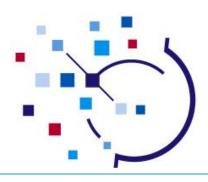
INTERNATIONAL HEALTH TERMINOLOGY STANDARDS DEVELOPMENT ORGANISATION



Documentation & Resources to Support SNOMED CT Implementation

SNOMED CT Implementation Advisor (SIA) Scheme 2012 Progress Report

Presenters: David Markwell, Mikael Nyström, Alejandro Lopez Osornio, Sarah Ryan, Mark Shafarman & Harold Solbrig

Chief I&I Officer and SIA Scheme participants

International Health Terminology
Standards Development Organisation



Documentation & Resources to Support SNOMED CT Implementation

Introduction

David Markwell



Documentation & Resources to Support **SNOMED CT Implementation**

Audience

- People involved in designing, developing, procuring, deploying or maintaining SNOMED CT implementations.
- People interested in participation in the SNOMED CT Implementation Advisor (SIA) scheme in 2013

Objectives

- To make attendees aware of the SIA scheme, its objectives, approach, progress so far, and opportunities for future involvement.
- To introduce documentation updates developed as SIA assignments to offer improved access to authoritative specifications and experience-based implementation guidance.

Documentation & Resources to Support SNOMED CT Implementation Overview

- The SNOMED CT Implementation Advisor (SIA) scheme
- Short presentations by each SIA participant
- Plans for the SIA Scheme in 2013
- **Questions & Discussion**



SNOMED CT Implementation Advisor Scheme

- Established this year to address need to ...
 - Increase availability of skilled implementation resources
 - Address known gaps in documentation and other implementation support services
- Similar approach to Consultant Terminologist Program
 - Initiated by the Chief Terminologist in 2011 and now in its second year
- One year scheme
 - Estimated eighty days for learning activities and assignment work
- Five participants this year
 - Three seconded by their employers
 - Two funded by IHTSDO (using budget for work items undertaken as assignments by SIA participants)



Aims of the SIA scheme

- To train and mentor people with existing knowledge of **SNOMED CT**
 - To enhance their implementation focused knowledge and skills
 - To assess them for accreditation as Registered SNOMED CT Implementation Advisors (RSIA).
- To progress IHTSDO Workplan items related to **SNOMED CT Implementation**
 - Utilizing assignments undertaken by SIA trainees
 - Including developing and updating documents that support wider and more consistent implementation of SNOMED CT



Documentation & Resources to Support SNOMED CT Implementation SIA Participant Presentations

- Getting to know SNOMED CT
- Frequently Asked Questions
- **Technical How to Guides**
- **Enhanced Implementation Guidance**
- Consistency, Glossary and Documentation Review



Documentation & Resources to Support SNOMED CT Implementation

Getting to know SNOMED CT

- A personal perspective
- Developing introductory "How to" guides

Mark Shafarman



A personal perspective

- I've been active in HL7 and CEN TC 251 during the last two and a half decades, and more recently in ISO TC 215 and CIMI (the Clinical Information Modeling Initiative).
- In the same time period, I've also been involved in creating networked, integrated health information systems for both start-up and established companies, and have had experience with the generic problems of binding standard vocabularies to information-model based systems
- Along the way, I became what is now known as an "information architect" and increasingly concerned with enabling the semantic interoperability of clinical information between real-time systems (e.g. various networked, integrated clinical information systems), and also with the secondary use of such data for various types of medical research, public health, and utilization



In an 'ordinary' coding system

- Each code has a single unique human-readable term
 - This acts as a textual definition of the code meaning
- Each textual definition (a single term) is uniquely associated with a code.
- Limitations of 'ordinary' code systems
 - Axes that group and/or organize the meaning of codes, are either not represented or have an ad-hoc structure that is not described in a formal logical (and implementable) way
 - No formal way of extending the system for different countries, languages, clinical specialty use cases, etc.
 - No specified methodology for mapping an 'ordinary' coding system to other coding systems
 - No way, within the coding system, to create logical expressions that can be used in rules-based processing



SNOMED CT: more than just a coding system

- Multiple ways of representing a concept: Fully Specified Names, Preferred Terms, and Synonyms
- A basic logical model for clinical terminology
- Multiple computable ways of expressing the relationships between and among concepts: including an expression language (that can be used by "reasoners")
- Computable (and formally extensible) ways of defining logical metadata specifying the needed types of relationships
- All of these "design features" define not just a terminology, but are effectively
- an *architecture* for implementing the terminology
- an architecture for using that terminology in a number of related applications, from terminology services and servers, to clinical decision support and research



Learning about SNOMED CT

- My first introduction to SNOMED was in 1983
 - When CAP was distributing 9-track tapes and two companion printed volumes... and there's been a lot of progress & evolution since 1983!
- My current introduction to SNOMED CT began with a number of IHTSDO tutorials, followed by the User Guide and Editorial Guide, and the Technical Implementation Guide
 - But it wasn't easy arriving at the 'big picture.' I knew about lots of details, but they weren't fitting together
- And unlike "ordinary" coding systems, I could not get a "feel" for SNOMED CT by paging through a code book or viewing simple linear files
- For a beginner like myself, experimenting with one of the publicly available SNOMED CT browsers was a good place to start putting together all the bits and pieces ...



Exploring SNOMED CT using a browser

- I started to explore the subtype hierarchies
 - Clinical finding, Procedure, Observable Entity, Body Structure, Organism, etc.
- That was followed by exploring in the opposite direction
 - Beginning with a word or phrase,
 - finding matches in different subtype axes
 - looking at its descendants, until I found the concept I wanted
- At that point I was able to discover further details:
 - the Fully Specified Name
 - the Preferred Term in a particular supported language
 - what types of qualifiers could be applied and what were their own subtype hierarchies
 - definitions of concepts, implemented in the SINOMED CT expression language
- Only then, could I go back to the tutorials and release documents and "see" how the parts of SNOMED CT fit together

Introducing SNOMED CT to various user communities

- My experiences with SNOMED CT have provided me with the necessary background to write short "How To Guides" for several types of audience:
- Basic How To Guides

For example:

- How to understand SNOMED CT
- Clinical How To Guides

For example:

- How SNOMED CT can represent various "domains/areas" of clinical knowledge: the basic clinical axes ("top level concepts")
- Technical How To Guides

For example:

How to obtain SNOMED CT release files



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Frequently Asked Questions

- Accessible, authoritative answers to common questions
- Integrated links to specifications and guidance

Mikael Nyström



FAQ query example

What is "Stockholm"?

Stockholm is the capital and the largest city of Sweden and constitutes the most populated urban area in Scandinavia. [see Ref #1]

Stockholm is located on Sweden's south-central east coast, where Lake Mälaren meets the Baltic Sea. [see Ref #2] The central parts of the city consist of fourteen islands. [see Ref #3]

Related Information

- Sweden
- Scandinavia
- Baltic sea
- Arlanda airport
- Hotels in Stockholm



Developing FAQ answers

- Select keywords for the question
- Search released documents using the keywords
 - Technical Implementation Guide
 - User Guide
 - Editorial Guide
- Collect references to all relevant document sections
- Read the relevant sections and make an outline for the answer
- Write the answer with references to (a subset of) the relevant sections in an easy accessible language, but with the correct terminology
- List all relevant sections in the end of the answer



Evaluation of methods

Benefits

- Easy accessible answers
- Answers in line with the released documents
- Easy to acquire more information using the references
- Find errors in the released documents
- Find gaps in the released documents

Drawbacks

- Centrally time consuming method (but not for the community)
- Is it worth it?
 - Yes



What is a "preferred term"?

Each concept has one description of type preferred term in each dialect and its term is a common word or phrase used by clinicians to name that concept. Unlike the fully specified name the descriptions of type preferred term do not need to have a unique term. Occasionally, the term in a description of type preferred term for one concept may also be identical to a term in a description of type synonym or preferred term for a different concept. Interpretation in these cases will depend on context of use. [see Descriptions]

The use of a description can vary between different languages, dialects and contexts, so a description may be a preferred term in one dialect and a synonym in another dialect. [see <u>Descriptions</u>] Language reference sets are used to specify the type of a description in a specific situation. [see <u>Language Reference Set</u>]

Related Information

- Descriptions
- Relationships between files
- Description File
- Language Reference Set
- Description Format Reference Set

- Managing duplicate terms
- Concept Enumerations for descriptionTypeId
- Language Reference Sets
- Description Format Reference Set



Current FAQ areas

- **General Questions**
- Terms and Descriptions
- Relationships between Concepts
- Expressions, Precoordination and Postcoordination
- http://www.ihtsdo.org/faq



Documentation & Resources to Support **SNOMED CT Implementation**

Reference Set "How to Guides"

 Step by step guides on working with Reference sets (with Integrated links to specifications and guidance)

Harold Solbrig



Reference Sets

- New to Release Format 2 (RF2)
- Extensible and maintainable replacement for RF1 subsets and cross maps
- Not to be confused with "subset"
 - Reference sets will support subsets…
 - ... but also support a whole lot more
 - Ordering, additional properties, relationships, maps, languages, ...



Reference Sets

Are Maintainable –

- All reference sets are based on a common model that supports
 - change history
 - point in time query
 - incremental update
- RF2 comes with a core set of table structures that address a variety of existing needs including...
- ... the definition of RF2 tables themselves, making additions relatively straight forward

The process of loading, querying, updating and extending reference sets, however, is a non-trivial process...



Working With Reference Sets

SIA task is, for each reference set, documenting:

- The intended purpose
- Sample content
- How to
 - Load and Update
 - Query
 - Create and extend
 - Disseminate
- Using SQL (MySQL) and command line utilities



Focus Area

- Reference Set Implementation How To Guides
 - How to Use a Simple Refset as a Subset of Concepts
 - How to use a Language Refset
 - How to use a Simple Map Refset
 - How to use a Complex Map Refset
- Extension Maintenance How To Guides
 - How to Create and Manage an Extension
 - How to Create a Simple Reference Set
 - How to Represent Subsets of Concepts Using a Refset
 - How to Represent a Mapping Using a Refset (simple and complex maps)
 - How to Represent Term Preferences Using a Refset (e.g. for languages and dialects)
 - How to Update a Refset to Take Account of Changes Between Releases



Reference Set How To Outline

- Overview
- Before You Start
- Table Layout
- How To Create and Load SQL Tables (e.g. MySQL)
 - SNAPSHOT Release
 - FULL Release
- How to (task)
 - SNAPSHOT Release
 - FULL Release
 - Unix Command Line
- Additional References
 - Cross references to other Documentation



Example

How to determine whether a concept is a member of a simple reference set

SNAPSHOT Release Type

The following query returns 1 if \(\rightarrow component \(sctid \rightarrow \) is a member of the simple reference set identified by \(\rightarrow refset \(sctid \rightarrow \) and 0 otherwise

```
SELECT count(*) FROM simplerefset_ss
WHERE refsetid = (refset sctid) AND active = 1
AND referencedComponentId = (component sctid);
```

FULL Release Type

```
SELECT count(*)
FROM simplerefset_full srs,
(SELECT id, MAX(effectiveTime) AS effectiveTime FROM simplerefset_full WHERE refsetId = (refset sctid) GROUP BY id) as srs
WHERE srs.id = srs_keys.id AND srs.effectiveTime = srs_keys.effectiveTime AND active = 1
AND referencedComponentId = (component sctid);
```

Command Line

The following command (a) removes the header line, (b) extracts the active, refsetId and referencedComponentId columns, (c) filters for active entries in \$\ref{refset} \sctid \dagger\$, (d) extracts the referenced component sctid column (e) filters for a \$\ref{referenced} \congonnent \sctid \dagger\$ and (e) counts the results, which will yield either a 0 or a 1

```
tail +2 der2_Refset_SimpleSnapshot_INT_20120731.txt | cut -f 3,5,6 | grep ^1\\\t(refset sctid) | cut -f 3 | grep (referenced
```



Documentation & Resources to Support **SNOMED CT Implementation**

A standard approach to SNOMED CT terminology service requirements

Using Common Terminology Services 2 (CTS2) to assist **SNOMED CT implementation**

Harold Solbrig



Terminology Services

Extending Terminology Services portion of Technical Implementation Guide

Adding Common Terminology Services 2 (CTS2) Implementation Guide



Common Terminology Services 2

- HL7 and OMG Standard
- Defines a set of structured models for terminological resources, including:
 - Entity Descriptions Concept Id + "lexical properties"
 - Preferred names and synonyms by language
 - Textual definitions
 - Additional annotations and properties
 - Relationships bridges OWL and RF2 models
 - Maps model for simple and complex map refsets
 - Value Sets includes simple refsets and query definitions

Common Terminology Services 2

CTS2 also provides standard mechanisms (REST and SOAP) for loading, querying and updating terminological components

- Allows software developers to create tools that load, query and present RF2 content in a structured fashion
- CTS2 services can be
 - Deployed locally
 - Federated and queried over the internet

Example:

http://server.org/cts2/entity/74400008 - give me all descriptions and definitions of SCTID 74400008



CTS2 Implementation Guide

Formal mapping between RF2 content and CTS2 Structures

- Goal is consistent, interoperable implementation of CTS2 based terminology services
- First draft of guide ready for release
- Next steps will be dissemination, review and completion



Documentation & Resources to Support **SNOMED CT Implementation**

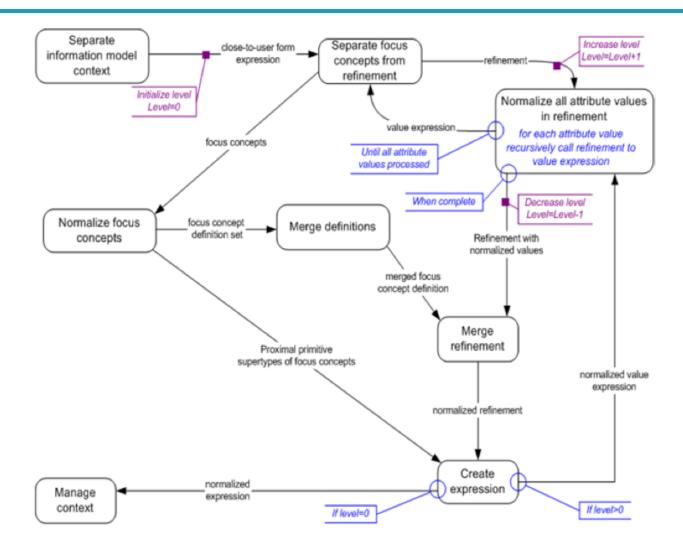
Enhanced Implementation Guidance

- Supporting precoordination and postcoordination
- Approaches to using SNOMED CT to address EHR use cases

Alejandro Lopez Osornio

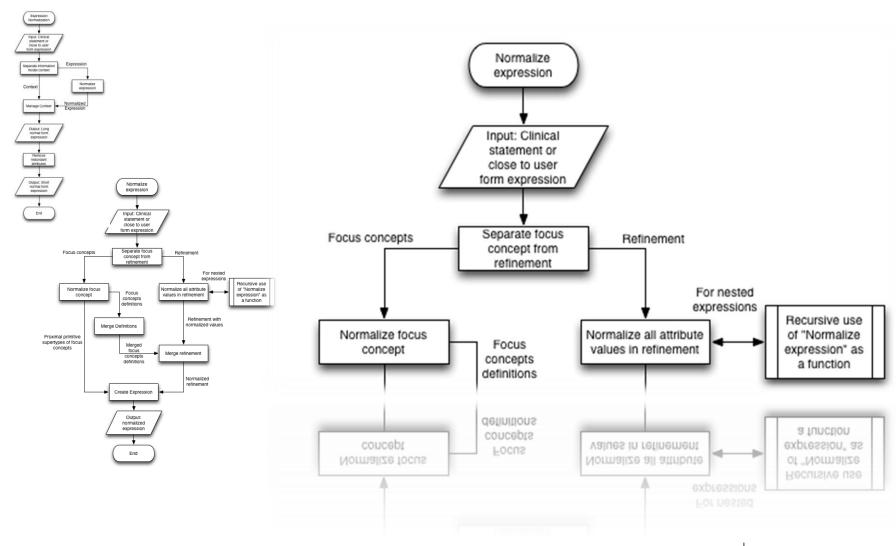


Expressions normalization documentation





Expressions normalization documentation





Expressions normalization documentation

7.8.2.4.4.2.1. Separate focus concepts from refinement

The set of focus concepts in the expression is passed to the Normalize focus concepts process.

If the expression contains a refinement, this is passed to the Normalize attribute values in refinement process.

Table 1. Separate focus concept from refinement

| | Expression |
|---------------------|--|
| Original expression | 12676007 fracture of radius + 397181002 open fracture : 272741003 laterality = 7771000 left 42752001 due to = 297186008 motorcycle accident |
| Focus Concept | 12676007 fracture of radius + 397181002 open fracture |
| Refinement | 272741003 laterality = 7771000 left 42752001 due to = 297186008 motorcycle accident |



 "Alternative approaches to expanding SNOMED CT coverage"

- Post-coordination
 - Expressions Reference Table (ERT)
 - Expressions normalization and subsumption / equivalence computer
 - User Interface widgets for guided structured data entry
- Managed Content Additions (MCA)
 - New concepts, descriptions, relationships
 - Uses a standard DL Classifier
 - User interface based on text search or direct concept references
 - Secondary coding of user suggestions

| | Post coordination | Extension |
|-------------------------------------|--|--------------------------------|
| Data entry | Structured forms, expression discovery from text phrases | Text search |
| Subsumption and equivalency testing | Normalization process | DL Classifier |
| Editorial effort | Distributed, users do the refinement. Cheap. | Centralized, more costly. |
| Upgrade to new SNOMED CT releases | Check all expressions or compute with hist. rels. | Check all concepts |
| Risk of errors | Limited impact of errors | Requires continuous QA process |



| | Post coordination | Extension |
|--------------------------------|----------------------------------|---|
| Re-usability | Expressions are not looked up | Available in text search |
| Text representation | Can be computed | Natural, human readable text representation |
| Accuracy of the representation | The user defines logically. | The user describes using text. |
| Usability by clinical users | Training required. | No training required. |
| Representation of primitives | Not available, only refinements. | Supported. |
| Sharing (Interoperability) | Shared with no changes | Need to be transformed into expressions |



Boundaries between Information Model and Terminology Model (i.e. "Family history of malignant tumour of colon")

| Information model | Terminology model |
|--|--|
| Table: family_history Field: history_sctid = 363406005 | 363406005 Malignant tumour of colon |
| Table: problems_list Field: problem_sctid = 363406005 Field: context_sctid = 281666001 | 363406005 Malignant tumour of colon 281666001 Family history of disorder |
| Table: problems_list Field: problem_sctid = 312824007 | 312824007 Family history of cancer of colon or 281666001 Family history of disorder : {246090004 Associated finding = 363406005 Malignant tumor of colon } |



Representing the knowledge in a sample clinical record

CASE #1: HEART CARE SUMMARY VISIT DATE: 21/07/2004

PATIENT: Minnie Mouse HOSPITAL: Hospital no 1

An 80-year-old patient presents herself in an outpatient clinic due to breathlessness and a lot of fatigue. The primary diagnosis is heart failure. Allergies are unknown. The patient is not diabetic and there is no answer to the question whether the patient had pain.

ON EXAMINATION (21/07/2004):

Oedema around knees. JVP at ear lobes level. Tachycardia.

Most recent ECG (17/07/2004):

Shows a heart rate of 73, atrial fibrillation and previous anterior infarct.

REQUESTED TESTS:

Glucose tolerance test

Check potassium in two weeks.

THERAPY:

Patient was recommended to start spironolactone 25mg/d.

Suggest increase carvedilol to 25mg twice per day.

Representing the knowledge in a sample clinical record

| HISTORY: | 422625006 History of present illness section |
|---|--|
| An 80-year-old patient presents herself in an outpatient clinic | 33022008 Hospital-based outpatient department |
| due to breathlessness and a lot of fatigue. | 267036007 Dyspnea 84229001 Fatigue : 246112005 Severity = 24484000 Severe |
| The primary diagnosis is heart failure. | 84114007 Heart failure |
| Allergies are unknown. | 396782006 medical history unknown : { 246090004 Associated finding =106190000 Allergy } |



Forms

| Diabetes II Form | 417319006 Record of health event |
|---------------------------------|--|
| Height | 50373000 Body height measure (observable entity) |
| Smoking status | Yes : 77176002 Smoker (finding) No : 8392000 Non-smoker (finding) |
| Signs of Peripheral neuropathy? | Yes: 373573001 Clinical finding present : {246090004 Associated finding = 302226006 Peripheral neuropathy } |
| | No : 373572006 Clinical finding absent : {246090004 Associated finding = 302226006 Peripheral neuropathy } |
| Metformin | 109081006 Metformin (product) Optional: (394725008 Diabetes medication review (procedure)) |



Documentation & Resources to Support **SNOMED CT Implementation**

Consistency and Review

- Developing a glossary
- Cross-checking consistency
- Invitation to review documents and add comments

Sarah Ryan



Developing a consistent IHTSDO Glossary

Starting Point

- Glossary material in web-published guidance materials
 - Editorial Guide, Technical Implementation Guide, etc.
- Extract of glossary definitions from various IHTSDO documents
 - Articles of Association, Affiliate License and a range of other agreements and specifications

Methodology

- Using IHTSDO Glossary Task Force Guidelines
- Review entry by entry
 - Starting with material not published in current web materials
- Cross-check
 - Different definitions of the same term
 - Different terms with similar definitions
 - Usage of terms in existing documents
- Log issues for review



IHTSDO Glossary Progress

- Draft IHTSDO Glossary included in July 2012 release
 - Web version: www.ihtsdo.org/glossary
 - Direct web lookup of phrases
 - www.ihtsdo.org/define/[word-or-phrase]
 - Downloadable PDF file <u>www.ihtsdo.org/glossary.pdf</u>
- Further work continuing
 - Add new entries
 - Resolving issues identified in the first phase
- Review required
 - Please post comments or corrections as new issues at www.ihtsdo.org/doc_issue
- Revised version of the IHTSDO Glossary
 - Due for publication with the January 2013 release



Cross checking document consistency

- As the range of documents grows it is increasingly important to check consistency between different documents
 - Technical Implementation Guide and other web-based guides
 - The IHTSDO Glossary
 - "How To" guides and "Frequently Asked Questions" are reviewed
- Using publishing tools based on the DITA standard our documents are
 - Integrated with reuse of material and extensive cross-referencing
 - This helps to improve overall consistency of documents
 - ... but there is no substitute for review and we welcome your input on any issues you find in web-published SNOMED CT documentation



Collabnet Issue Tracker

- SIA participants use the SIA issue tracker to share comments and work towards resolution
- Each issue is logged in the tracker
 - Issues are put into categories
 - Problem is defined in a textual description
 - Assigned to someone for resolution
 - Completed review is noted and removed from active list
- A public documentation issue tracker is also available for anyone who is registered to use the IHTSDO Collabnet
 - The IHTSDO encourages feedback on its web based documentation using this tracker
 - Please help us to improve the documentation by using this service at: www.ihtsdo.org/doc_issue

Documentation Issue Tracker

3

artf226912 : Link assertion

artf226887 : description format/type reference set inconsistency

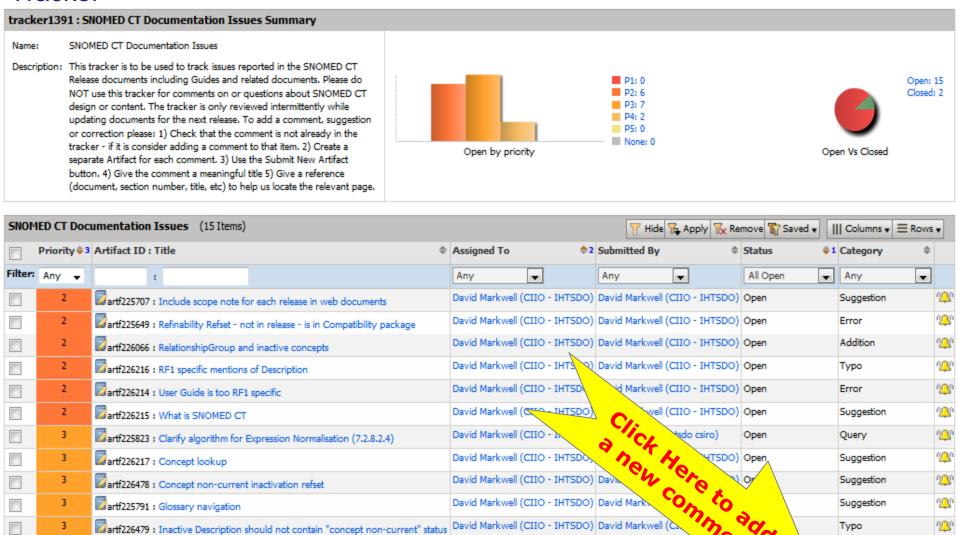
artf226740 : 'Time' glossary item inconsistent with RF2 'Time' datatype definition

artf225610 : Typo

http://www.ihtsdo.org/doc_issue

INTERNATIONAL HEALTH TERMINOLOGY STANDARDS DEVELOPMENT ORGANISATION





David Markwell (CIIO - IHTSDO) David Markwell (CIIO

David Markwell (CIIO - IHTSDO) David Markwell (CII

Export

David Markwell (CIIO - IHTSDO) Dion McMurtrie (

Monitor

David Markwell (CIIO - IHTSDO) Dion McMurtrie (Submit New Artefact

Addition

rg_gn

Туро

Recording a **Documentation Issue**

http://www.ihtsdo.org/doc_issue



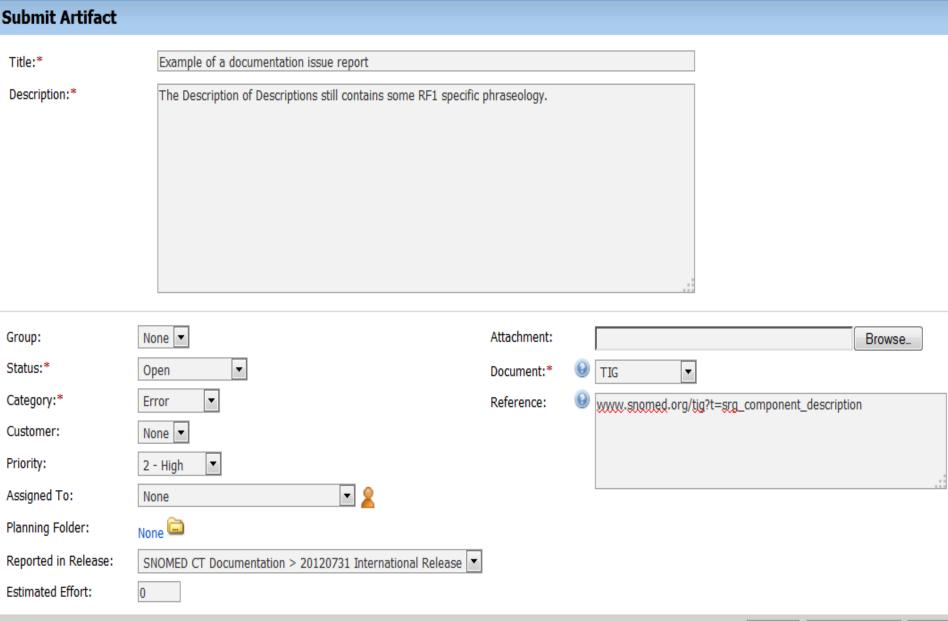


Save and View

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Submit Artifact





Documentation & Resources to Support **SNOMED CT Implementation**

Looking forward: improving the SIA scheme

- Lessons learned so far
- SIA Scheme Plans for 2013

David Markwell



SIA scheme year one evaluation (so far)

- So far the SIA scheme has met three key objectives
 - Increasing availability of SNOMED CT Implementation related knowledge and skills
 - Delivering work on assignments that will benefit the wider SNOMED CT implementation community
 - Providing experience that can be used to make further iterations of the scheme more effective in meeting these goals
- More will be done over the next three months
 - To ensure the scheme fully meets its year one expectations
 - To apply the lessons learnt in to the 2013 SIA Scheme
 - To consider the potential for continuing input from the "SIA class of 2012" to enhance the learning experience for next year's participants



Lessons Learnt and Planning for 2013

- Earlier call for applications and selection process
 - Call for applications early November 2012
 - Selection process in December with final decisions early January 2013
 - Scheme will run from early Feb 2013 to end January 2014.
- Clarification of criteria for selection
 - Clearer distinction between expectations for funded and seconded participants
 - Short assessment of applicant skills
 - Phone interviews with short-listed candidates
- Modest increase in number of participants
 - Probably six depending in quality of applications
- Face-to-face meeting
 - Early initial face-to-face meeting to kick things off
 - Slight increase in required face-to-face meeting time over year
- Clearer initial specification of assignments
 - Based on methods and templates developed in year one
 - Closer link of IHTSDO funding support to assignment delivery
- Regular tutorial program
 - Sharing of presentation load between CIIO, previous SIA participants and later in the year participant led sessions



Documentation & Resources to Support SNOMED CT Implementation

Questions & Discussion

CONTACT DETAILS

Documentation: www.ihtsdo.org/doc

Documentation tracker: www.ihtsdo.org/doc_issue

SIA Scheme information: www.ihtsdo.org/sia

Web site: www.ihtsdo.org