The Read Codes

Clinical Terms Version 3 (CTV3)

The Read Codes

- The Read codes (now called Clinical Terms) are used in
  - primary care to record the every day care of a Patient
  - Developed in the United Kingdom and were originally produced for clinician use.

- Developed by Dr James Read (GP, Loughborough), 1982
- Purchased and adopted by NHS 1990
- Recognised standard for General Practice

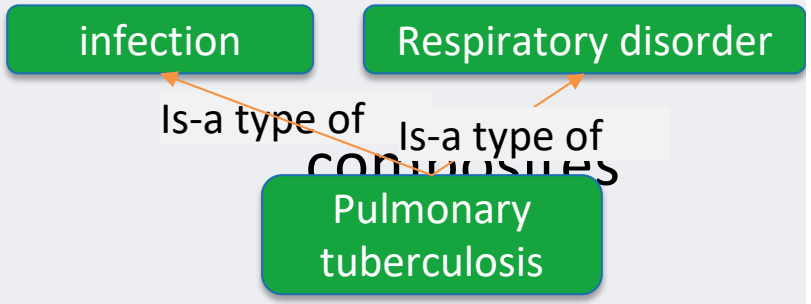
- The Clinical Terms Version 3 (CTV3) was intended, to code events in the electronic patient record.

The Read Codes

- The Read codes have undergone substantive changes through their various revisions.
  - In Versions 1 and 2, Read Codes structure was a strictly hierarchical classification system.
  - Read Version 3 was released in two stages and was a 'super-set' of all previous releases, containing all previous terms, to allow retro-compatibility with past versions.
- Version 3.0 is (a kind of) compositional classification system.
  - i.e. composed from several related concepts, or relationships may be derived from several concepts

The Read Codes

- A term can appear in several different 'hierarchical structures', classified against different axes.
- Unlike the ICD, the codes themselves do not reflect a given hierarchy. They simply act as a unique identifier for a clinical concept.
- The 'hierarchy' exists as a set of links between concepts. Terms can inherit properties across these links.
  - *For example, 'pulmonary tuberculosis' may naturally be inherited from a parent 'respiratory disorder' or a parent 'infection' term.*



- When terms are combined, these exist outside any strict hierarchy.

The Read Codes

- To combine qualifiers with terms, terms are grouped into templates (instead of using an explicit ontology)
- Like other major systems, Read Codes offers mapping to ICD codes to permit international reporting.

Table 23.2 Example Read Version 3.1 template showing allowable combinations of terms with qualifier attributes and attribute values

Object	Applicable attribute	Applicable values
Bone operation	Site	Bone, part of bone
Fixation of fracture	Reduction method	Percutaneous, open, closed
Fixation of fracture using intramedullary nail	Reaming method	Hand, powered rigid, powered flexible, etc.
Fixation of fracture using intramedullary nail	Nail type	Flexible, locking, rigid, etc.

The Read Codes: Structure

- Sorted into categories and chapters
- Has a hierarchical structure
- **Code**: Combination of letters and numbers
- CaSe-SeNsItIve
- Version 1: Maximum of 4 characters (1983)
  Version 2: Maximum of 5 characters (1985)

The Read Codes: Chapters

- **Diagnoses**
  - Codes all begin with a capital letter
  - e.g. **H**33 (Asthma), **C**10E (Type 1 diabetes mellitus)

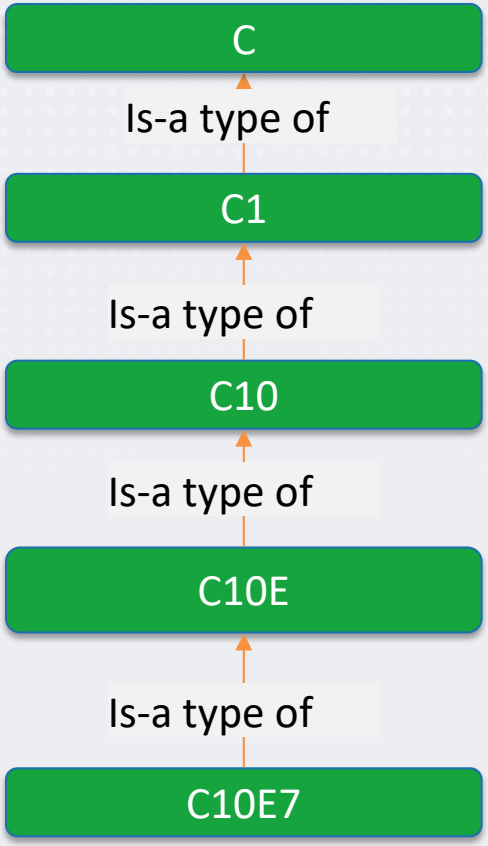
- **Processes of Care**
  - Codes all begin with a number
  - Used to record history, symptoms, examinations, tests, screening, operations and patient administration, etc
  - e.g. **4**4P (Serum cholesterol), **6**5E (Influenza vaccination)

- **Medication**
  - Codes all begin with a small case letter
  - Automatically entered into the patient record when any treatment is prescribed
  - e.g. **b**u25 (Aspirin 75mg tablets)

The Read Codes: Chapters

Example:

C	Endocrine, nutritional, metabolic and immunity disorders
C1	Other endocrine gland diseases
C10	Diabetes mellitus
C10E	Type 1 diabetes mellitus
C10E7	Type 1 diabetes mellitus with retinopathy



- Could refer to these as “families” of codes – Parent and Child Codes
- C10 is a parent code to C10E, and a child code to C1
- Each code begins the same way as the one before but contains an extra layer of detail
- Enables data to be entered at the required level of detail

The Read Codes: Example Structure

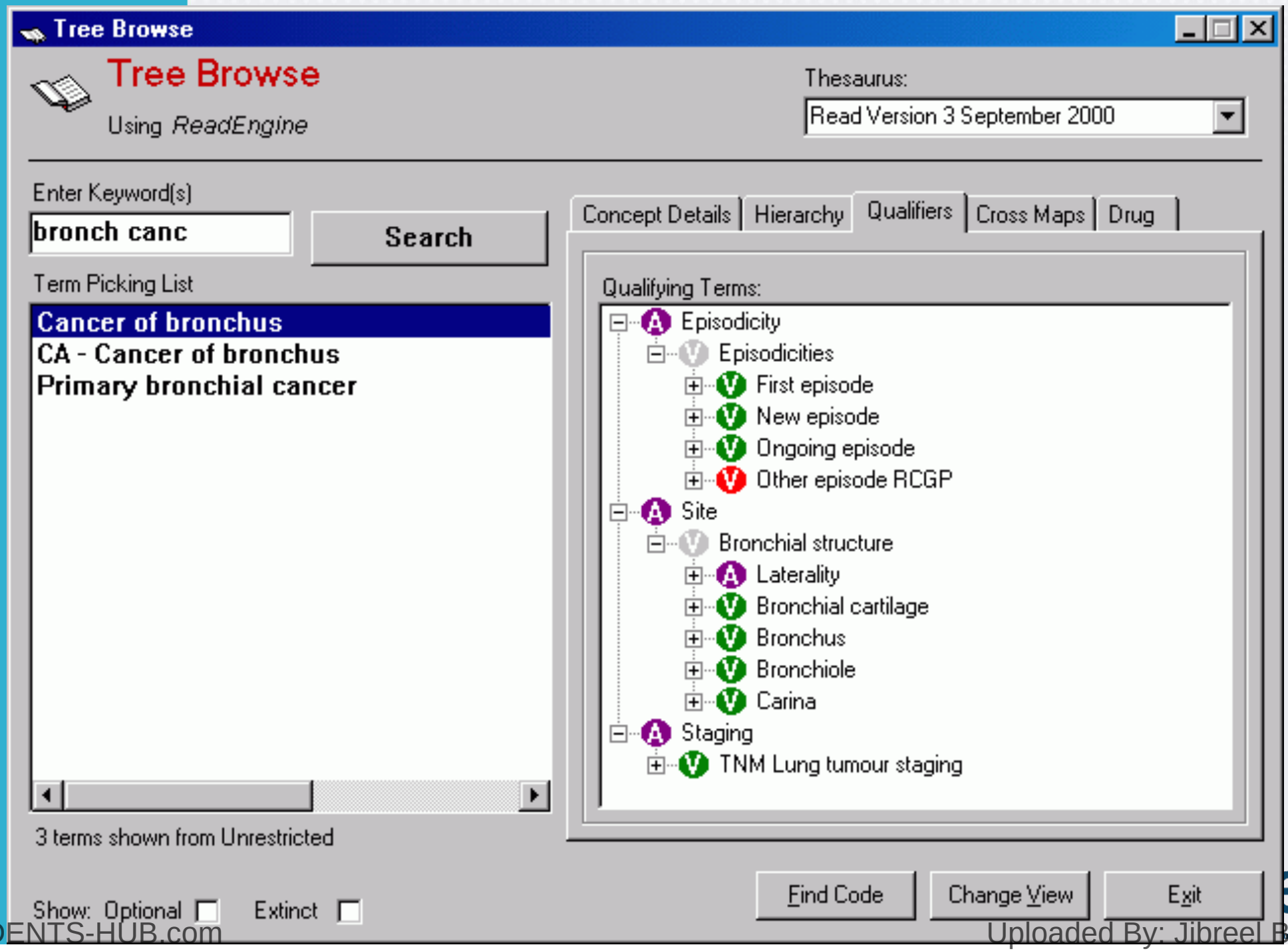
Level One Codes	Level Two Codes	Level Three Codes
Circulatory System Disease (G.....)	Hypertensive Disease(G2)	Benign Essential Hypertension (G201)
		Secondary Hypertension(G24)
		Acute MI (G30)
	Ischaemic Heart Disease(G3)	Angina Pectoris (G33)
		TIA (G65)
	Cerebrovascular Disease(G6)	Stroke and CVA unspecified (G66)
		Subarachnoid Haem. (G60)

Read Codes V3, Clinical Terms

- Known as
  - Read version 3, clinical terms
  - Clinical Terms version 3

- Was combined with SNOMED-RT to create SNOMED-CT

Read Codes Browsers



LOINC

Logical Observations, Identifiers, Names and Codes

LOINC

- A standard for electronic exchange of lab results transmitted to hospitals, clinics, and payers.
- The database has more than 72,000 terms (and increasing!) used for lab results.
- Widely accepted internationally.
- Have been cross referenced to SNOMED-CT

LOINC design summary

- **LOINC Term**
  - Represents a measurement, question or observation
- **LOINC Part**
  - Represents a value for one of **six dimensions** used to specify a LOINC Term

LOINC design summary

- **LOINC Term**
  - Consists of (3-7 long, but may increase!)
    - LOINC Code (Numeric with dash and check-digit)
    - LOINC Name (in SNOMED CT called a term)

2951-2: The LOINC code for serum sodium

LOINC design summary

- **LOINC Part**
  - Consists of
    - LOINC Part Number (LP prefix, numeric then dash and check-digit)
    - LOINC Part Name (in SNOMED CT called a term)
  - Is specified by values applied to six dimensions or Part Types
    - **Component**: the name of the measurement
    - **Property**: kinds of quantities of the substance: Mass, Substance, Catalytic Activity, Arbitrary, and Number
    - **Time**: A measurement may be taken at a moment in time or measured over a specified time interval
    - **System**: system used for lab test measurement
    - **Scale**: Quantitative(Qn), Ordinal(Ord), Nominal(Nom), Narrative(Nar)
    - **Method**: method of testing

2951-2: The LOINC code for serum sodium

SODIUM: SCNC: PT: SER/PLAS:QN
(component:property:timing:specimen:scale)

LOINC Part: Code structure

COMPONENT (ANALYTE)

The substance or entity being measured or observed.

PROPERTY

The characteristic or attribute of the analyte.

TIME

The interval of time over which an observation was made.

SYSTEM (SPECIMEN)

The specimen or thing upon which the observation was made.

SCALE

How the observation value is quantified or expressed: quantitative, ordinal, nominal.

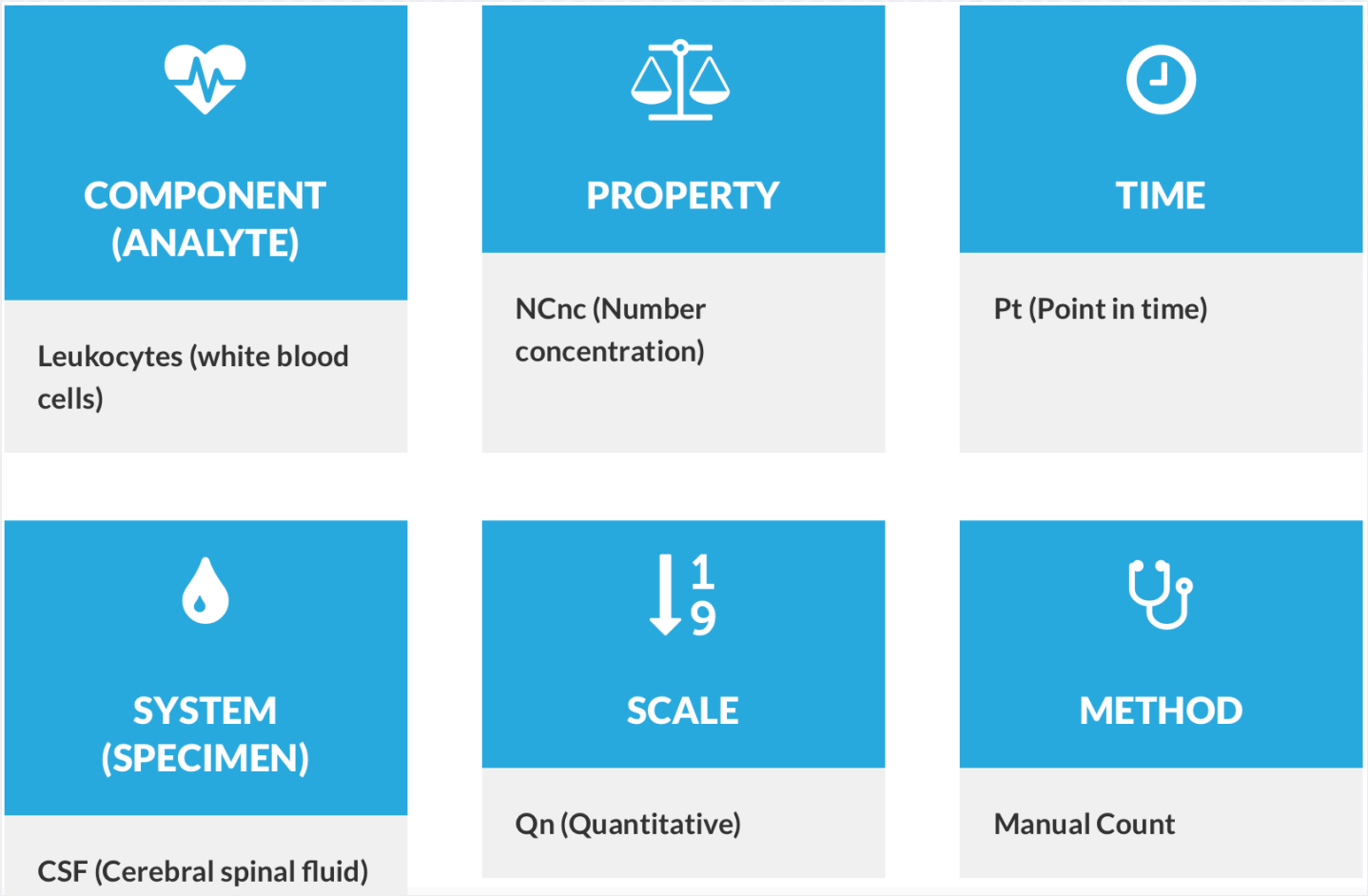
METHOD

OPTIONAL *A high-level classification of how the observation was made. Only needed when the technique affects the clinical interpretation of the results.*

LOINC: *manual count of white blood cells in cerebral spinal fluid specimen*

***Lab test**: manual count of white blood cells in cerebral spinal fluid specimen*

***LOINC code**: 806-0*



LOINC Example – Sodium concentration in serum of plasma

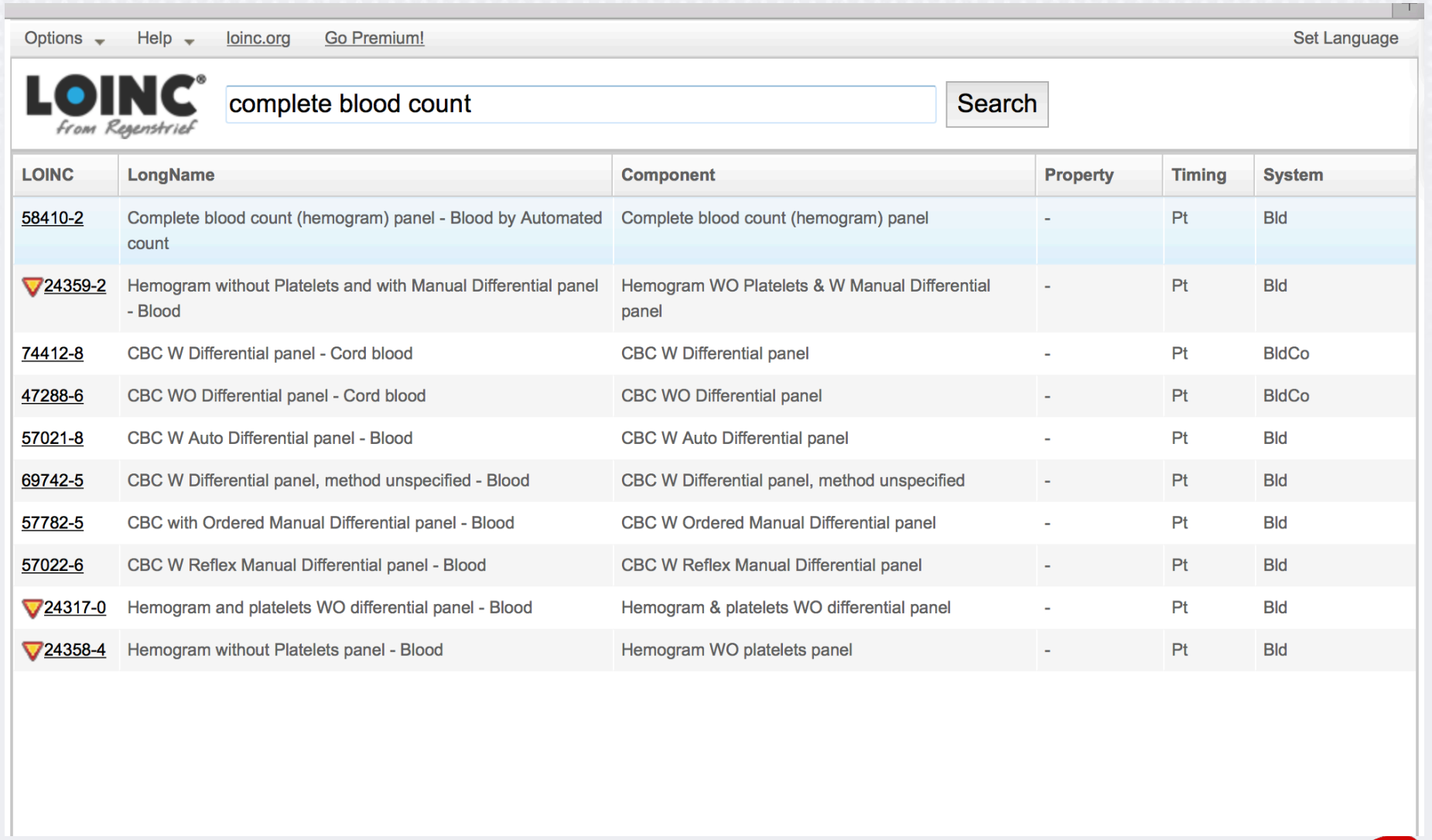
	LOINC Code	LOINC Name
LOINC Term	2951-2	Sodium [Mass or Moles/volume] in Serum or Plasma
Part Type	Part No.	Part Name
Component	LP15099-2	Sodium
Property	LP6860-3	SCnc [Substance Concentration]
Time	LP6960-1	Pt [Point in time (spot)]
System	LP7576-4	Ser/Plas [Serum or Plasma]
Scale	LP7753-9	Qn
Method		

LOINC Example – Colour of Urine

	LOINC Code	LOINC Name
LOINC Term	5778-6	Colour of Urine
Part Type	Part No.	Part Name
Component	LP28806-5	Colour
Property	LP6886-8	Type
Time	LP6960-1	Pt [Point in time (spot)]
System	LP7681-2	Urine
Scale	LP7750-5	Nom [Nominal]
Method		

LOINC Browser

https://search.loinc.org/searchLOINC/search.zul



Options Help loinc.org Go Premium! Set Language

LOINC from Regenstrief

complete blood count Search

LOINC	LongName	Component	Property	Timing	System
58410-2	Complete blood count (hemogram) panel - Blood by Automated count	Complete blood count (hemogram) panel	-	Pt	Bld
24359-2	Hemogram without Platelets and with Manual Differential panel - Blood	Hemogram WO Platelets & W Manual Differential panel	-	Pt	Bld
74412-8	CBC W Differential panel - Cord blood	CBC W Differential panel	-	Pt	BldCo
47288-6	CBC WO Differential panel - Cord blood	CBC WO Differential panel	-	Pt	BldCo
57021-8	CBC W Auto Differential panel - Blood	CBC W Auto Differential panel	-	Pt	Bld
69742-5	CBC W Differential panel, method unspecified - Blood	CBC W Differential panel, method unspecified	-	Pt	Bld
57782-5	CBC with Ordered Manual Differential panel - Blood	CBC W Ordered Manual Differential panel	-	Pt	Bld
57022-6	CBC W Reflex Manual Differential panel - Blood	CBC W Reflex Manual Differential panel	-	Pt	Bld
24317-0	Hemogram and platelets WO differential panel - Blood	Hemogram & platelets WO differential panel	-	Pt	Bld
24358-4	Hemogram without Platelets panel - Blood	Hemogram WO platelets panel	-	Pt	Bld

RxNorm

Standardized (NORMalized) names for Clinical Drugs

RxNorm

- Developed as part of UMLS, maintained and distributed by NLM (USA)
- Free dataset published monthly (with weekly FDA adds) by NLM
  - Also a browser and API access to the data
- RxNorm takes terms and codes from several sources and vendors
  - It indicates when names from different sources are synonymous, and gives them the same RxNorm identifier (RxCUI)

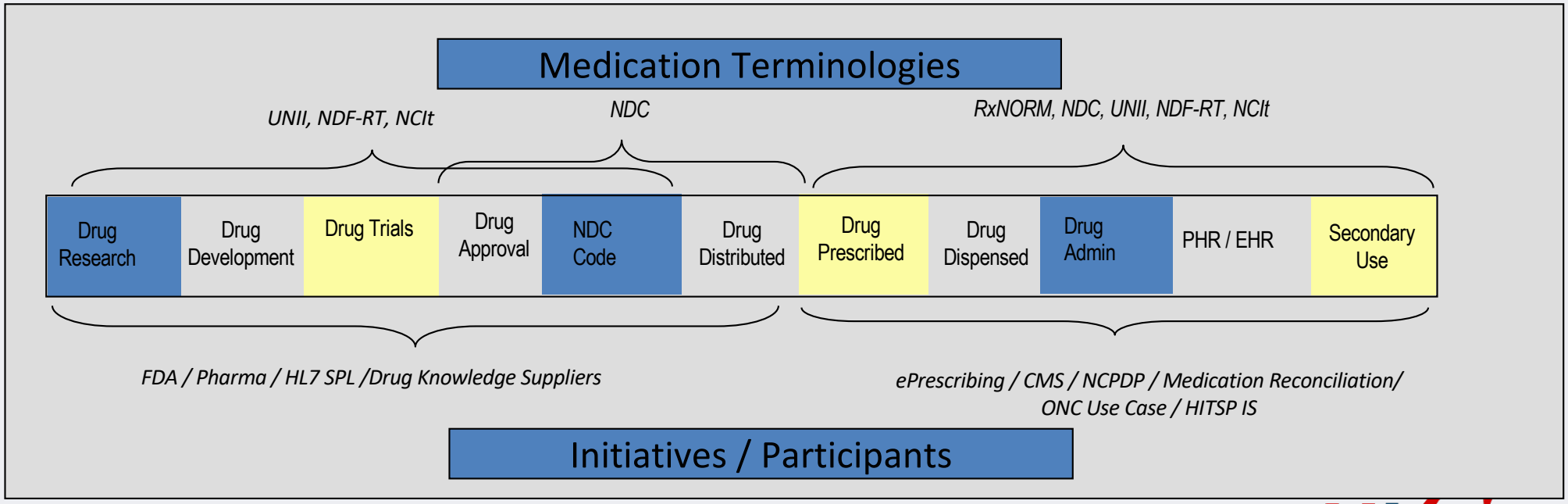
RxNorm and its sources

- Data sources aggregated and organised
  - FDA: Structured Product Label – SPL (DailyMed)
  - First Databank
  - Multum
  - MicroMedex
  - Gold Standard
  - Medi-Span
  - VA: NDF-RT and VANDF
  - SNOMED CT

RxNorm: Background

- Consolidated Health Informatics (CHI) 2003-2006
  - National Committee on Vital and Health Statistics (NCVHS) / CHI endorsed selection of medication standards http://www.hhs.gov/healthit/chiinitiative.html
  - Drug code, semantic clinical drug, classifications, ingredients, units

- Need for standardisation of medication terminology



The Clinical Drug Problem

- Ciprofloxacin 100mg/50mL IV Infusion
- Ciprofloxacin 400mg/200 ml IV Infusion
- Ciprofloxacin Lactate 0.2% in Saline (Base Equiv)
- Ciprofloxacin IV Soln 2 MG/ML

➔Are these the Same or Different?

- Clinical Drug Defined
  - Ingredient plus Strength or Form or Both?

Source names vs. normalized name

"Ranitidine Hydrochloride **15 MG** ORAL SYRUP"

"Ranitidine Hydrochloride **16.8 MG** ORAL SYRUP"

"Ranitidine Hydrochloride **75 MG** ORAL SOLUTION"

Ranitidine 15 MG/ML Oral Solution (normalized name)

- SY: ranitidine 15 MG (ranitidine hydrochloride 16.8 MG) per ML Oral Solution
- SY: ranitidine 75 MG per 5 ML Syrup

Normalized Names

- Name of a clinical drug combines its ingredient(s), strength(s), form, and brand name if present:
  - Acetaminophen 500 MG Oral Tablet
  - Acetaminophen 500 MG Oral Tablet [Tylenol]

RxNorm building blocks: term types (TTYs)

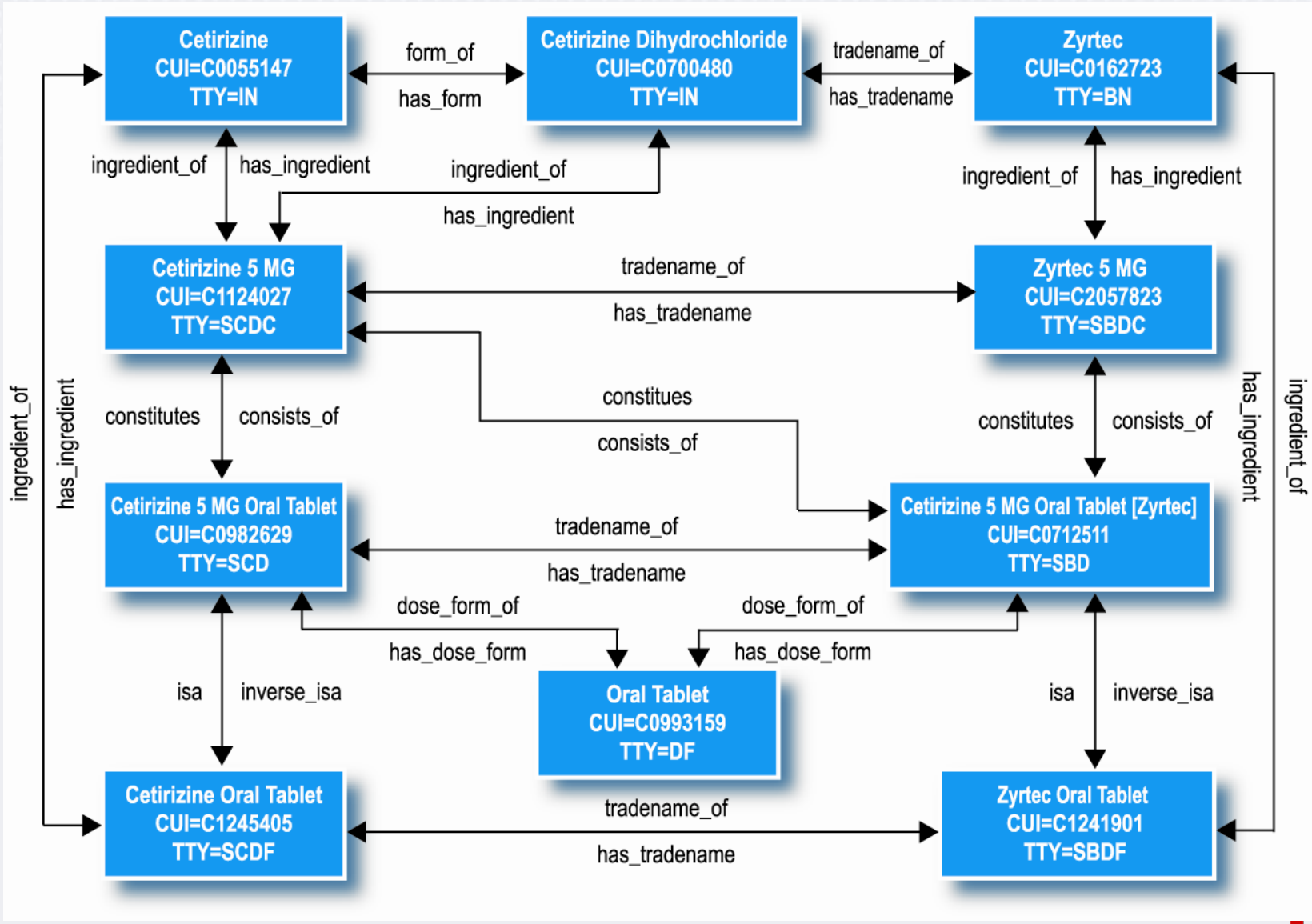
- **SCD - Semantic Clinical Drug**
- **SBD - Semantic Branded Drug**
- SCDC - Semantic Clinical Drug Component
- SBDC - Semantic Branded Drug Component
- IN – Ingredient
- SCDF – Semantic Clinical Drug Form
- SBDF – Semantic Branded Drug Form
- DF – Dose Form

RxNorm building blocks: term types (TTYs)

- SCD (Semantic Clinical Drug): Core concept for RxNorm
  - Ingredient + strength+ Unit + dose form
    - Azithromycin 250 MG Oral Tablet - RxCUI 308460
    - Diazepam 10 MG Oral Tablet – RxCUI 197590

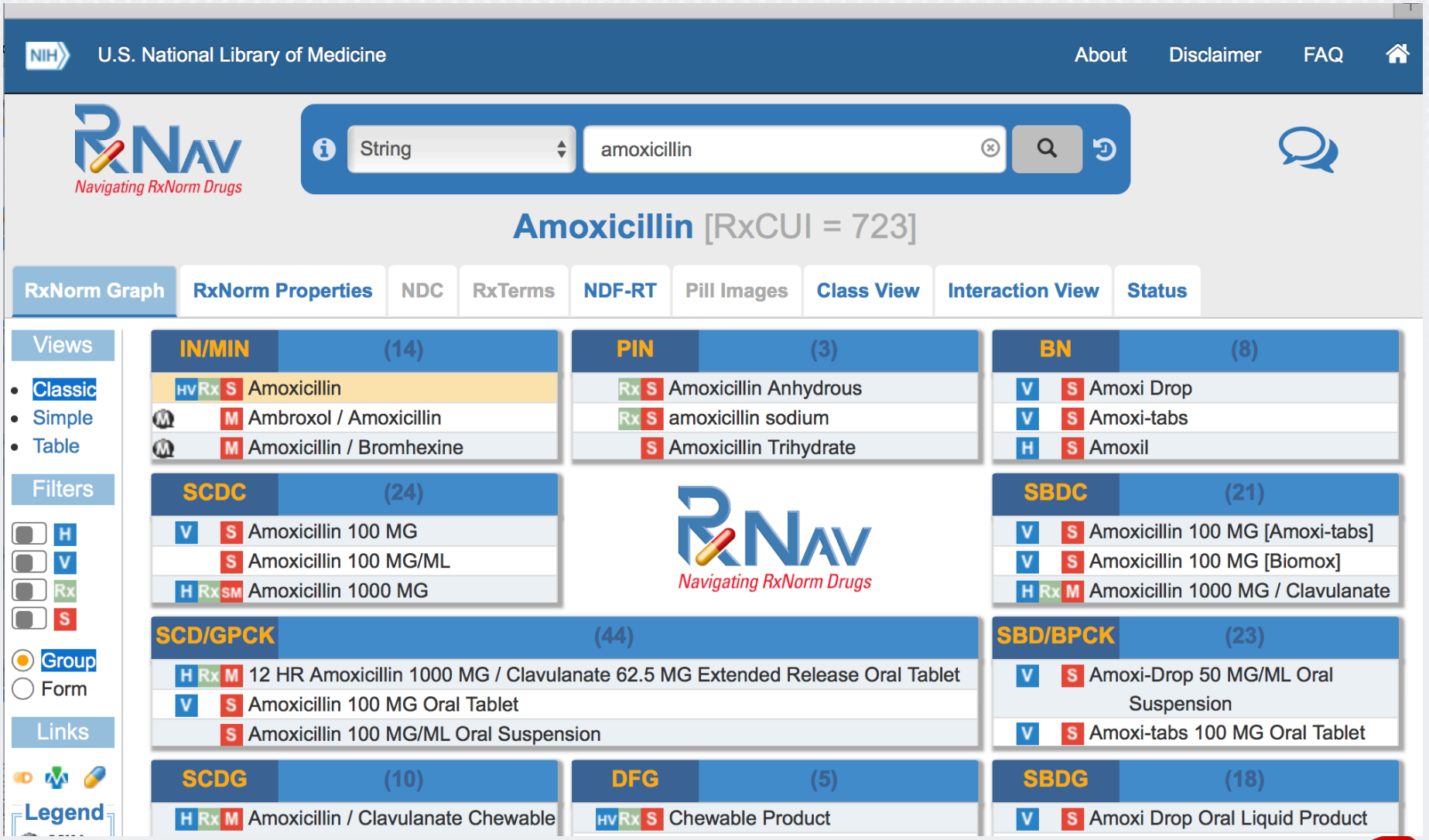
- SBD (Semantic Branded Drug):
  - <SCD> [Brand name (BN)]
    - Azithromycin 250 MG Oral Tablet [Zithromax] RxCUI = 212446
    - Amoxicillin 250 MG / Clavulanate 125 MG [Augmentin] RxCUI = 824184

The RxNorm Model



RxNorm Browser: RxNav

https://mor.nlm.nih.gov/RxNav/



UMLS

The Unified Medical Language System

UMLS

- UMLS links the major international terminologies into a common structure and provides a translation mechanism between them.

- Designed to retrieve and integrate electronic biomedical information from a variety of sources and to permit the linkage of disparate information systems (i.e. EHRs, bibliographic databases and decision support systems).

UMLS

- The UMLS is composed of three ‘knowledge sources’:
  - **a Metathesaurus,**
  - **a semantic network, and**
  - **a lexicon.**

- The UMLS Metathesaurus
  - is intended for system developers
  - provides a uniform format for more than 150 different biomedical vocabulary and classification standards.
- Terminologies integrated within the UMLS include the ICD-9, ICD-10, Medical Subject Headings (MeSH), ICPC, WHO Adverse Drug Reaction Terminology and SNOMED CT.

UMLS

- The **Metathesaurus** is conceptualised as
  - a web (rather than as a hierarchical tree), by linking alternative names and views of the same concept together and identifying useful relationships among different concepts.

- Major **UMLS semantic types** include
  - More than 132 semantic types
  - They include organisms, anatomical structures, biologic function, chemicals, events, physical objects and concepts or ideas.
- The **UMLS Semantic Network** is used
  - to ensure the integrity of meaning between different concepts.

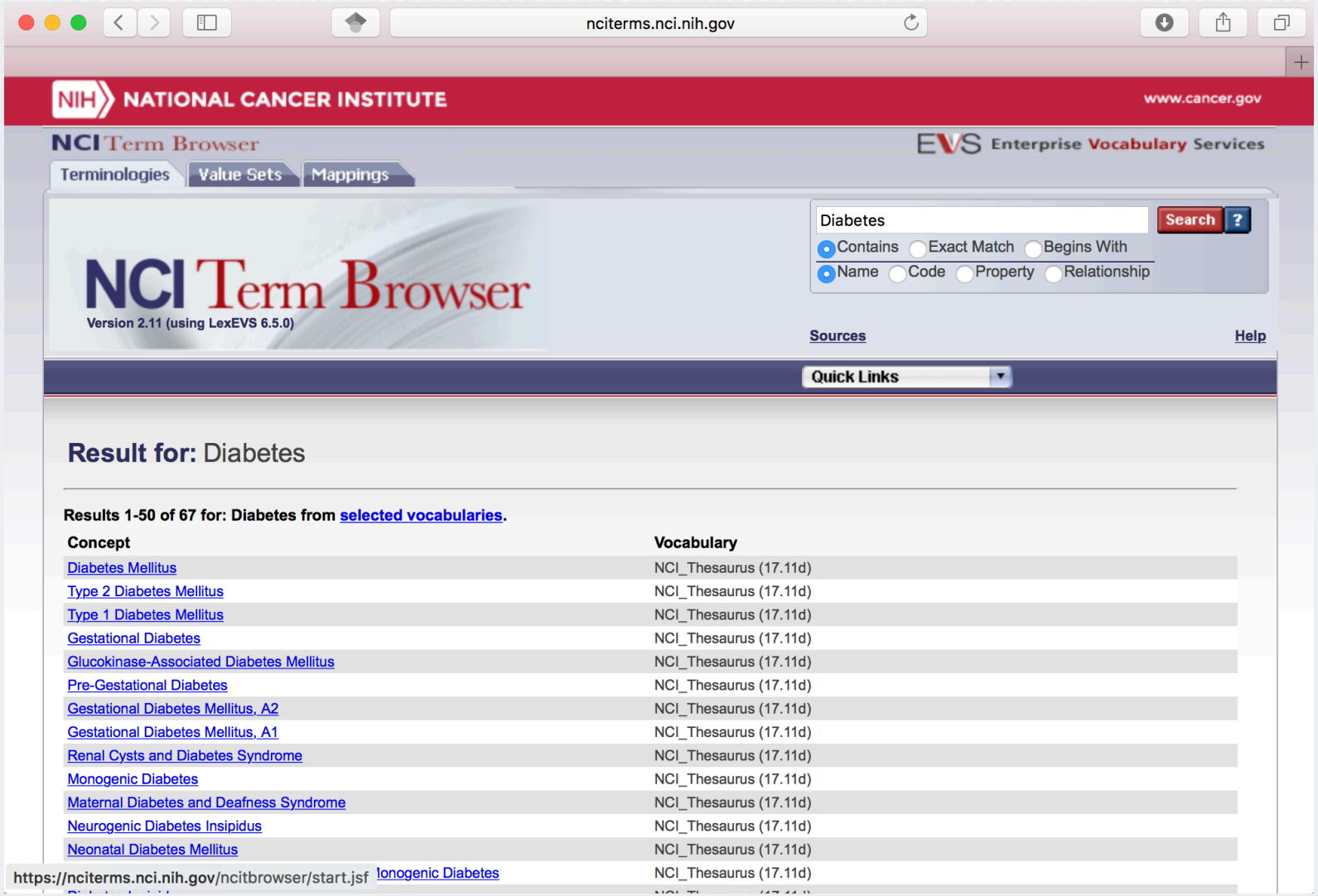
UMLS

- The **SPECIALIST Lexicon**
  - is intended to assist in producing computer applications that need to translate free-form or natural language into coded text.
  - It contains syntactic information for terms and English words, including verbs that do not appear in the Metathesaurus, and multi-word expansions of generally used acronyms and abbreviations.

- It can be used to generate natural language or lexical variants of words. *For example:*
  - *the word 'treat' has three variants that all have the same meaning as far as the Metathesaurus is concerned – treats, treated or treating.*

UMLS Browser:

https://nciterms.nci.nih.gov/ncitbrowser/pages/multiple_search.jsf?nav_type=terminologies



A comparison of coding for four different clinical concepts using some of the major coding systems

Table 23.7 A comparison of coding for four different clinical concepts using some of the major coding systems

Clinical concept	UMLS	ICD-10	ICD-9-CM 4th edition	Read, 1999	SNOMED International, 1998	SNOMED CT, 2002
Chronic ischaemic heart disease	448589 Chronic ischaemic heart disease	I25.9 Chronic ischaemic heart disease	414.9 Chronic ischaemic heart disease	XE0WG Chronic ischaemic heart disease NOS	14020 Chronic ischaemic heart disease	84537008 Chronic ischaemic heart disease
Epidural haematoma	'453700 Hematoma, epidural'	S06.4 Epidural haemorrhage	432.0 Nontraumatic extradural haemorrhage	Xa0AC Extradural haematoma	89124 Extradural haemorrhage	68752002 Nontraumatic extradural haemorrhage
Lymphosarcoma	'1095849 Lymphoma, diffuse'	C85.0 Lymphosarcoma	200.1 Lymphosarcoma	B601z Lymphosarcoma	'95923 Lymphosarcoma, diffuse'	'1929004 Malignant lymphoma, non-Hodgkin'
Common cold	1013970 Common cold	J00 Acute nasopharyngitis (common cold)	460 Acute nasopharyngitis (common cold)	XE0X1 Common cold	35210 Common cold	82272006 Common cold

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- https://imscdrmba.wordpress.com/206-unit-iii/

Thanks!

Any questions?

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