with the same meaning together to aid consistent interpretation and retrieval.
Release Format	A file structure specified by the SNOMED International for files used to distribute SNOMED CT® content.
Release Notes	Release notes are communication documents shared with users and implementers of a standard (e.g., BC Value Set(s)) detailing the changes made to the content of a release.
Release Type	The temporal scope and completeness of a Release Format 2 file or set of files (i.e. full, delta, snapshot).
RFC	Request for Change
Subset	A subset is a set of members all of which are also members of another set.
Synonym	<p>A term that is an acceptable way to express the meaning of a SNOMED CT® concept in a particular language.</p> <p>Synonyms are represented as SNOMED CT® descriptions with the typed value 90000000000013009 Synonym .</p> <p>Synonyms allow representations of the various ways a concept may be described.</p> <p>Synonyms (unlike fully specified names) are not necessarily unique because the same term can be used to describe more than one concept .</p> <p>The preferred term is the synonym marked as preferred for use in the Language Reference Set for a given language or dialect.</p>

Term	Description
Target Code	A code or identifier in a code system, classification or terminology other than SNOMED CT®.
Term	A human-readable phrase that names or describes a concept. A term is one of the properties of a description. Other properties of a description link the term to an identified concept and indicate the type of description(e.g. Fully Specified Name, Synonym, etc.).
Terminology	A clinical terminology is a structured vocabulary used in clinical practice to accurately describe the care and treatment of patients such as SNOMED CT®.
Terminology Binding	A link between a terminology component and an information model artifact, such as class or attribute in an electronic health record or message.
Terminology Server	Software that provides access to SNOMED CT® (and/or to other terminologies). A terminology server typically supports searches and Navigation through Concepts. A server may provide a user interface (e.g. a browser or set of screen controls) or may provide low-level software services to support access to the terminology by other applications.
Terminology Service	A function performed by software that interacts with one or more representations of the terminology and provide access to information derived from the terminology.
User Interface	The way a software application presents itself to a user including, its' on screen appearance, the commands it puts at a user's disposal, and the manner in which the user can access and update information by using the application.

Term	Description
Value Set	A uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set.
Version	A new version of the International Edition of SNOMED CT® is released twice a year (in January and July). National extensions mostly follow this cycle (albeit typically with a three month delay). However, some extensions (notably those including medication related concepts) are released more frequently.
World Health Organization (WHO)	The directing and coordinating authority for health within the United Nations system. The World Health Organization (WHO) maintains the International Statistical Classification of Diseases and Related Health Problems (ICD).

4.0 Appendix B – BC Health Concerns and Diagnosis Value Set

The following is a screenshot from the BC Health Concerns and Diagnosis Value Set:

SNOMED ID	SNOMED Term	ICD-10	ICD-10CA Term	Ced	CedDes (ICD-10CA) Term	ICD-9	ICD-9 Term	SNOMED SYNONYMS
281004	Dementia associated with alcoholism (dis)	F1027	Alcohol dependence with alcohol-in	F03	Unspecified dementia	2912	Alcohol-induced persisting dementia	Alcohol-induced persisting demen
290006	Melnick-Fraser syndrome (disorder)	Q870	Congenital malformation syndrome	Q899	Congenital malformation, unspecified	7560	Anomalies of skull and face bones	Branchio-oto-renal syndrome, BOI
297009	Acute myringitis (disorder)	H730	Acute myringitis	H669	Otitis media, unspecified	3840	Acute myringitis	myringite aiguë, Acute tympaniti
317006	Reactive hypoglycemia (disorder)	E161	Other hypoglycaemia	E162	Hypoglycaemia, unspecified	2512	Hypoglycemia, unspecified	Hypoglycemic reaction, Hypoglyce
355001	Hemorrhagic shock (disorder)	R571	Hypovolaemic shock	R571	Hypovolaemic shock	7855	Shock without mentions of trauma	choc hemorrhagique, Haemorrhagi
378007	Morquio syndrome (disorder)	E762	Other mucopolysaccharidoses	E889	Metabolic disorder, unspecified	2775	Mucopolysaccharidosis	mucopolysaccharidose type IV, Ch
442001	Secondary hypopituitarism (disorder)	E230	Hypopituitarism	E237	Disorder of pituitary gland, unspecifie	2532	Panhypopituitarism	
554003	2p partial trisomy syndrome (disorder)	Q922	Major partial trisomy	Q999	Chromosomal abnormality, unspecifie	7585	Other conditions due to autosomal anomalies	

The Value Set and guides can be downloaded from:

<https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/health-information-standards/standards-catalogue>

It can also be accessed from the Infoway Terminology Gateway in future at:

- <https://tgateway.infoway-inforoute.ca>

5.0 Appendix C – SNOMED CT® Expressions

SNOMED CT® provides a mechanism that enables clinical phrases to be represented, even when a single SNOMED CT® concept does not capture the required level of detail. This is important as it enables a wide range of clinical meanings to be captured in a record, without requiring the terminology to include a separate concept for every detailed combination of ideas that may potentially need to be recorded. Application software that supports the use of SNOMED CT® expressions enables detailed clinical information to be recorded, retrieved and analyzed.

Clinical expressions using SNOMED CT® concepts can be of two types: pre-coordinated expressions, which use a single SNOMED CT® concept identifier; and post-coordinated expressions, which contain more than one SNOMED CT® identifier.

Pre-coordinated expressions are expressions that represent the meaning of individual concepts which are predefined in SNOMED CT®, For example, laparoscopic emergency appendectomy would be captured as:

```
174041007|laparoscopic emergency appendectomy|
```

Expressions that contain two or more concept identifiers are referred to as post-coordinated expressions. Post-coordination combines concepts and allows more detail to be added to the meaning represented by a single concept. For example, laparoscopic emergency appendectomy would be captured as:

```
80146002|appendectomy|:260870009|priority|=25876001|emergency|, 425391005|using access device|=86174004|laparoscope|
```

The BC Health Concerns and Diagnosis Value Set uses pre-coordinated expressions only.

6.0 Appendix D – Related Links

- SNOMED CT® E-Learning Server; <http://snomed.org/elearning>.
- SNOMED International Website; <http://snomed.org>.
- SNOMED CT® Collaboration Platform; <http://snomed.org/confluence>.
- SNOMED CT® Browser; <http://browser.ihtsdotools.org>.
- SNOMED CT® Mapping Tool; <https://confluence.ihtsdotools.org/tools/snomed-ct-mapping-tool>.
- Infoway Terminology Gateway; <https://tgateway.infoway-inforoute.ca>.
- Infoway Request Management Tool; <https://infocentral.infoway-inforoute.ca/en/tools/collaboration-tools/informs>.
- BC Ministry of Health Standards Catalogue;
<https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/health-information-standards/standards-catalogue>

7.0 Appendix E – References

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