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Using UMLS to map from a Library to a Clinical Classification: Improving the Functionality of a Digital Library

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Primary Care Electronic Library

<http://www.pcel.info>

The screenshot shows the Primary Care Electronic Library (PCEL) website in a Microsoft Internet Explorer browser window. The browser title is "Primary Care Electronic Library (PCEL) - Microsoft Internet Explorer". The address bar shows "http://www.pcel.info/". The website has a blue header with a search bar and navigation links: "Site Map", "Feedback", "About", "Help", and "Text only". Below the header is a logo of a knight on a horse and the text "Primary Care Electronic Library (PCEL) Community Health Sciences St. George's, University of London Cranmer Terrace, London, SW17 0RE Email: pcel@sgul.ac.uk". A secondary navigation bar includes "Home", "Directory", "MeSH", "SNOMED CT", "EBM Search", "Submit", "Message Board", "MyPCEL", and "News Feeds". The main content area features three boxes: "Submit a site" (submitting URL, description, and organisation), "Message Board" (discussing threads), and "MyPCEL" (creating a personalised directory). A central text block describes the library's indexed resources. A "Directory" list includes "MeSH", "SNOMED CT", "Alphabetical", and "Numerical". A "HONcode" logo is present with the text "We comply with the HONcode standard for trustworthy health information: Verify here." Below this is a search bar with a "Submit" button and an "Advanced search" link. An "RSS" link is also provided. The footer contains copyright information for St. George's, University of London, a privacy policy, XHTML and CSS links, contact email, and a last updated date of Wednesday 31st May 2006.



Primary Care Electronic Library (PCEL) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites RSS Mail Print Print Preview Stop

Address <http://www.pcel.info/> Go Links

Search Site Map Feedback About Help Text only

 **Primary Care Electronic Library (PCEL)**
Community Health Sciences
St. George's, University of London
Cranmer Terrace, London, SW17 0RE
Email: pcel@sgul.ac.uk 

Home | Directory | MeSH | SNOMED CT | EBM Search | Submit | Message Board | MyPCEL | News Feeds


Submit a site
Submit a site straight to our directory. For a basic submission all you need are the URL, description and organisation.

Message Board
You can discuss threads relating to primary care. The board accepts Word and PDF files and images.


MyPCEL
Create your own personalised directory structure from the resources indexed in PCEL.

The Primary Care Electronic Library has indexed and classified over one thousand internet sites relevant to primary care. Each site has been quality assessed by our team so you can rest assured that you are searching up to date, evaluated resources. Resources are classified according to our in-house directory, Medical Subject Headings (MeSH) and the Systematized Nomenclature of Medicine (SNOMED CT). Resources can also be searched and browsed alphabetically or numerically.

- Directory
- MeSH
- SNOMED CT
- Alphabetical
- Numerical

 We comply with the HONcode standard for trustworthy health information: [Verify here.](#)

Search
Advanced search

 [RSS Feed of latest additions to the site](#)

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Last updated: Wednesday 31st May 2006

Internet

Digital Libraries Produced by the PCI Group at St. Georges

DrsDesk (1998-present)

de Lusignan S, Brown A. The Doctors Desk – linking PCGs to NHSnet. *Health Service Computing* May/June 1999: 27-9.

<http://drsdesk.sgul.ac.uk>

NeLH-PC (2000-2003)

Gray JA, de Lusignan S. National electronic Library for Health (NeLH) *BMJ* 1999;319:1476-9. [Online] [access 2005 September].

<http://www.pcel.org.uk>

PCEL (2003-present)

Robinson J, de Lusignan S and Kostkova P. The Primary Care Electronic Library (PCEL) five years on: open source evaluation of usage. *Informatics in Primary Care*. 2005;13(4):271-280.

<http://www.pcel.info>

Medical Coding and Classification Systems

Library Classifications

Exemplified by Medical Subject Headings (MeSH). Used by the National Library of Medicine for indexing articles from 4,800 of the world's leading biomedical journals for the MEDLINE/PubMED database. 20 000 terms organised in hierarchies.

Clinical Classifications

In current use by UK General Practitioner are READ codes. It is planned that these will be superseded by the SNOMED CT classification, which is to be used in the electronic patient record in the UK. 700 000 terms arranged in hierarchies.

Epidemiological Classifications

The International Classification of Diseases (ICD), published by the World Health Organisation (WHO) has become the international standard diagnostic classification for all general epidemiological and many health management purposes.

Different classifications for different purposes

Unified Medical Language System (UMLS)


UMLS consists of three components, the Metathesaurus, the Semantic Network and the SPECIALIST Lexicon. To map between library and clinical classifications we have use the Metathesaurus.

“The Metathesaurus is a very large, multi-purpose, and multi-lingual vocabulary database that contains information about biomedical and health related concepts, their various names, and the relationships among them.”


The relationships recorded in the Metathesaurus database have enabled us to map from one classification system to another. It is important to note that not all classifications are represented in the Metathesaurus. READ codes, for example, are not. Some of the classifications which are represented are MeSH, SNOMED CT, ICPC, ICD, and HL7 amongst 50 or so others.

The End Result

[Site Map](#) | [Feedback](#) | [About](#) | [Help](#) | [Text only](#)



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[Home](#) | [Directory](#) | [MeSH](#) | [SNOMED CT](#) | [EBM Search](#) | [Submit](#) | [Message Board](#) | [MyPCEL](#)

SNOMED CT Concept:	Disorder of cardiovascular system
Parent:	Cardiovascular finding

[Heart disease \(76\)](#)
[Hypoxemia \(0\)](#)
[Syncope \(1\)](#)
[Circulatory system disease NOS \(0\)](#)
[Disorder of cardiovascular prostheses and implants \(0\)](#)
[Other specified diseases of circulatory system \(0\)](#)
[Peripheral vascular complications of care \(0\)](#)
[Vein, lymphatic and circulatory diseases NOS \(0\)](#)
[\[X\]Additional circulatory system disease classification terms \(0\)](#)
[\[X\]Cardiovascular disease, unspecified \(14\)](#)
[\[X\]Other and unspecified disorders of the circulatory system classification terms \(0\)](#)

[Atrial Fibrillation](#)
[British Heart Foundation \(BHF\) - Factfiles](#)
[British Journal of Cardiology \(BJC\)](#)
[Cardiac Arrhythmia](#)
[Cardiac Risk in the Young \(CRY\)](#)
[ECG Library](#)
[European Heart Network \(EHN\)](#)
[Facts About Cardiomyopathy](#)
[Heart UK](#)
[Intermittent claudication](#)
[National Heart Forum \(NHF\)](#)
[Primary Care Cardiovascular Society](#)
[Primary Care Management of Atrial Fibrillation](#)
[Risk Score for Cardiovascular Disease](#)



Client

HTTP REQUEST



HTML



Web server
running PHP

MySQL QUERY



RESULT SET



Database
server running
MySQL

Two tasks are necessary to achieve the end result:

- Produce a browsable version of SNOMED CT. Able to identify parent and children of a given node.
- Map MeSH terms to SNOMED CT terms. Assign resources a position in the hierarchy of SNOMED CT concepts.

BROWSABLE VERSION OF SNOMED CT

UMLS: MRHIER table: "Computable" Hierarchies

“This file contains one row for each hierarchy or context in which each atom appears. If a source vocabulary does not contain hierarchies, its atoms will have no rows in this file. If a source vocabulary is multi-hierarchical (allows the same atom to appear in more than one hierarchy), some of its atoms will have more than one row in this file. MRHIER.RRF provides a complete and compact representation of all hierarchies present in all Metathesaurus source vocabularies. Hierarchical displays can be computed by combining data in this file with data in MRCONSO.RRF.”

UMLS documentation

AUI	Atom Unique Identifier
SAB	Source Abbreviation
PTR	Path to Root

Sample records

NODE

Disorder of cardiovascular system

A3684559.A3886745.A3456474.A3340519.**A6938265**

PARENT

Cardiovascular finding

A3684559.A3886745.A3456474.**A3340519**

CHILD

Heart disease

A3684559.A3886745.A3456474.A3340519.A6938265.**A2876047**

Preparing for the web

- INDEXING HUI COULUMN

Maximum length of HUI is 278 characters

TEXT rather than VARCHAR.

```
CREATE INDEX x_snomedct_hui ON snomedct(hui(300))
```

- SUBSETTING TABLES

No problem finding parent but execution time rises to five to ten minutes when looking for children.

```
SELECT hui, str  
FROM snomedct  
WHERE hui LIKE '{$_GET["hui"]}._____'
```

Mapping from MeSH to SNOMED CT

- For historical reasons a NLM distribution of MeSH separate to, but identical to, UMLS was used.

- Directory indexed according to MeSH Tree Number (MN)

Cardiomyopathy, Hypertrophic

C14.280.238.100

- MN maps to Unique Identifier (UI) in MeSH distribution

Cardiomyopathy, Hypertrophic

D002312

- UMLS contains the MeSH UI in the CODE column of the MRCONSO table.

UMLS: MRCONSO table: Concept Names and Sources

“There is exactly one row in this file for each atom (each occurrence of each unique string or concept name within each source vocabulary) in the Metathesaurus, i.e., there is exactly one row for each unique AUI in the Metathesaurus. Every string or concept name in the Metathesaurus appears in this file, connected to its language, source vocabularies, and its concept identifier.”

UMLS documentation

CODE	Source Asserted Identifier
SAB	Source Abbreviation
CUI	Concept Unique Identifier
AUI	Atom Unique Identifier

From MeSH UI to SNOMED CT HUI

- Select distinct CUIs corresponding to a given MeSH UI (limiting SAB to MSH):

D002312

C0007194

C0205700

C0700053

- Select AUIs corresponding to the given CUIs limiting the SAB to SNOMEDCT

C0007194

A2872579

A2889219

A2978478

A2974495

A3027399

A3027616

A3501792

A3501820

UMLS: MRHIER table: "Computable" Hierarchies

“This file contains one row for each hierarchy or context in which each atom appears. If a source vocabulary does not contain hierarchies, its atoms will have no rows in this file. If a source vocabulary is multi-hierarchical (allows the same atom to appear in more than one hierarchy), some of its atoms will have more than one row in this file. MRHIER.RRF provides a complete and compact representation of all hierarchies present in all Metathesaurus source vocabularies. Hierarchical displays can be computed by combining data in this file with data in MRCONSO.RRF.”

UMLS documentation

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SAB	Source Abbreviation
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Final database structure

snomedct

HUI	Hierarchical Unique Identifier
STR	String

snomedct short

HUI	Hierarchical Unique Identifier
STR	String

directory snomedct

HUI	Hierarchical Unique Identifier
RES_ID	Resource ID

Implications for Digital Libraries

Improved data retrieval

Clinicians are now able to browse the hierarchical structure of SNOMED CT to identify relevant resources.

Integration with the clinical record

There is a auto-completion search tool online for SNOMED-CT terms included in the digital library. This permits users to type a series of letters and be provided with matching SNOMED CT terms. The next step, which is not technically challenging, is to allow clinicians to link to SNOMED CT terms automatically from the electronic patient record.

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Power Point Presentation:

<http://www.gpinformatics.org/meetings.htm>

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