



A large, multilingual, integrated terminology  
built around SNOMED-CT

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# Plan

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- ▶ Why a medical terminology
- ▶ VOC Terminology engine
- ▶ Lexical tools
- ▶ Semantic tools
- ▶ Codes and mapping
- ▶ Demo

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**A strong clinical terminology  
is the foundation  
of a good clinical application**

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**A strong clinical terminology  
is essential  
for good clinical data**

# The problem

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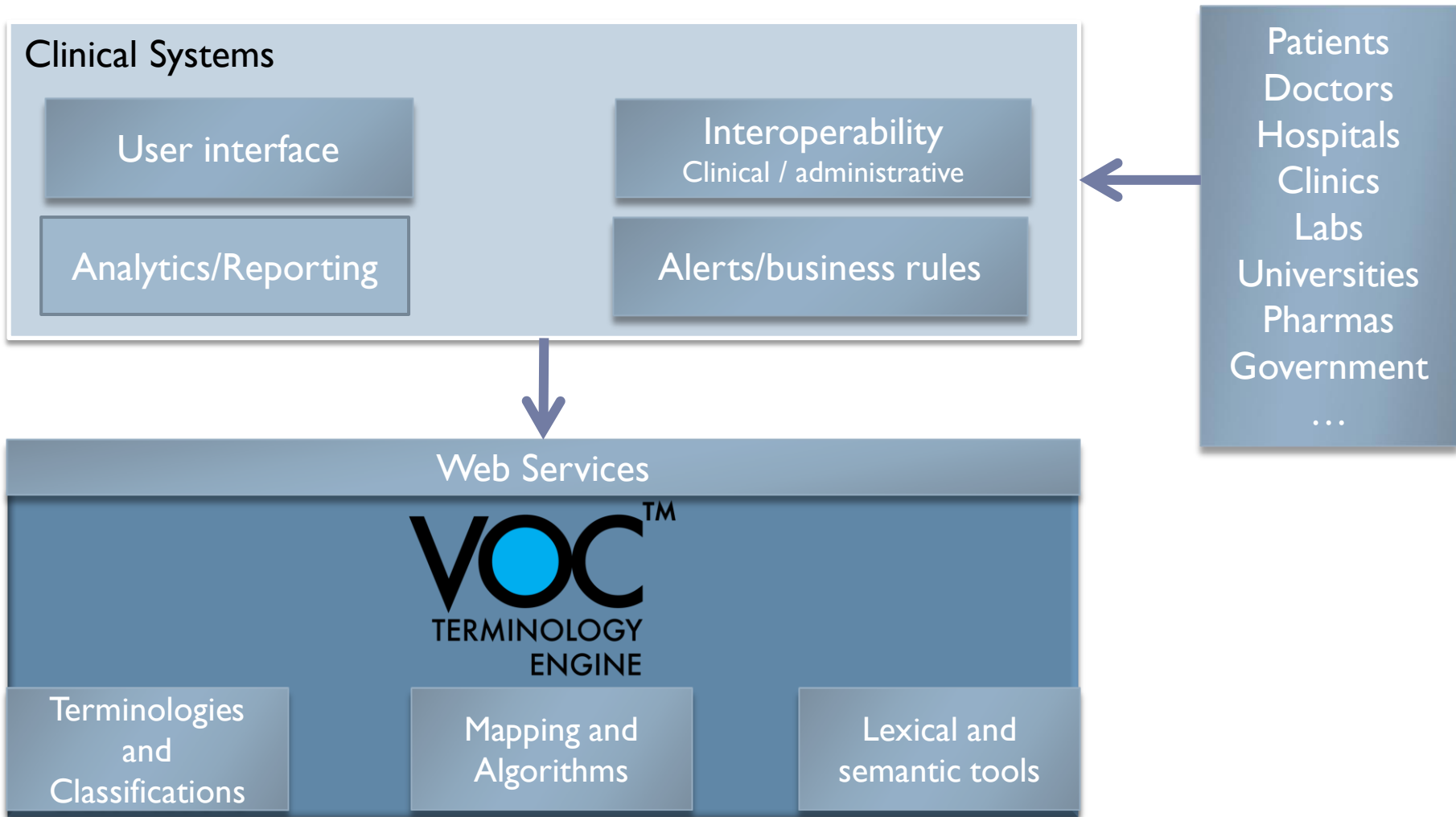
Many software developers don't have time, resources or expertise to implement and maintain a good terminological foundation for their clinical applications.

# What is VOC?

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- ▶ The integration of many terminologies around SNOMED CT providing a unified semantic ontology
- ▶ Synonyms, codes, mapping, semantic information, definitions, links to encyclopedic information
- ▶ A set of lexical and semantic tools
- ▶ A terminology server accessible via Web services
- ▶ **A solution to the terminology problem for any clinical application (EMR, PHR, HIE, etc.)**

# VOC enables



# Characteristics

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- ▶ Multilingual (English, French, Spanish)
- ▶ Synonyms
- ▶ Interoperable → Standards
- ▶ Complete, with specific access to frequent terms
- ▶ Powerful keyword searches
- ▶ Semantic content for “intelligent” behavior
- ▶ Many contexts and many countries
- ▶ Integrated
- ▶ Simple and pragmatic



# Sources

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- ▶ All vocabularies for US Stage 2 Meaningful Use Certification, including:
  - ▶ Snomed CT (International +US extension + Spanish version)
  - ▶ RxNorm (US Medication)
  - ▶ LOINC (*for Lab*)
  - ▶ ICD-10, ICD-10CM, ICD-9CM
  - ▶ Current Procedural Terminology (CPT)
  - ▶ Healthcare Common Procedure Coding System, (HCPCS)
  - ▶ HL7 Standard Code Set CVX - Vaccines Administered
  - ▶ ISO639 Languages,
  - ▶ Consumer Health Vocabulary (CHV)
  - ▶ HealthVault / HealthSpace (partial)
  - ▶ Unified Medical Language System (UMLS)
  - ▶ OMB race and ethnicity, smoking status, etc.

*Some terminologies may need a specific license agreement*

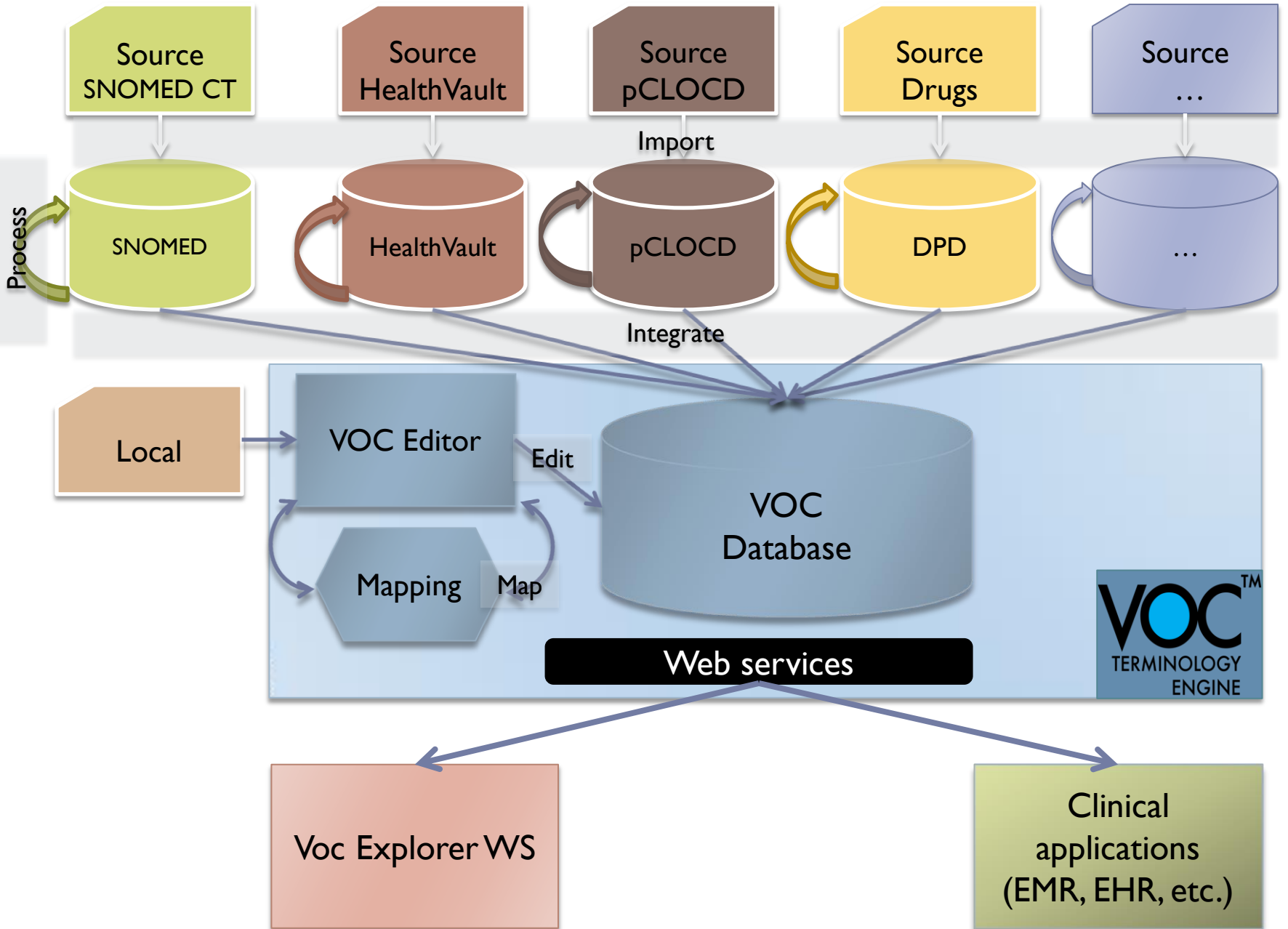
# Sources

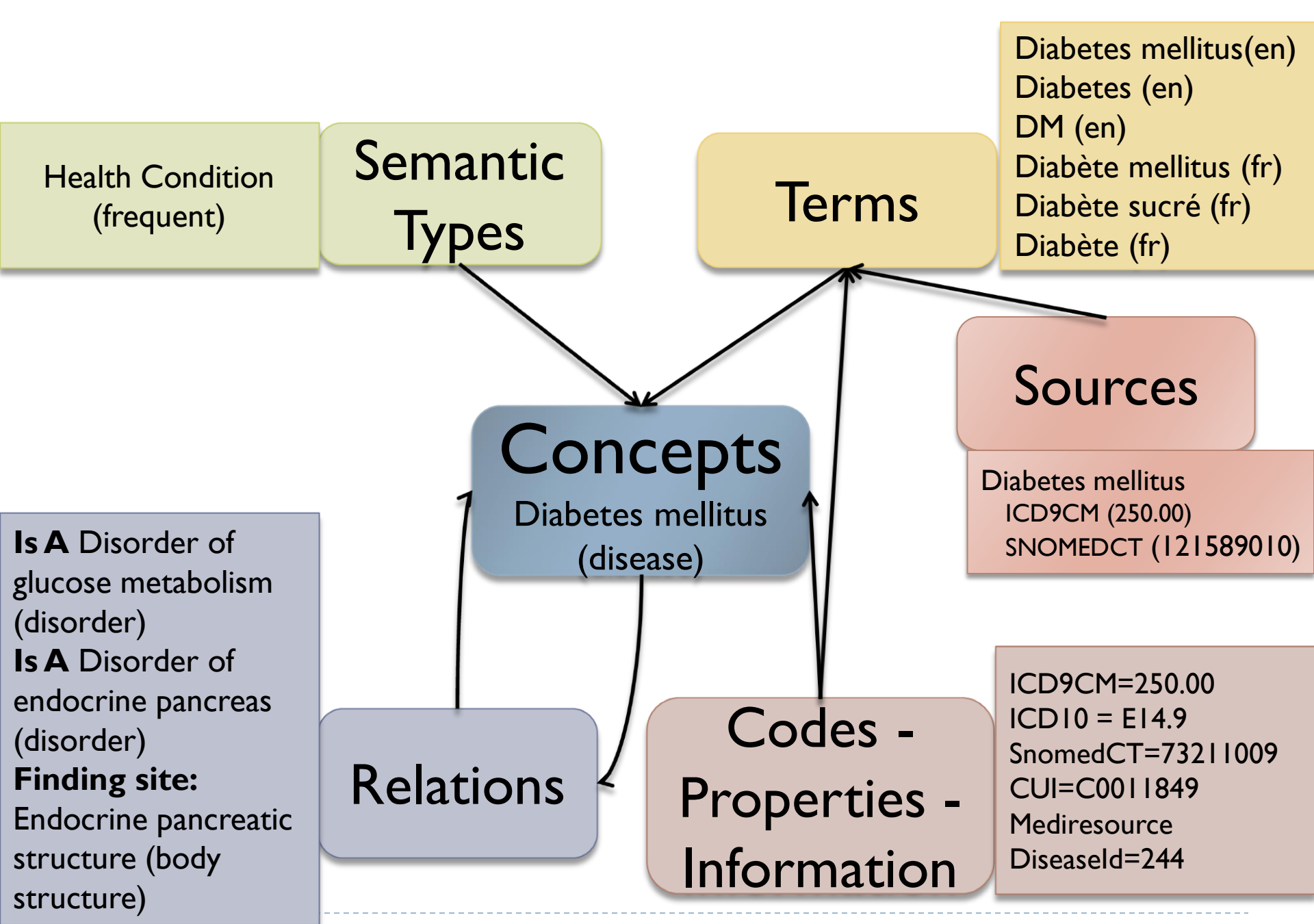
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## ▶ Specific Canadian sources

- ▶ Snomed CT Canadian extension (French translation and specific concepts)
- ▶ Drug Product Database + Natural Products (Health Canada)
- ▶ pCLOCD (*Canadian LOINC for Lab*)
- ▶ French version of Snomed International 3.5
- ▶ All Primary Health Care Reference sets (PHC RefSets) from Canada Health Infoway
- ▶ ICD10CA and CCI
- ▶ Mediresource

*Some terminologies may need a specific license agreement*





# Lexical tools

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- ▶ Very fast keyword searches
- ▶ General or specific to some semantic types
- ▶ Lexical techniques
  - ▶ Fuzzy search
  - ▶ Spell checking
  - ▶ Lexical algorithms (Soundex)
  - ▶ Word stemming

*Alsimer*      →      *Alzheimer*

*Diabait*      →      *Diabète*

# Lexical tools (2)

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- ▶ **Synonyms injection**

- ▶ *Broken thighbone* → *Fracture of femur*

- ▶ **Progressive algorithm**

- ▶ Start with specific searches

- ▶ Then use more sensitive searches

- ▶ Increase specificity and sensitivity

- ▶ **Scoring algorithm**

- ▶ **Specific searches for frequent terms**

# Semantic information

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- ▶ **Multiple hierarchies**

- ▶ Ex. Is myocardial infarction a cardiac disease?
- ▶ Support business rules, alerts, data analysis, etc

- ▶ **Semantic Browsing**

- ▶ Browse hierarchies and other relations

- ▶ **Semantic Search and Filtering**

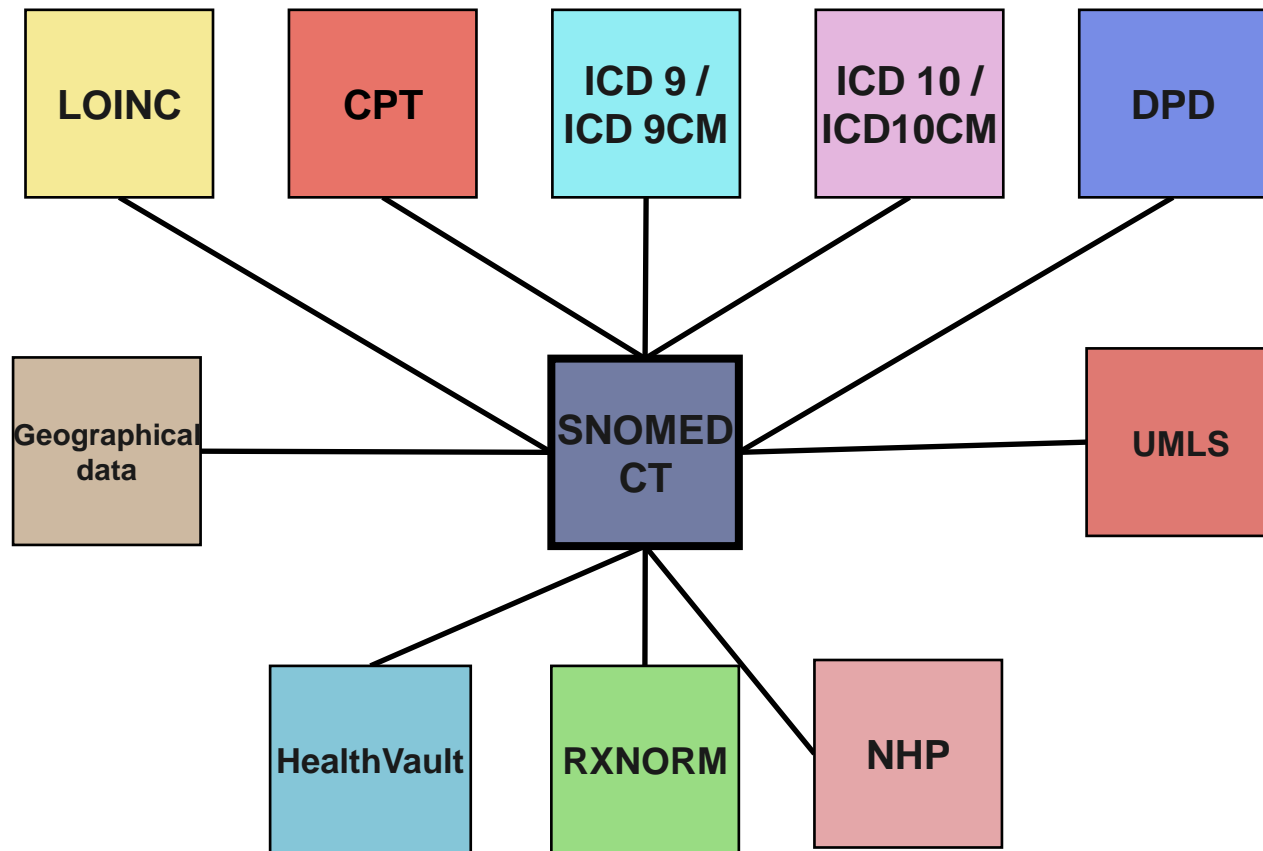
- ▶ Find a concept using semantic rules
  - ▶ Ex. Find a disease caused by a virus and affecting the head

- ▶ **Lexico-semantic searches**

- ▶ Find terms using semantic definitions
  - ▶ Ex. Liver infection -> hepatitis
- ▶ Integrated with keyword searches

# Integration and mapping

Each concept is positioned in the integrated semantic hierarchy





# Mapping

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- ▶ **Exact mapping**
  - ▶ The new source term is equivalent to an existing concept
  - ▶ New terms, relations, codes are added to the existing concept
- ▶ **Inexact mapping**
  - ▶ There is no existing concept equivalent to the new source term
  - ▶ A new concept is created with terms, relations and codes
  - ▶ New “is a” relations are created with one or more closest existing concepts (usually SNOMED)
- ▶ **Difficulty:** if a new SNOMED CT concept is added later, we try to merge the 2 concepts.

# Codes

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- ▶ Code equivalence is not an exact science
- ▶ Code qualifier
  - ▶ The code is specific for a Term that has a source from this code
  - ▶ The concept has a Term that has a source from this code
  - ▶ The concept has a good quality “map to” this code
  - ▶ The concept has a medium quality “map to” this code. There may be circumstances when this mapping is not adequate
  - ▶ The concept has a low quality “map to” this code. this mapping may not be adequate
  - ▶ The code has been inherited

# Demo Voc Explorer WS

The screenshot displays the Voc Explorer WS interface. On the left is a navigation menu with 'Actions' such as 'View synonyms', 'View parent concepts', and 'View child concepts'. The main search area includes a search bar with 'diabetes' entered, a language dropdown set to 'English', and a 'Search 2/14' button. Below the search bar is a table of search results for 'diabetes', with 'Diabetes' selected. The right pane shows detailed information for 'Diabetes mellitus (disorder)', including a definition, synonyms in English, French, and Spanish, and a source citation: 'Source: CRISP Thesaurus, 2006'.

**VOC ExplorerWS**

Search: What are you looking for?  In which language?  Type a few words:   Search in definitions

Double click to correct spelling

Synonyms

3 - Terms search for diabetes (Step 1)

Term	Type
Diabetes	Disorder
Pre-diabetes	Disorder
Pre-diabetic	Disorder
Diabetes (DM)	Disorder
Diabetes bronze	Disorder
Labile diabetes	Disorder
Latent diabetes	Disorder
Brittle diabetes	Disorder
Chemical diabetes	Disorder
Diabetes chemical	Disorder
Diabetes mellitus	Disorder
Diabetic acidosis	Disorder
Diabetic cataract	Disorder
Juvenile diabetes	Disorder
Ketosis, Diabetic	Disorder
Maternal diabetes	Disorder
Chemicals diabetes	Disorder
Diabetes insipidus	Disorder
Diabetic neuropathy	Disorder
Diabetic oculopathy	Disorder
Diabetic nephropathy	Disorder
Diabetic retinopathy	Disorder
Gestational diabetes	Disorder
Diabetes in Pregnancy	Disorder
Diabetic complication	Disorder
Diabetic ketoacidoses	Disorder

### Diabetes mellitus (disorder)

Diabetes (high blood sugar) affecting the pancreas

**Synonyms**

**English:** Diabetes mellitus, Diabetes, DM - Diabetes mellitus, Diabetes (DM), Disorder diabetes mellitus, diabetes (high blood sugar)  
**French:** Diabète sucré, Diabète, Diabète mellitus, le diabète (sucre élevé dans le sang)  
**Spanish:** diabetes mellitus, diabetes sacarina, Diabetes

**Definitions**

diabetes mellitus

**Source: Consumer Health Vocabulary**

heterogeneous group of disorders that share glucose intolerance in common.

**Source: CRISP Thesaurus, 2006**

Diabetes is a disease in which your blood glucose, or sugar, levels are too high. Glucose comes from the foods you eat. Insulin is a hormone that helps the glucose get into your cells to give them energy. With **Type 1 diabetes**, your body does not make insulin. With Type 2 diabetes, the more common type, your body does not make or use insulin well. Without enough insulin, the glucose stays in your blood.

Over time, having too much glucose in your blood can cause **serious problems**. It can damage your **eyes**, **kidneys**, and **nerves**. Diabetes can also cause heart disease, stroke and even the need to remove a limb. Pregnant women can also get diabetes, called **gestational diabetes**.

Symptoms of Type 2 diabetes may include fatigue, thirst, weight loss, blurred vision and frequent urination. Some people have no symptoms. A blood test can show if you have diabetes. Exercise.

# VOC can be used to:

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- ▶ **Create efficient user interfaces**
  - ▶ Fast and powerful Keyword search
- ▶ **Improve clinical data**
  - ▶ Better reports and data analysis
- ▶ **Improve Interoperability**
  - ▶ The right standard code to exchange data
- ▶ **Support intelligent behavior**
  - ▶ Alerts, automations, etc.
- ▶ **Provide contextual information to user**
  - ▶ Definitions, reference information, consumer information, etc.

# Conclusion

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- ▶ VOC is a functional integrated multilingual terminology engine
- ▶ Based on standards terminologies
- ▶ Lexical tools for powerful keyword searches
- ▶ Semantic information for “intelligent” reasoning
- ▶ Usable via Web Services
- ▶ Strong foundation for any clinical applications (PHR, EMR, EHR, etc.)

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