2.1. Motivation for Implementation

SNOMED Clinical Terms (SNOMED CT) is widely recognized as the leading global clinical terminology for use in electronic health records. It is maintained and developed by an International body (the SNOMED International) which has a growing community of Members and Affiliates. It is available free for use in Member countries and can also be used in other countries based on openly published licensing terms that are designed to be affordable. SNOMED International policies allow for the open involvement of its Members and Affiliate Licensees in the development of content and the design of future enhancements.

The features of SNOMED CT include:

- A broad scope that covers most of the clinical concepts used in patient centered clinical records;
- Ability to express different levels of clinical detail in patient record entries by using expressions containing one or more concept identifiers ;
- Relationships between concepts that enable consistent retrieval of a common form of clinical information for many different purposes;
- Extensible design allowing graceful, evolutionary enhancement and addition of national, local or specialty content within a coherent standard structure;
- A reference set mechanism to support representation of language / dialect variants, value sets , alternative hierarchies and mapping to classifications;
- Component permanence with history tracking;
- Good compliance with the essential features for future clinical terminologies as identified by JJ Cimino in his peer acclaimed 1998 paper .

SNOMED CT is designed to enable effective representation of clinical information in electronic health records. While there are other potential uses for SNOMED CT, the potential benefits are greatest where it is implemented as a part of a Clinical Information System centered on the delivery of health care services to individuals and populations.

The benefits actually realized by implementation depend on the technical design of applications and the way they integrate SNOMED CT with other essential elements. These technical issues are addressed in this guide. Another critical success factor is a process for managing implementation across an organization, region or country. Although the guide does not address broader issues of operational implementation within an organisation, it does provide a key source of reference for those specifying the practical details of a plan for large scale implementation of SNOMED CT .

Benefits for electronic health records

Implementation of SNOMED CT, as part of a well-designed Clinical Information System, is the key to unlock many of the potential benefits of electronic health records .

SNOMED CT enables consistent representation of clinical information within electronic health records. Its content and design allow most types of clinical information to be represented at levels of detail appropriate to a wide range of different use cases. The hierarchical and defining relationships of SNOMED CT facilitate effective meaning-based retrieval and reuse of this information. By using these relationships, a SNOMED CT enabled application can query electronic health records to extract, analyze and aggregate relevant data recorded in different settings and at different levels of detail.

Many of the benefits of electronic health records require an effective retrieval and reuse of clinical information. These include:

- Enhancing the care of individual patients:
  - Display of appropriate information to enable clinical staff to assess the condition and needs of patients;
  - Decision support tools that help to guide safe, appropriate and effective patient care;
  - Communicating, sharing and maintaining information in ways that enable different members of the health care team to access and use relevant information collected at different places and times .
- Enhancing the care of populations of patients:
  - Epidemiology monitoring and reporting;
  - Research into the causes of diseases;
  - Research into the effectiveness of different approaches to disease management and treatment.
- Supporting cost-effective delivery of care:
  - Using decision support to minimize the risk of costly errors in treatment;
  - Reducing duplication of investigation and interventions through effective access to shared information about the patient;
  - Auditing the delivery of clinical services; with more opportunity to analyze outliers and exceptions in the pattern of care delivery;
  - Planning future service delivery based on emerging health trends, perceived priorities and changes in clinical understanding.

Delivering these benefits depends on consistent representation of the various types of information that are represented in a health record. It must be possible to represent this information at different levels of detail and it must be possible to query this information from various perspectives and at different levels of detail. To meet these requirements electronic health records need a well-maintained terminology that meets the criteria specified in *Desiderata for Controlled Medical Vocabularies in the Twenty-First Century*(*Cimino JJ in Methods Inf Med. 1998 Nov;37(4-5):394-403*). SNOMED CT addresses these requirements and additional practical requirements for an implementable, globally applicable but locally extensible, multilingual solution.

Benefits for knowledge representation

Implementation of SNOMED CT within a knowledge resource, such as an electronic reference book, clinical guideline, decision support protocol, facilitates effective access from, or integration with, Clinical Information Systems .

The use of SNOMED CT in electronic health records enables consistent processable representation of clinical information. Potential uses of this information include linkage to knowledge sources to assist its understanding and interpretation.

Developers of decision support protocols, care pathways or data analysis packages can benefit by using SNOMED CT to represent requirements for clinical information collection and processing. This allows direct translation of the protocol into queries that can be applied directly to a SNOMED CT enabled electronic health record .

Publishers of knowledge based resources can benefit by tagging their information using SNOMED CT. These tags can be used to index information by concept rather than by keywords. As a result, relevant information can be identified by users during interaction with an electronic health record . For example, when selecting a particular item during data entry or review potentially relevant articles can be listed and/or displayed.

SNOMED CT also offers benefits during the development of knowledge resources. Tagging information using SNOMED CT while authoring knowledge artifacts may identify potential ambiguities that would otherwise be overlooked.

Benefits of an open global approach

Implementation of SNOMED CT offers the benefit of a global approach to the requirements for clinical terminology.

Any country or large organization that is developing or deploying electronic health records needs to consider the requirements for consistent representation of clinical information. One element of the solution is usually a coding scheme, controlled vocabulary or terminology. The breadth or scope and depth of detail in clinical records means that the set of codes or term required is large and grows rapidly as additional disciplines and specialties become involved. Similarly the interdependency of term used in different domains leads to a significant level of complexity.

Developing and maintaining a terminology that adequately addresses clinical requirements is a substantial task. A global approach has significant benefits by enabling economies of scale for National bodies and health care service providers.

A global approach also encourages common solutions to some of the challenges posed by requirements for consistent representation of complex information. The resulting reduction in divergence provides a more secure foundation for implementers who wish to deploy their applications in many countries.

Implementing a global clinical terminology also enables applications to be deployed in other countries without needing to switch between terminologies. It also allows use of other standards and materials that incorporate or are designed for use with that terminology. The ability to integrate components and standards based on a common terminology is a major advance over solutions that depend on a local or proprietary code system.

A global clinical terminology also provides a foundation for communication and sharing of information. The information communicated may include clinical records used to support delivery of health care to a mobile population. It may also include aggregations of records used for epidemiology and multi - center research.

Benefits of extensibility and configurability

Implementation of SNOMED CT allows common approaches to be applied to extend and configure the terminology for use in a particular environment.

Most clinical concepts are relevant in all countries, organizations and specialties but some concepts are relevant only to a particular environment. SNOMED CT allows national, local or organizational requirements to be addressed by separately maintained SNOMED CT Extensions. SNOMED CT enabled implementations can benefit from the content in these Extensions without the need for any additional software development because Extensions have exactly the same structure as the International Release .

SNOMED CT covers a broad domain to depth of detail appropriate to a range of health care disciplines and clinical specialties. As a result, it has an extensive content, different parts of which are needed in particular environments. The SNOMED CT design includes the Reference Set mechanism which provides a standard way to refer to a set of SNOMED CT components. Reference Sets can be used to configure different views of SNOMED CT by constraining searches or representing short lists of terms for a data entry field. They can also be used to meet other requirements including checking that a concept id falls within a permitted set of values for a field in a data structure or message (e.g. to represent an HL7 value set).

- Organizations implementing SNOMED CT benefit from Reference Sets because they allow requirements for use of particular terms and concepts to be represented in a form that can be applied to any SNOMED CT enabled application. This allows Reference Sets to be shared throughout and between organizations , even when different software is used to meet local or departmental requirements.
- Software developers and vendors benefit because Reference Sets provide a common, machine processable representation of requirements for different patterns of use of SNOMED CT. This simplifies local configuration and enhances interoperability with other SNOMED CT enabled applications .