1 Executive Summary

SNOMED CT is a clinically validated, semantically rich, controlled terminology designed to enable effective representation of clinical information. SNOMED CT is widely recognized as the leading global clinical terminology for use in Electronic Health Records (EHRs). SNOMED CT enables the full benefits of EHRs to be achieved by supporting both clinical data capture, and the effective retrieval and reuse of clinical information.

The term 'analytics' is used to describe the discovery of meaningful information from healthcare data. Analytics may be used to describe, predict or improve clinical and business performance, and to recommend action or guide decision making.

Using SNOMED CT to support analytics services can enable a range of benefits, including:

- Enhancing the care of individual patients by supporting:
  - Retrieval of appropriate information for clinical care
  - Guideline and decision support integration
  - Retrospective searches for patterns requiring follow-up
- Enhancing the care of populations by supporting:
  - Epidemiology monitoring and reporting
  - Research into the causes and management of diseases
  - Identification of patient groups for clinical research or specialized healthcare programs
- Providing cost-effective delivery of care by supporting:
  - Guidelines to minimize risk of costly errors
  - Reducing duplication of investigations and interventions
  - Auditing the delivery of clinical services
  - Planning service delivery based on emerging health trends

SNOMED CT has a number of features, which makes it uniquely capable of supporting a range of powerful analytics functions. These features enable clinical records to be queried by:

- Grouping detailed clinical concepts together into broader categories (at various levels of detail);
- Using the formal meaning of the clinical information recorded;
- Testing for membership of predefined subsets of clinical concepts; and
- Using terms from the clinician's local dialect.

SNOMED CT also enables:

- Clinical queries over heterogeneous data (using SNOMED CT as a common reference terminology to which different code systems can be mapped);
- Analysis of patient records containing no original SNOMED CT content (e.g. free text);
- Powerful logic-based inferencing using Description Logic reasoners;
- Linking clinical concepts recorded in a health record to clinical guidelines and rules for clinical decision support; and
- Mapping to classifications, such as ICD-9 or ICD-10, to utilize the additional features that these provide.

Analytics tasks, which may be enabled or enhanced by the use of SNOMED CT techniques, can be considered in three broad categories:

1. Point-of-care analytics, which benefits individual patients and clinicians. This includes historical summaries, decision support and reporting.
2. Population-based analytics, which benefits populations. This includes trend analysis, public health surveillance, pharmacovigilance, care delivery audits and healthcare service planning, and
3. Clinical research, which is used to improve clinical assessment and treatment guidelines. This includes identification of clinical trial candidates, predictive medicine and semantic searching of clinical knowledge.

While the use of SNOMED CT for analytics does not dictate a particular data architecture, there are a few key options to consider, including:

- Analytics directly over patient records;
- Analytics over data exported to a data warehouse;
- Analytics over a Virtual Health Record (VHR);
- Analytics using distributed storage and processing; and
- A combination of the above approaches.

Practically all analytical processes are driven by database queries. To get the most benefit from using SNOMED CT in patient records, record-based queries and terminology-based queries must work together to perform integrated queries over SNOMED CT enabled data. To this end, SNOMED International is developing a consistent family of languages to support a variety of ways in which SNOMED CT is used. Clinical user interfaces can also be designed to harness the capabilities of SNOMED CT, and to make powerful clinical querying more accessible. Innovative data visualization and analysis tools are becoming more widespread as the capabilities of SNOMED CT content are increasingly utilized.

A number of challenges exist when performing analytics over clinical data, irrespective of the code system used. These include the reliability of patient data, terminology/information model boundary issues, concept definition issues and versioning. Many of these challenges, however, are able to be mitigated using the unique features of SNOMED CT.

A number of software vendors are now realizing the competitive advantage that using SNOMED CT can provide to unlock the analytics potential of clinical data. Several commercial tools are now available that support analytics using SNOMED CT, while others are following a roadmap of increasing functionality driven by SNOMED CT.

As the SNOMED CT encoding of healthcare data increases, so too have the benefits being realized from analytics processes performed over this data.