

LexWiki Framework & Use Cases

SMW for Distributed Terminology Development

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Mayo Clinic

NCI caBIG Vocabulary Knowledge Center

SME users meeting at Boston

November 22, 2008

Outline

- Tools supported in VKC (by Bob)
- LexWiki framework
- LexWiki features
 - Browsing support
 - Authoring support
- Main use cases
 - NCI BiomedGT development
 - WHO ICD11 revision
- Discussion points
- LexWiki demo

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Main Page

Welcome to the caBIG® Vocabulary Knowledge Center

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Background

The ability of caBIG® tools to share and integrate information from disparate sources is dependent on the use of robust vocabularies. [Mayo Clinic](#), with support from [SemanticBits](#) leverage a deep domain knowledge. [Read More](#)

Mission, Scope and Services Provided

The caBIG® Vocabulary Knowledge Center acts as the steward of the tools and documentation, providing access and support to those individuals and institutions interested in making use of or extending caBIG® tools. The high-level primary objectives include dissemination of domain expertise, community outreach, application releases, development-related activities, documentation, and training. [Read More](#)

Vocabularies and Ontologies

- [General Information](#)
- [Resources](#)
- [Documents](#)
- [Links](#)

Tool	Purpose	Links
LexGrid	<ul style="list-style-type: none"> Common access point for representing and accessing terminology content Step toward making terminologies an interoperable component of caBIG® 	<ul style="list-style-type: none"> LexGrid Resources

Announcement

What? [EVS 4.x API to 5.0 API Migration](#)
Is a Boot Camp Needed? [\[Discuss here\]](#)
More information at: [Migration Boot Camp](#)

LexWiki

- An open source, high-capacity editor for distributed terminology development.
- Based on the integration of semantic wiki and LexGrid technology.
- Developed by Mayo Clinic with collaborations of National Cancer Institute (NCI), World Health Organization (WHO) , Stanford University.

Motivation

- Ontology development becomes a community-based enterprise.
 - Ontologies are becoming so large in their coverage that no single centralized group of people can develop them effectively
 - E.g. NCI Thesaurus, BiomedGT, Gene ontology, SNOMED CT (370k)

Motivation

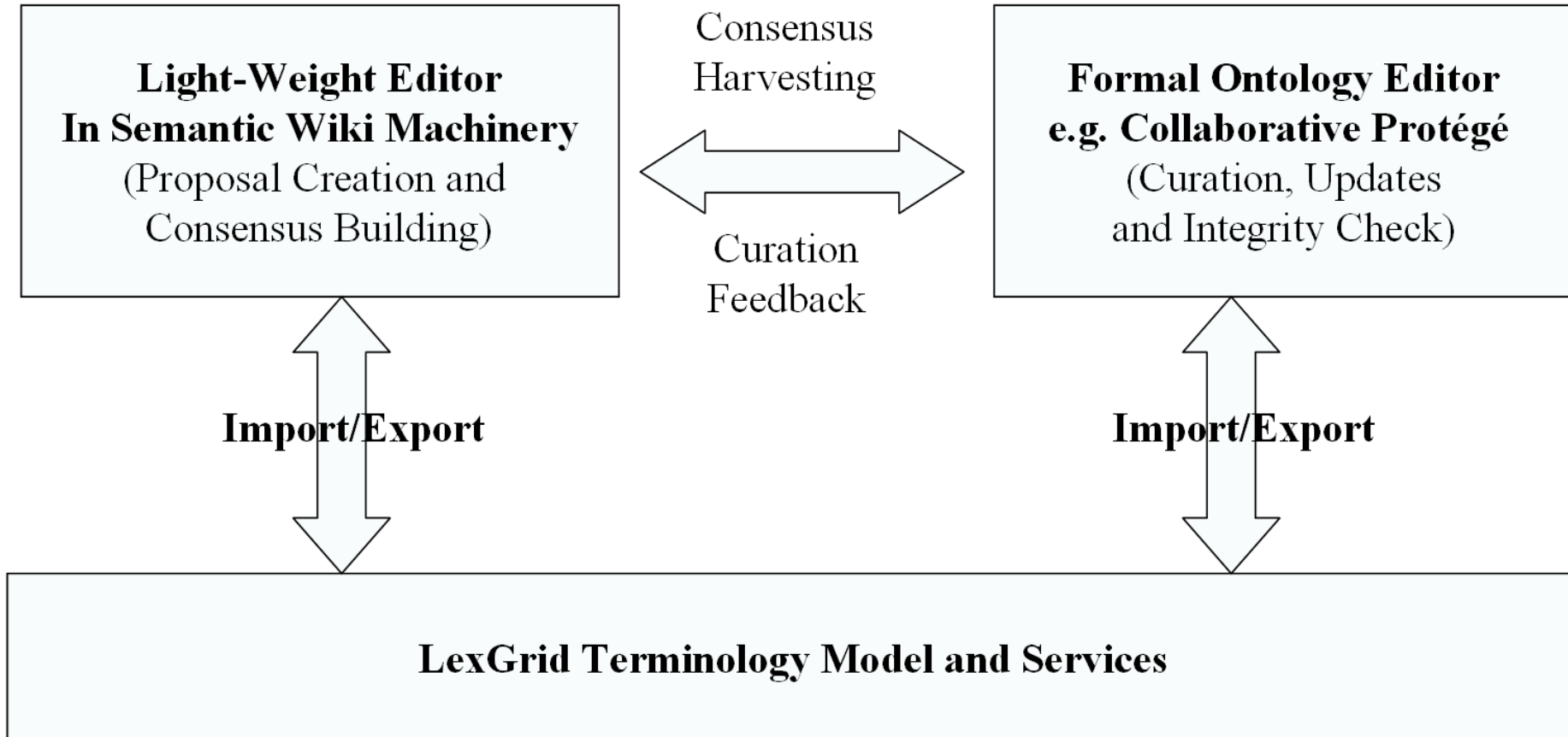
- Challenges in traditional ontology authoring,
 - ontologists must overcome dual challenges as they build, refine and maintain an abstract terminology model, that is
 - “Not only must the ontologists understand the formalism of the DL (i.e. Description Logic),
 - but also they must find effective ways to explain the model, including its formal and operational properties, to subject matter experts from many end user communities”.
 - Hartel FW, de Coronado S, Dionne R, Fragoso G, Golbeck J. Modeling a description logic vocabulary for cancer research. *Journal of Biomedical Informatics*. 28 (2005) 114-129.

Why Semantic Wikis?

- Easy to learn tool
- Open content development platform
 - ensures by design community acceptance and content relevant to community's needs
 - supports rapid publication cycles
- Change history management
- Formal output rendering (RDF export)

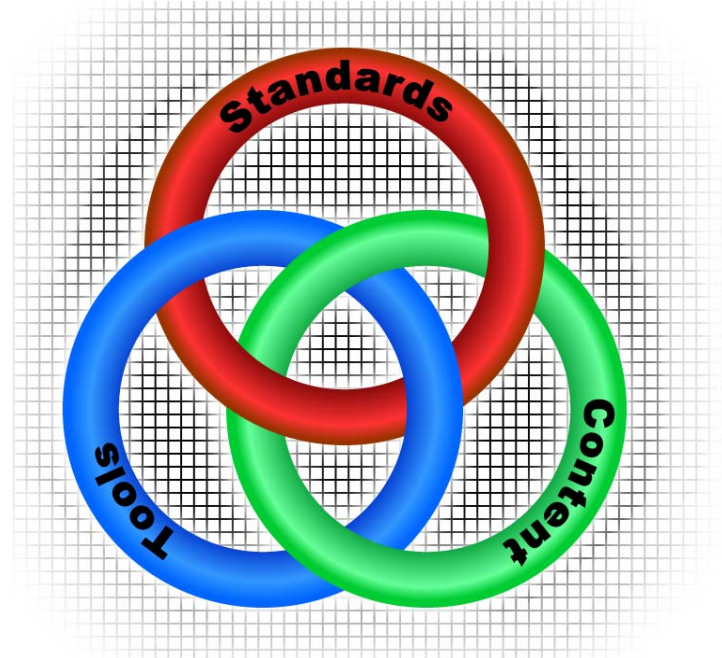
The adoption of semantic wiki machinery may provide a solution for dividing these challenges, leaving formal refinement as a separate step in an iterative authoring process.

LexWiki Framework



LexGrid Ontology Services as *Backend*

- HL7 ANSI Standard
- ISO DIS
- Open specification & source
- *Provide consistency and standardization required to support large-scale vocabulary adoption and use*
 - Common **model**, tools, formats, and interfaces
- Standard terminology model (Excel to OWL)
- Grid-nodal architecture
- <http://informatics.mayo.edu>



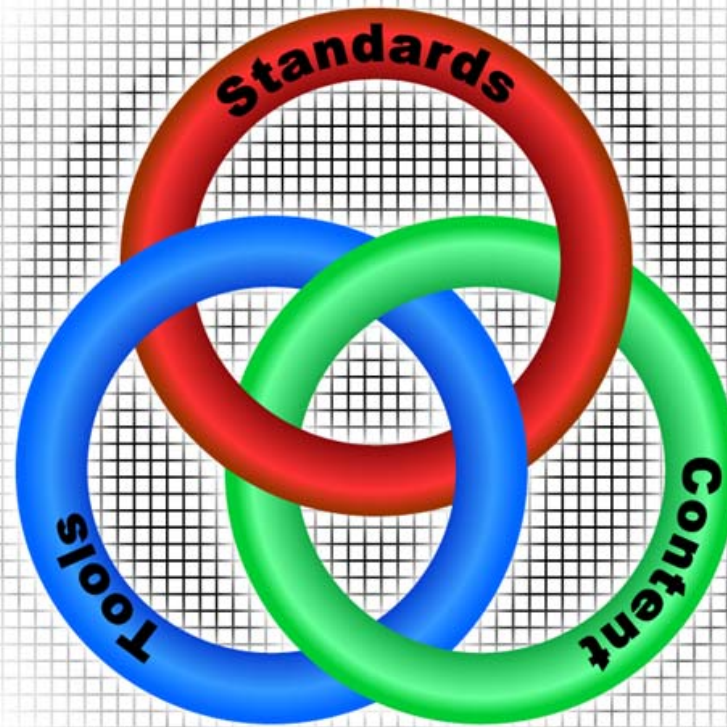
LexWiki/LexGrid/Protégé

LexWiki Tools

- Representation
- Proposal
- RDF rendering

Protégé Tools

- Content import/export
- Change set detection
- Robust DL capable editor



Terminologies

BiomedGT
CTCAE
UMLS SemNet
ICDs
SNOMED CT
HUGO
...

LexGrid

Terminology Model

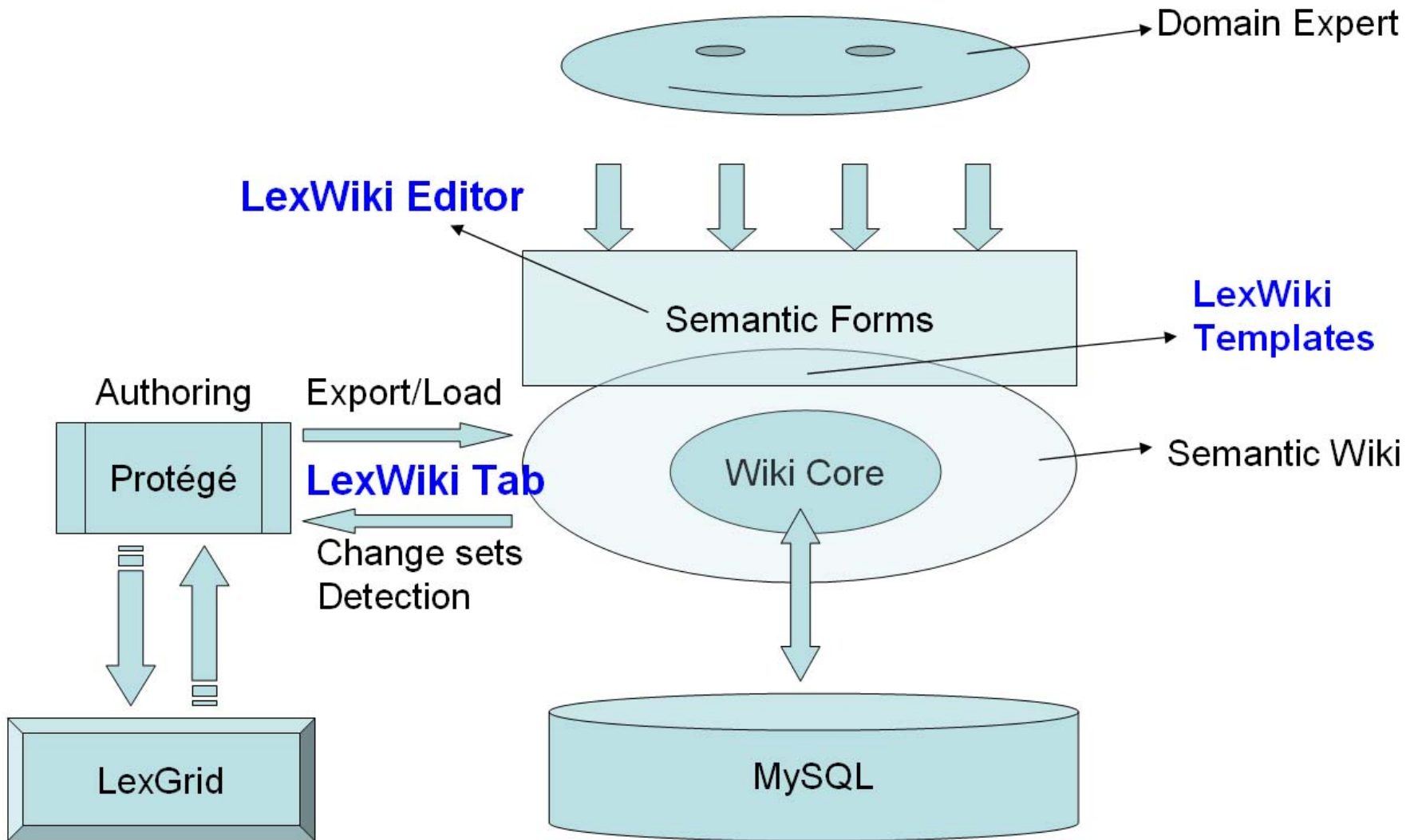
LexWiki Software Stacks (wiki side)

- MediaWiki
- Semantic MediaWiki extension
- Semantic Forms extension
- SMW Halo extension
- LexWiki Extension
- Other MediaWiki extensions
 - See <http://informatics.mayo.edu/vkcdemo/lexwiki1/index.php/Special:Version>

LexWiki Components

- LexWiki Templates
 - LexWiki representation of terminology contents and semantics
- LexWiki Editor
 - Based on Semantic Forms
- LexWiki Extension
 - A Semantic MediaWiki Extension
 - Provide Functions to access, manipulate and parse the LexWiki Semantics
- LexWiki Protégé Tab Plugin
 - Import/Export among LexWiki, LexBIG, and Protégé
 - Changeset detection
 - Workflow management
- LexWiki Workflow Management
 - My Workflow extension

LexWiki Architecture



LexWiki Features (I)

- Browsing support
 - For each category
 - Lexical
 - Properties
 - Associations
 - For each coding scheme
 - Hierarchy view
 - Freemind map
 - Hypergraph
 - among coding scheme
 - Cross reference
 - Both lexical and semantic query support

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ICD10CM

[\[-\]](#) ICD10CM

[\[-\]](#) (A00-B99) Certain infectious and parasitic diseases (CHAPTER 1)

[\[+\]](#) (A00-A09) Intestinal infectious diseases

[\[-\]](#) (A15-A19) Tuberculosis

[\[+\]](#) (A15) Respiratory tuberculosis

[\[-\]](#) (A17) Tuberculosis of nervous system

[\[+\]](#) (A17.0) Tuberculous meningitis

[\[+\]](#) (A17.1) Meningeal tuberculoma

[\[+\]](#) (A17.8) Other tuberculosis of nervous system

[\[+\]](#) (A17.9) Tuberculosis of nervous system unspecified

[\[+\]](#) (A18) Tuberculosis of other organs

[\[+\]](#) (A19) Miliary tuberculosis

[\[+\]](#) (A20-A28) Certain zoonotic bacterial diseases

[\[+\]](#) (A30-A49) Other bacterial diseases

[\[+\]](#) (A50-A64) Infections with a predominantly sexual mode of transmission

[\[+\]](#) (A65-A69) Other spirochetal diseases

[\[+\]](#) (A70-A74) Other diseases caused by chlamydiae

[\[+\]](#) (A75-A79) Rickettsioses

[\[+\]](#) (A80-A89) Viral infections of the central nervous system

[\[+\]](#) (A90-A99) Arthropod-borne viral fevers and viral hemorrhagic fevers

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ICD10CM Hypergraph

Semantic Graph (by Rob Challen)

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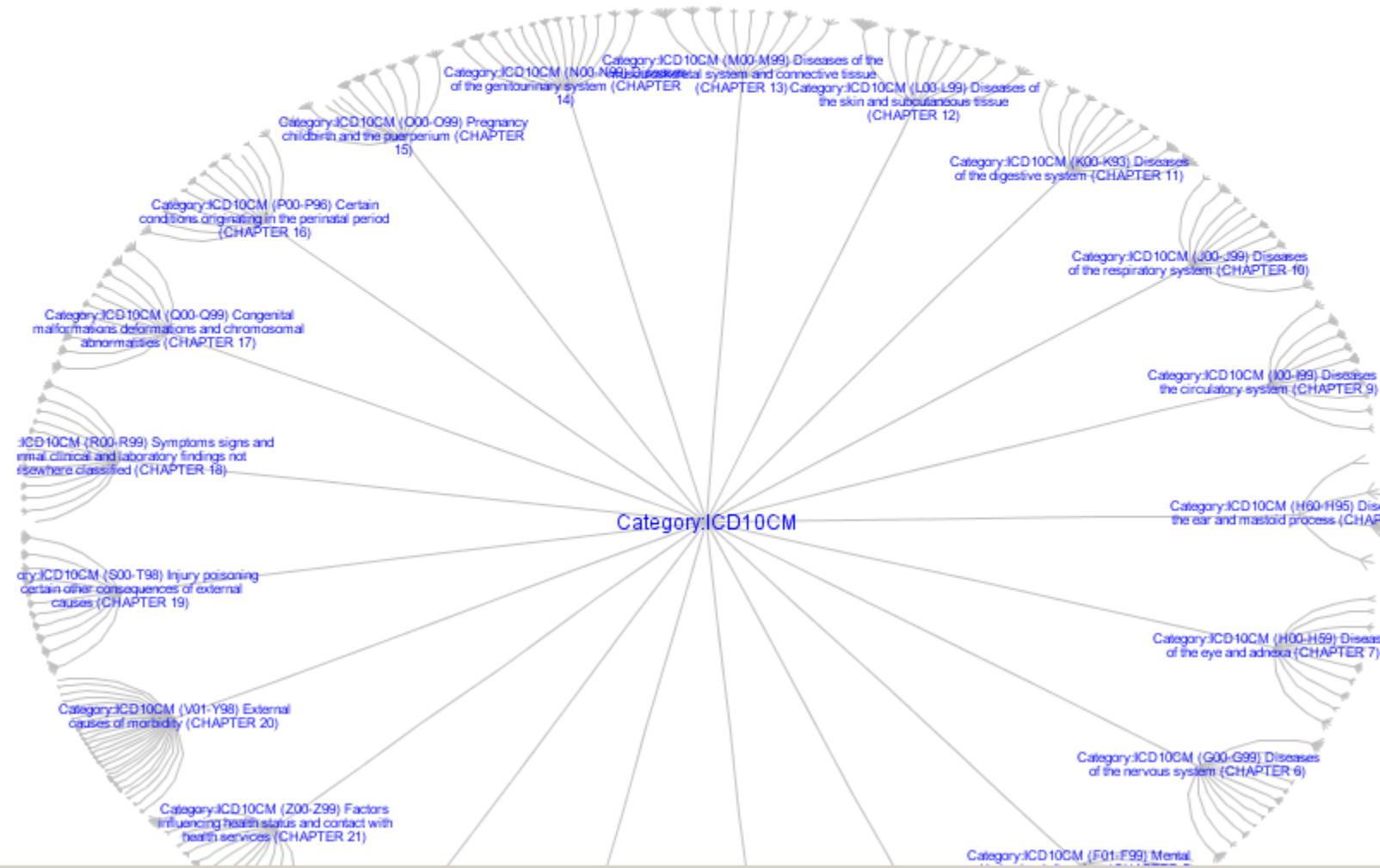
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Category:ICD10CM (A15.0) Tuberculosis of lung

[Lexical](#) [Properties](#) [Associations](#) [Factbox](#)

Concept Code: A15.0
Preferred Name: Tuberculosis_of_lung
Coding Scheme: ICD10CM JULY2007 RELEASE
ICD10CM_textualPresentation: Tuberculosis_of_lung
URI: ICD10CM JULY2007 RELEASE:A15.0

[Form:LexWiki ICD10 Form](#)

Queries for categories

[Ask for all instances of "ICD10CM \(A15.0\) Tuberculosis of lung" and for all instances of its subcategories](#)

[Category: ICD10CM \(A15\) Respiratory tuberculosis](#)

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View source


for [Category:ICD10CM \(A15.0\) Tuberculosis of lung](#)

You do not have permission to edit this page, for the following reason:

The action you have requested is limited to users in the group: [Users](#).

You can view and copy the source of this page:

```
<noinclude>{{LexWiki Basic Data Header}}</noinclude>
{{LexWiki Concept Code|A15.0}}
{{LexWiki Preferred Name|Tuberculosis_of_lung}}
{{LexWiki inScheme|ICD10CM JULY2007 RELEASE}}
{{LexWiki Presentation|ICD10CM_textualPresentation|Tuberculosis_of_lung}}
{{LexWiki URI|ICD10CM JULY2007 RELEASE:A15.0}}
<noinclude>{{LexWiki Basic Data Trailer}}</noinclude>
<noinclude>{{LexWiki Concept Property Header}}</noinclude>
{{LexWiki Concept Property|ICD10CM_Inclusion|Tuberculous bronchiectasis}}
{{LexWiki Concept Property|ICD10CM_Inclusion|Tuberculous fibrosis of lung}}
{{LexWiki Concept Property|ICD10CM_Inclusion|Tuberculous pneumonia}}
{{LexWiki Concept Property|ICD10CM_Inclusion|Tuberculous pneumothorax}}
<noinclude>{{LexWiki Concept Property Trailer}}</noinclude>
<noinclude>{{LexWiki Association Header}}</noinclude>
<noinclude>{{LexWiki
Parent|ICD10CM_(A15)_Respiratory_tuberculosis}}</noinclude>
<noinclude>{{LexWiki Inverse
Association|ICD10CM_Excludes1|ICD10CM_(J47)_Bronchiectasis}}</noinclude>
<noinclude>{{LexWiki Association Trailer}}</noinclude>
<noinclude>[[has default form::Form:LexWiki ICD10 Form]]</noinclude>
<includeonly>[[Category:ICD10CM_(A15.0)_Tuberculosis_of_lung]]</includeonly>
```

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Main Page

LexWiki Distributed Terminology Development Platform

This is a collaborative content development platform based on Semantic MediaWiki.

search

icd10cm myocar infarct

- ICD10CM (I25.2) Old **myocar**dial **infarct**ion
- ICD10CM (I24.0) Acute coronary thrombosis not resulting in **myocar**dial **infarct**ion
- ICD10CM (I23.8) Other current complications following acute **myocar**dial **infarct**ion
- ICD10CM (I23.6) Thrombosis of atrium auricular appendage and ventricle as current complications following acute **myocar**dial **infarct**ion
- ICD10CM (I23.5) Rupture of papillary muscle as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23.4) Rupture of chordae tendineae as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23.3) Rupture of cardiac wall without hemopericardium as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23.2) Ventricular septal defect as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23.1) Atrial septal defect as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23.0) Hemopericardium as current complication following acute **myocar**dial **infarct**ion
- ICD10CM (I23) Certain current complications following ST elevation (STEMI) and non ST elevation (NSTEMI) **myocar**dial **infarct**ion (within the 28 day period)
- ICD10CM (I22.9) Subsequent ST elevation (STEMI) **myocar**dial **infarct**ion of unspecified site
- ICD10CM (I22.8) Subsequent ST elevation (STEMI) **myocar**dial **infarct**ion of other sites
- ICD10CM (I22.2) Subsequent non ST elevation (NSTEMI) **myocar**dial **infarct**ion
- ICD10CM (I22.1) Subsequent ST elevation (STEMI) **myocar**dial **infarct**ion of inferior wall

By Category tree Browse by HyperGraph

By FreemindMap

veloped by
nd Stand

LexWiki Features (II)

- Authoring support
 - Proposal mechanism
 - Proposal creation (LexWiki Editor)
 - Proposal commenting
 - Evidence attachment
 - Proposal browsing
 - Change set detection
 - Change and Annotation Ontology (ChAO)
 - Formalism rendering/Integrity check in collaborative Protégé



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Category:ICD10CM (A15.0) Tuberculosis of lung

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Concept Code: A15.0

Preferred Name: Tuberculosis_of_lung

Coding Scheme: ICD10CM JULY2007 RELEASE

ICD10CM_textualPresentation: Tuberculosis_of_lung

URI: ICD10CM JULY2007 RELEASE:A15.0

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LexWiki

special

Add LexWiki ICD10 Form: Proposal for ICD10CM (A15.0) Tuberculosis of lung by Vkcdemo at 20081121183929

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- Meta
- Lexical**
- Properties
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Concept Code

Concept Code:

A15.0

Preferred Name

Preferred Name: Tuberculosis_of_lung

Coding Scheme

Coding Scheme: ICD10CM JULY2007 RELEASE

URI

URI: ICD10CM JULY2007 RELEASE:A15.0

Presentation

Name: ICD10CM_textualPresentation



page discussion edit with form history

Edit LexWiki ICD10 Form: Proposal for ICD10CM (A15.0) Tuberculosis of lung by Vkcdemo at 20081121183929

Meta Lexical Properties Associations

Parent

Association

- ICD10CM (Y82.5) Failure of sterile precautions during heart catheterization
- ICD10CM (T86.32) Heart lung transplant failure
- ICD10CM (T86.22) Heart transplant failure
- ICD10CM (I97.131) Postprocedural heart failure following other surgery
- ICD10CM (I97.130) Postprocedural heart failure following cardiac surgery
- ICD10CM (I97.13) Postprocedural heart failure
- ICD10CM (I50.9) Heart failure unspecified
- ICD10CM (I50.43) Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure
- ICD10CM (I50.42) Chronic combined systolic (congestive) and diastolic (congestive) heart failure
- ICD10CM (I50.41) Acute combined systolic (congestive) and diastolic (congestive) heart failure
- ICD10CM (I50.40) Unspecified combined systolic (congestive) and diastolic (congestive) heart failure

Summary:

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page discussion edit with form history

Proposal for ICD10CM (A15.0) Tuberculosis of lung by Vkcdemo at 20081121183929

Proposal for:Category:ICD10CM_(A15.0)_Tuberculosis_of_lung

Meta Lexical Properties Associations Factbox

Curation Status: NewChange

Reason for change: test

Categories: ICD10CM (A15.0) Tuberculosis of lung | WorkFlow LexWiki Proposal | WorkFlow CurationStatus NewChange



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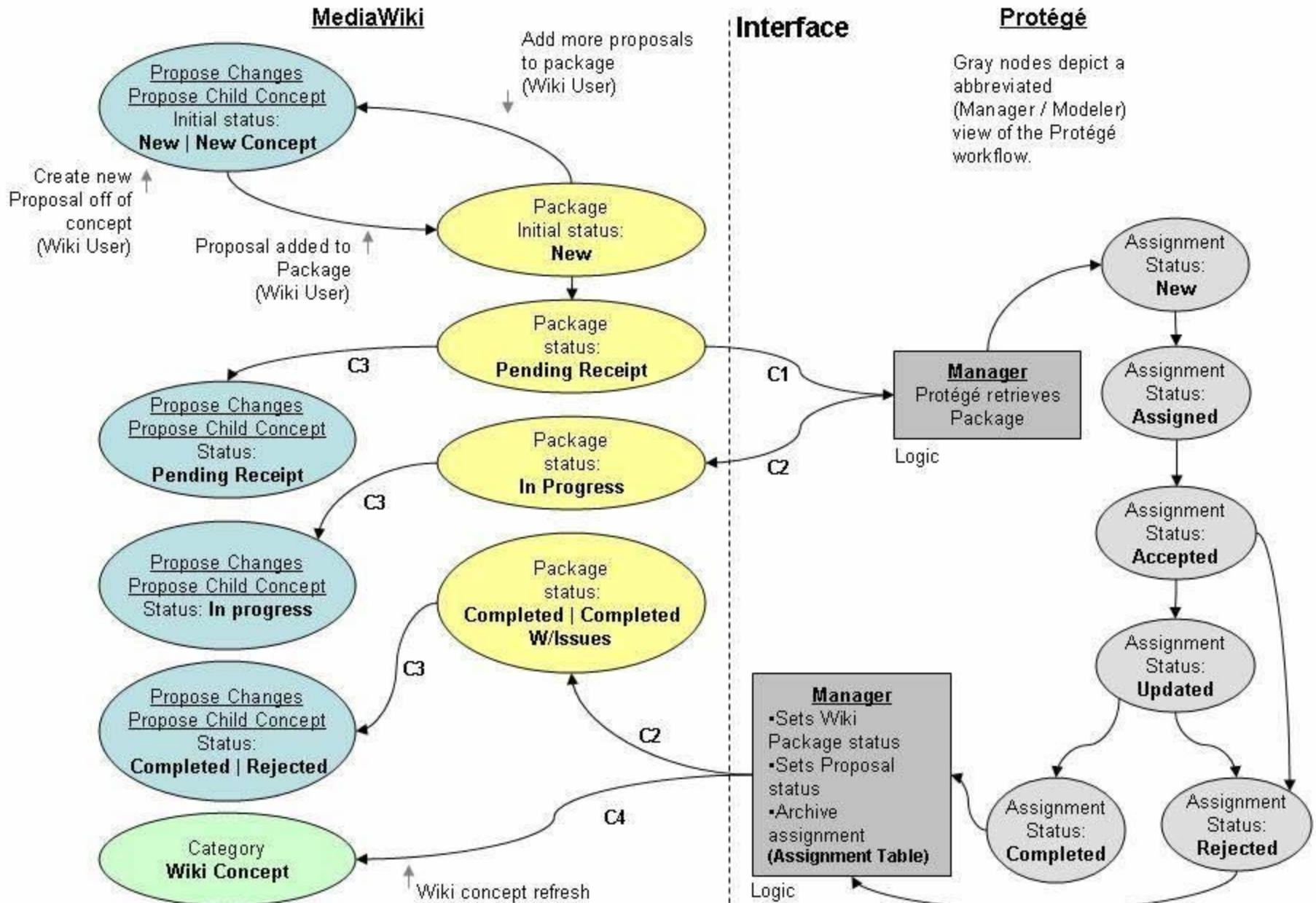
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Proposal Work flow



Main Use Cases

- Biomedical Grid Terminology (BiomedGT)
 - <http://biomedgt.nci.nih.gov/index.php>
 - Officially released at July, 2008
 - Using single proposal mechanism
 - See demo
- WHO ICD11 Revision
 - Under development
 - Using multiple proposal mechanism
 - See demo

BiomedGT wiki main page:

http://biomedgt.nci.nih.gov/index.php/Main_Page

The screenshot shows a Mozilla Firefox browser window displaying the BiomedGT wiki main page. The browser's address bar shows the URL http://biomedgt.nci.nih.gov/index.php/Main_Page. The page features a navigation menu with tabs for 'main page', 'discussion', 'view source', and 'history'. The main content area includes a search bar, a navigation sidebar with links to 'Main Page', 'Current events', 'Recent changes', 'TODO List', and 'Help', and a list of terminologies such as 'BiomedGT', 'CTCAE Subject Terms', 'NanoTech Domain', 'CRCH Nutrition Terms', 'Biospecimen', 'CTCAE_Category', and 'CTCAE_SOC (Draft 1.0)'. The main text describes BiomedGT as an open, collaboratively developed terminology for translational research, built on the strengths of the NCI Thesaurus. It also mentions that BiomedGT is registered in the HL7 OID Registry as 2.16.840.1.113883.3.26.1.3. The page is titled 'Main Page' and 'BiomedGT Collaborative Ontology Development Wiki (Alpha 2 Release Jul 15 2008)'. The 'About BiomedGT' section explains that BiomedGT is an open, collaboratively developed terminology for translational research, built on the strengths of the NCI Thesaurus. The 'About This Wiki' section states that the BiomedGT Wiki is a new tool that enables groups of domain experts to collaboratively develop and maintain terminologies, including BiomedGT, subsets of BiomedGT, and other standalone terminologies. The 'Becoming a Collaborator' section invites users to browse the site and search for terminology, and offers registration as a collaborator.

Main Page

BiomedGT Collaborative Ontology Development Wiki

(Alpha 2 Release Jul 15 2008)

About BiomedGT

The Biomedical Grid Terminology ([BiomedGT](#)) is an open, collaboratively developed terminology for translational research. BiomedGT builds on the strengths of the NCI Thesaurus, including concept orientation, description logic, and public accessibility. While the current terminology has been seeded with NCI Thesaurus content, it is being restructured to facilitate open content development. The goal is to evolve BiomedGT into a set of federated sub-terminologies, with content maintained by experts in the relevant research communities.

BiomedGT is registered in the [HL7 OID Registry](#) as 2.16.840.1.113883.3.26.1.3

About This Wiki

The BiomedGT Wiki is a new tool that enables groups of domain experts to collaboratively develop and maintain terminologies, including BiomedGT, subsets of BiomedGT, and other standalone terminologies. This wiki is being developed by the [National Cancer Institute Center for Bioinformatics](#), [Apelon, Inc.](#), and the [Mayo Clinic Division of Biomedical Informatics](#). We welcome your help in developing terminology in your specialty area and in fine tuning the use of the wiki as a collaborative terminology development tool.

The terminology content developed in this wiki will be transferred to and integrated into the BiomedGT terminology and/or converted into LexGrid format. This will make the terminology available to the Cancer Bioinformatics Grid (caBIG) community and other interested users. After integration, the content in the wiki will be refreshed for collaborator review.

Becoming a Collaborator

You are welcome to browse this site and search for terminology. If you want to contribute content, you can register as a collaborator by following the instructions at the [Registration Process for Collaborators](#).



Main Page

ICD10+ Collaborative Revision Platform

This is a ICD10+ collaborative content development platform based on Semantic MediaWiki.

Hi-Ki is a jokular acronym rhyming with Wiki - **How I** Klassify in ICD (similar to the urban myth on wiki 's origin: what I know is)...

See [a Beginner's Guide](#)

- Contents
- SandBox
- User Scenarios
- Getting Started

ICD Classifications

- [ICD11 Draft](#) - A LexWiki rendering of ICD10+ contents in ICD11 draft information model.
- [ICD10WHO](#) - The Second Edition of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10).
- [ICD10CM](#) - The 2007 release of International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM).
- [ICECI](#) - The International Classification of External Causes of Injury (ICECI) is a system of classifications to enable systematic description of how injuries occur. The ICECI is a Related Classification in the World Health Organization Family of International Classifications (WHO-FIC).
- [Orphanet Classification Of Rare Diseases](#) - from Orphanet.

Clinical Terminologies

- [SNOMED CT](#) - SNOMED Clinical Terms version: 20080131 [R] (January 2008 Release). SNOMED CT®, was originally created by The College of American Pathologists. SNOMED and SNOMED CT are registered trademarks of the International Health Terminology Standards Development Organisation (IHTSDO).

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http://informatics.mayo.edu/vkcdemo/lexwiki1/index.php/Main_Page

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http://informatics.mayo.edu/vkcdemo/lexwiki1/index.php/Main_Page

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LexWiki Distributed Terminology Development Platform

This is a collaborative content development platform based on Semantic MediaWiki.

About LexWiki

LexWiki is an open source, high-capacity editor for distributed terminology development, and is developed by Mayo Clinic with collaborations of National Cancer Institute (NCI), World Health Organization (WHO) and Stanford University.

Documentation

- see a [Beginners' Guide](#)

ICD10CM

- [Browse by Category Tree](#)

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Discussions

- Wiki for Ontology vs Ontology for Wiki?
- Usability
- Change tracking
 - Visual diff (MediaWiki 1.4)
 - Change and Annotation Ontology
- Formal backend
 - Owl model
 - LexGrid model
 - Triplestore
- Reasoning support
- Rule support vs rule authoring support
- Workflow management

Acknowledgements

- LexWiki development team in Mayo BSI
 - Deepak Sharma
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 - Kevin Peterson
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 - Guoqian Jiang, Ph.D.
 - Harold Solbrig
 - Thomas Johnson
 - Bob Freimuth