

# Computing for Medicine

Google Classroom Code: dnd5qkt5

Monsoon 2025

Lecture 5

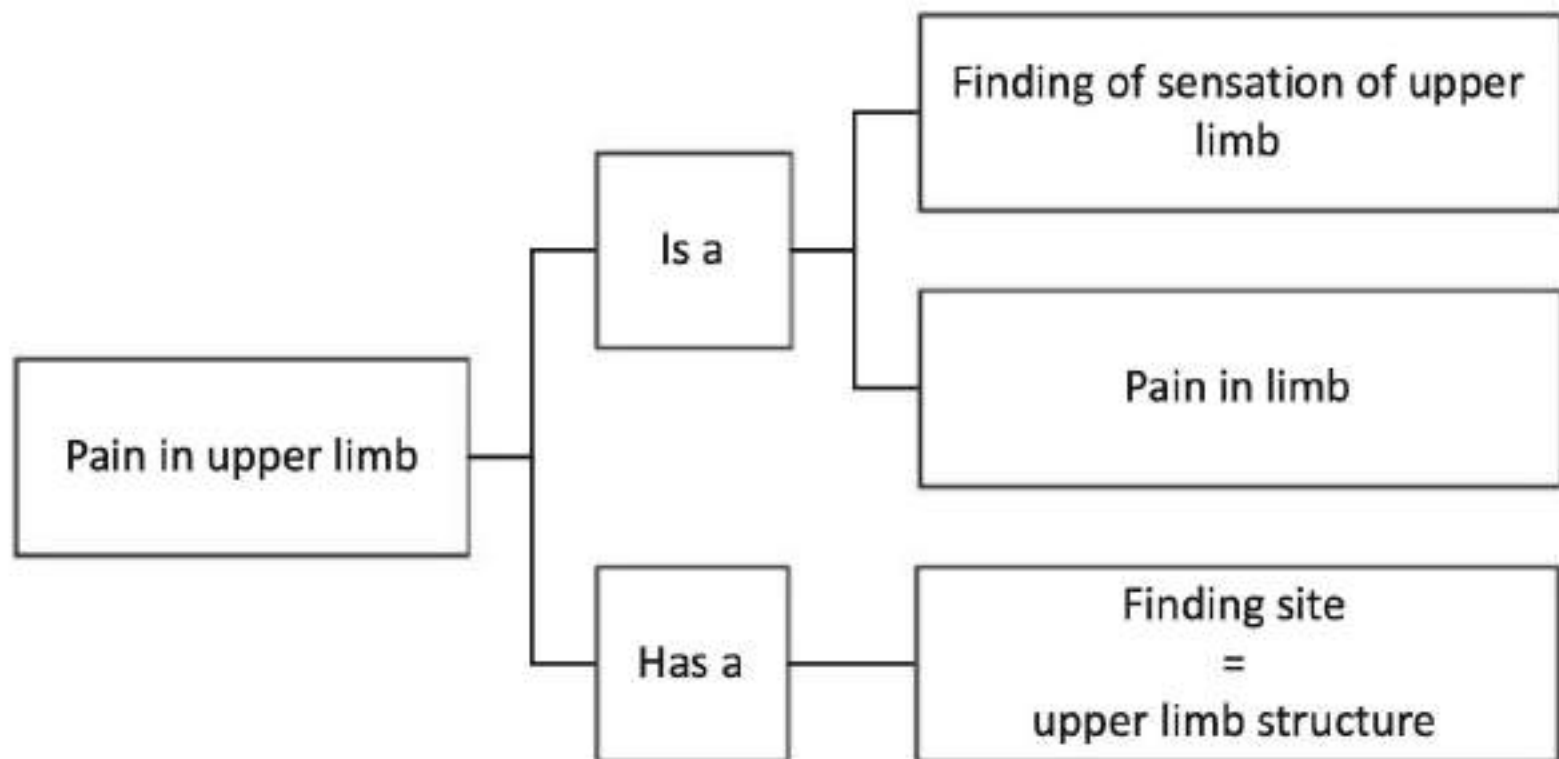
SNOMED & ICD

# Revision- SNOMED 3.5 Axes

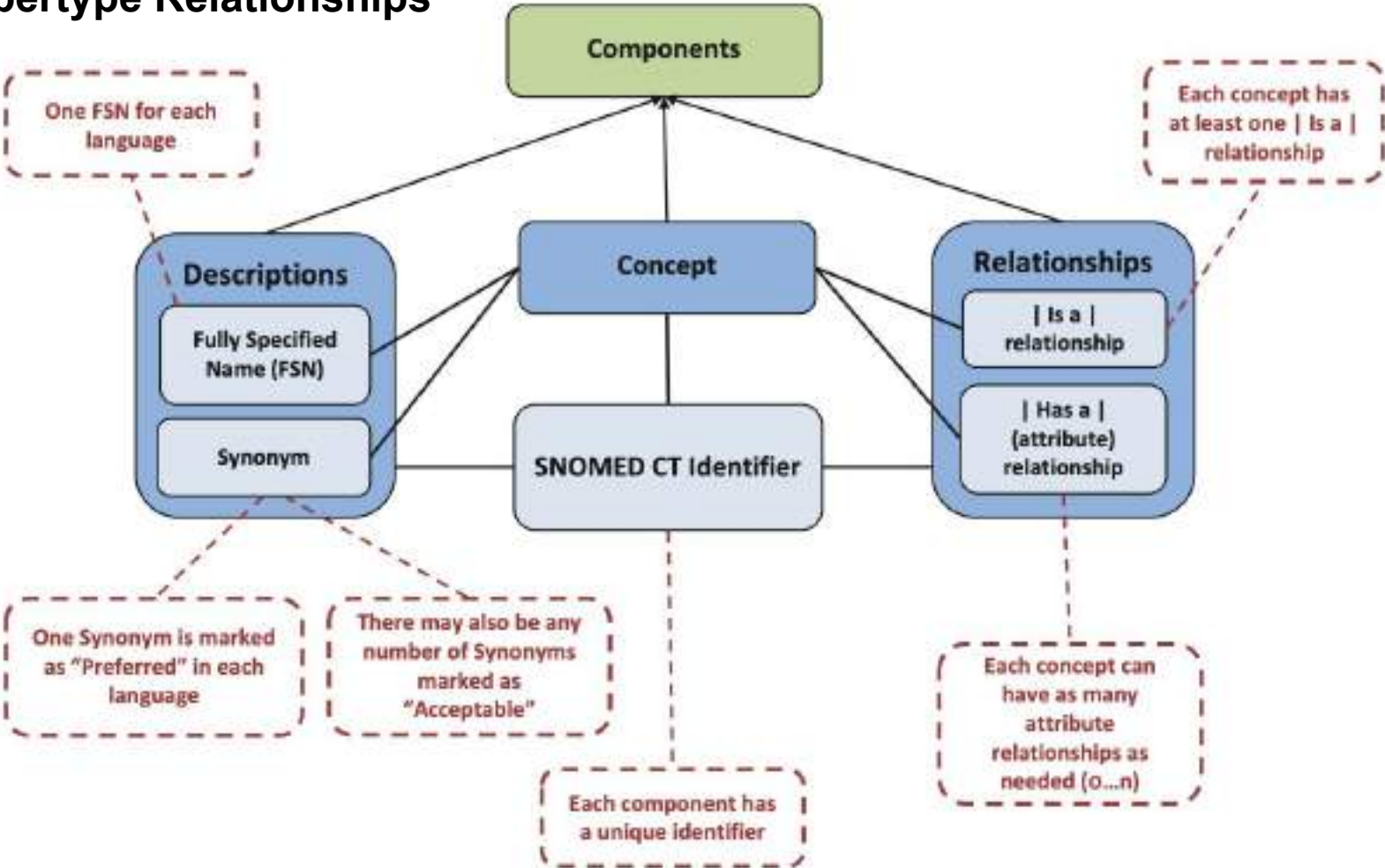
Axis	Description
T	Topography—Anatomic terms (13,000 records)
M	Morphology—Changes found in cells, tissues and organs (6000 records)
L	Living organisms—Bacteria and viruses (25,000 records)
C	Chemical—Drugs (15,000 records)
F	Function—Signs and symptoms (19,000 records)
J	Jobs Terms that describe the occupation (1900 records)
D	Diagnosis—Diagnostic terms (42,000 records)
P	Procedure—Administrative, diagnostic and therapeutic procedures (31,000 records)
A	Agents—Devices, physical agents and activities associated with disease (1600 records)
S	Social context—Social conditions and important relationships in medicine (500 records)
G	General—Syntactic linkages and qualifiers (1800 records)

# Concepts, Descriptions

- **Concepts** are clinical meanings that do not change.
- SNOMED CT is concept-oriented
- Concept IDs are machine readable
- Each concept is associated text **descriptions**,
- Descriptions are human readable form of the concept
- Every concept has at least **two descriptions**
  - Fully Specified Name (FSN) - unique and unambiguous, not meant for end users
  - Display term in the language being used
- FSN has a suffix in () indicating its primary hierarchy e.g. myocardial infarction (**disorder**).
- Display term is often FSN without suffix, e.g. myocardial infarction
- All other descriptions are synonyms
- Synonyms are marked as **Preferred** or **Acceptable**



# Supertype Relationships



# Defining Relationships

- (1) Supertype Relationships and (2) Defining Attributes
- Everything is a concept
- E.g. |is a| Relationship -> Concept ID: 116680003
- Every concept except the SNOMED CT root has a supertype
- A concept is **sufficiently defined** if its defining relationships are sufficient to distinguish it from all its supertype and sibling concepts.
- Another concept represented as a combination of the same defining characteristics, is equivalent to it or a subtype of it.
- Large parts of SNOMED CT are not yet sufficiently defined.
- Primitive concepts: not fully defined and do not have the unique relationships needed to distinguish them from their parent or sibling concepts.
- E.g. Pneumonia - unless defining characteristics are specified

# Expressions

- Pre-coordinated: when a single concept identifier is used to represent a clinical idea
- Post-coordinated: to represent a meaning using a combination of two or more concept identifiers
- ID |Name|
- Refinement : (colon)
  - Attribute (Can be more than one, separated by comma)
  - Value

```
80146002|appendectomy|:260870009|priority|=2587600  
1|emergency|
```

```
80146002|appendectomy|:260870009|priority|=25876001|emergency|,  
425391005|using access device|=86174004|laparoscope|
```

# Description Logic

|concept|:|attribute|=|value|

| Viral pneumonia (disorder) | is a | Infective pneumonia (disorder) |

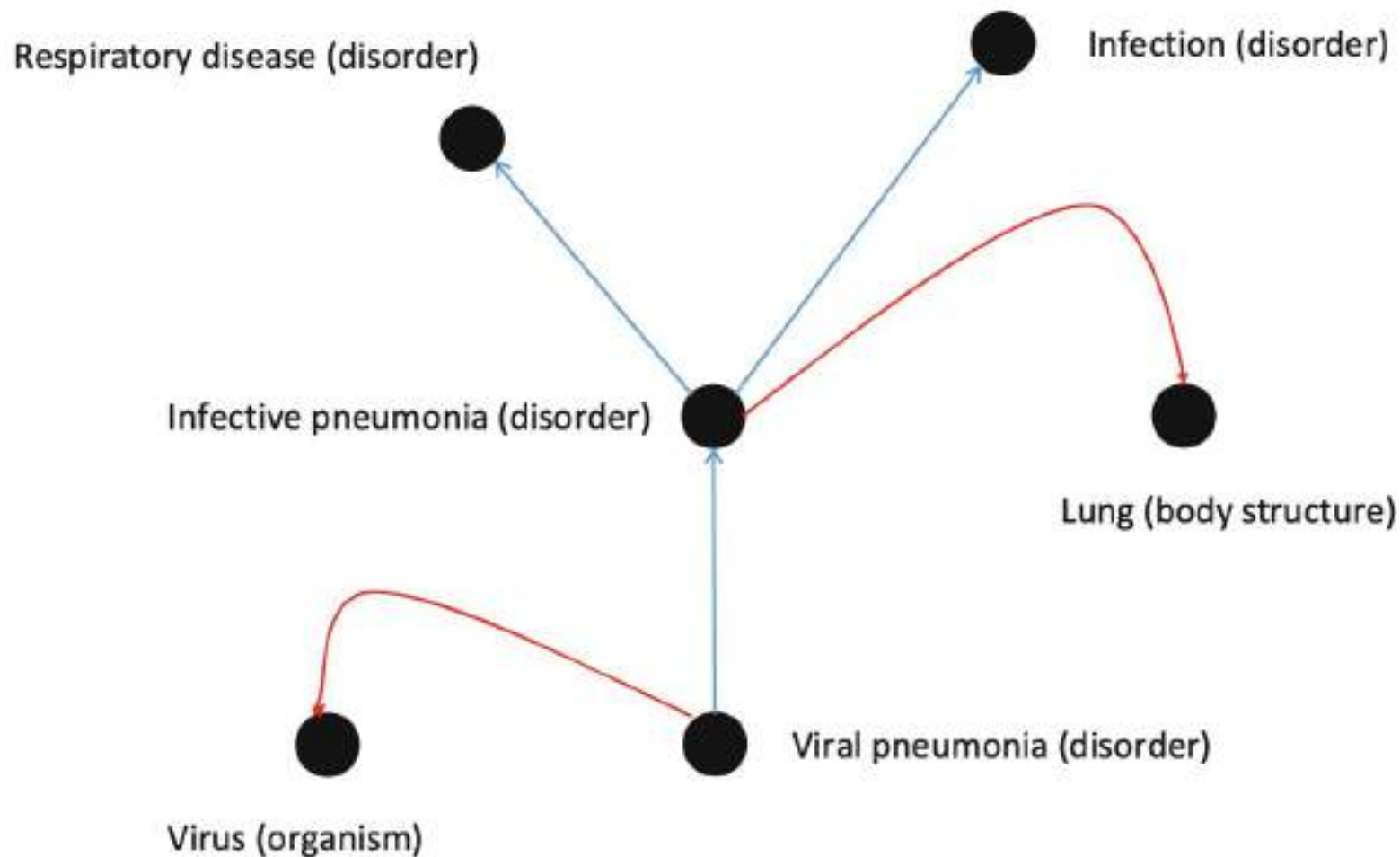
| Viral pneumonia (disorder) | "has a" | Causative agent (attribute) |  
= | Virus (organism) |

| Infective pneumonia (disorder) | is a | Respiratory disease (disorder) |

| Infective pneumonia (disorder) | is a | Infection (disorder)

| Infective pneumonia (disorder) | "has a" | Finding site (attribute) |  
= | Lung (body structure) |





1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-2508-2509-2510-2511-2512-2513-2514-2515-2516-2517-2518-2519-2520-2521-2522-2523-2524-2525-2526-2527-2528-2529-2530-2531-2532-2533-2534-2535-2536-2537-2538-2539-2540-2541-2542-2543-2544-2545-2546-2547-2548-2549-2550-2551-2552-2553-2554-2555-2556-2557-2558-2559-2560-2561-2562-2563-2564-2565-2566-2567-2568-2569-2570-2571-2572-2573-2574-2575-2576-2577-2578-2579-2580-2581-2582-2583-2584-2585-2586-2587-2588-2589-2590-2591-2592-2593-2594-2595-2596-2597-2598-2599-2600-2601-2602-2603-2604-2605-2606-2607-2608-2609-2610-2611-2612-2613-2614-2615-2616-2617-2618-2619-2620-2621-2622-2623-2624-2625-2626-2627-2628-2629-2630-2631-2632-2633-2634-2635-2636-2637-2638-2639-2640-2641-2642-2643-2644-2645-2646-2647-2648-2649-2650-2651-2652-2653-2654-2655-2656-2657-2658-2659-2660-2661-2662-2663-2664-2665-2666-2667-2668-2669-2670-2671-2672-2673-2674-2675-2676-2677-2678-2679-2680-2681-2682-2683-2684-2685-2686-2687-2688-2689-2690-2691-2692-2693-2694-2695-2696-2697-2698-2699-2700-2701-2702-2703-2704-2705-2706-2707-2708-2709-2710-2711-2712-2713-2714-2715-2716-2717-2718-2719-2720-2721-2722-2723-2724-2725-2726-2727-2728-2729-2730-2731-2732-2733-2734-2735-2736-2737-2738-2739-2740-2741-2742-2743-2744-2745-2746-2747-2748-2749-2750-2751-2752-2753-2754-2755-2756-2757-2758-2759-2760-2761-2762-2763-2764-2765-2766-2767-2768-2769-2770-2771-2772-2773-2774-2775-2776-2777-2778-2779-2780-2781-2782-2783-2784-2785-2786-2787-2788-2789-2790-2791-2792-2793-2794-2795-2796-2797-2798-2799-2800-2801-2802-2803-2804-2805-2806-2807-2808

10/10

- Daily schedule
- Clinical finding
- Environment or geographical location
- Form
- Observable entity
- Organism
- Pharmaceutical (drugs)/product
- Physical force
- Physical object
- Procedure
- Qualifier value
- Action
- Additional disease indications
- Accidental notes
- Adjective
- Anatomic reference point
- Basic code form
- Behavior, motion events and rights
- Classification system
- Clinical specialty
- Control values
- Descriptor
- Description
- Disease fact administrative use - control
- Code form intended use
- Code form release of information
- Code form transaction
- Coding instruction flag/mnemonic
- Explanations
- Finding value
- Findings category type
- For all languages
- General clinical stage for disease AND/OR organism
- General information qualifier
- Institution type
- Inpatient admission through
- Inpatient components and systems
- Indicator values
- Legal proceedings
- Mechanism of disease spread value
- Mechanisms

[illegible]

10

## ramses-antibiotics/snomedizer

R Interface to the SNOMED-CT Terminology Server REST API

[Package index](#)

Search the ramses-antibiotics/snomedizer package



### Vignettes

[README.md](#)

[Functions](#) ▶

72

[Source code](#) ▶

10

[Man pages](#) ▶

12

[api\\_operations](#): SNOMED CT Terminology Server  
[concepts\\_descendants](#): Fetch descendants  
[concepts\\_descriptions](#): Fetch descriptions  
[concepts\\_find](#): Find SNOMED CT concepts  
[release\\_versions](#): Fetch SNOMED CT R22 releases  
[result\\_completeness](#): Check that results are complete  
[result\\_flatten](#): Flatten results from a server  
[snomed\\_endpoint\\_test](#): Test a SNOMED CT endpoint  
[snomedizer\\_options](#): Set SNOMED CT endpoint

[Home](#) / [GitHub](#) / [ramses-antibiotics/snomedizer](#) / [snomedizer-package: snomedizer: R Interface to the SNOMED-CT Terminology Server REST API](#)

# snomedizer-package: snomedizer: R Interface to the SNOMED-CT Terminology Server...

In [ramses-antibiotics/snomedizer: R Interface to the SNOMED-CT Terminology Server REST API](#)

[Description](#)


[SNOMED CT licensing](#)

[Licensing for reference use](#)

[Author\(s\)](#)

[See Also](#)

## Description

Manipulate the SNOMED CT clinical ontology using the SNOMED International Terminology Server REST API <<https://github.com/IHTSDO/snowstorm>>. 

## SNOMED CT licensing

In order to use SNOMED CT, a licence is required which depends both on the country you are based in, and the purpose of your work. Although SNOMED International allows access to the SNOMED CT terminology server hosted by IHTSDO to anyone for reference purpose, uses for data analysis or health care production systems is subject to other licences.

SNOMED International allows access to public SNOMED-CT terminology servers to anyone for strict 'reference purposes' under the [SNOMED International SNOMED CT Browser License Agreement](#) (see section below).

Use of SNOMED CT terminology for data analysis or health care production systems is subject to other licences. Some users are eligible for free licences:

- UK-based users can obtain a licence free of charge on the [NHS TRUD website](#)
- residents of other Member Countries and low-income countries are also eligible. More information can be found on [SNOMED International's website](#).

## Licensing for reference use

**snomedizer** contains examples and documentation that makes use of an IHTO public API endpoint restricted to reference uses such as testing or browsing the terminology. It is subject to the [SNOMED International Browser License Agreement](#) reproduced below:

1. The meaning of the terms "Affiliate", or "Data Analysis System", "Data Creation System", "Derivative", "End User", "Extension", "Member", "Non-Member Territory", "SNOMED CT" and "SNOMED CT Content" are as defined in the SNOMED International Affiliate License Agreement (see <http://snomed.org/license-affiliate>).
2. Information about Affiliate Licensing is available at <https://www.snomed.org/snomed-ct/get-snomed>. Individuals or organizations wishing to register as SNOMED International Affiliates can register at [mlds.ihtsdo.org](https://mlds.ihtsdo.org), subject to acceptance of the Affiliate License Agreement (see <http://snomed.org/license-affiliate>).
3. The current list of SNOMED International Member Territories can be viewed at [www.snomed.org/members](http://www.snomed.org/members). Countries not included in that list are "Non-Member Territories".
4. End Users, that do not hold an SNOMED International Affiliate License, may access SNOMED CT® using SNOMED International SNOMED CT Browser subject to acceptance of and adherence to the following sub-license limitations:
  - » a) The sub-licensee is only permitted to access SNOMED CT® using this software (or service) for the purpose of exploring and evaluating the terminology.
  - » b) The sub-licensee is not permitted the use of this software as part of a system that constitutes a SNOMED CT "Data Creation System" or "Data Analysis System", as defined in the SNOMED International Affiliate License. This means that the sub-licensee must not use SNOMED International SNOMED CT Browser to add or copy SNOMED CT identifiers into any type of record system, database or document.
  - » c) The sub-licensee is not permitted to translate or modify SNOMED CT Content or Derivatives.
  - » d) The sub-licensee is not permitted to distribute or share SNOMED CT Content or Derivatives.
5. SNOMED International Affiliates may use SNOMED International SNOMED CT Browser as part of a "Data Creation System" or "Data Analysis System" subject to the following conditions:
  - » a) The SNOMED International Affiliate, using SNOMED International SNOMED CT Browser must accept full responsibility for any reporting and fees due for use or deployment of such a system in a Non-Member Territory.
  - » b) The SNOMED International Affiliate must not use SNOMED International SNOMED CT Browser to access or interact with SNOMED CT in any way that is not permitted by the Affiliate License Agreement.
  - » c) In the event of termination of the Affiliate License Agreement, the use of SNOMED International SNOMED CT Browser will be subject to the End User limitations noted in 4.

## Development of phenotype algorithms using electronic medical records and incorporating natural language processing

BMJ 2015 ; 350 doi: <https://doi.org/10.1136/bmj.h1885> (Published 24 April 2015)

Cite this as: BMJ 2015;350:h1885

[Article](#)[Related content](#)[Metrics](#)[Responses](#)[Peer review](#)

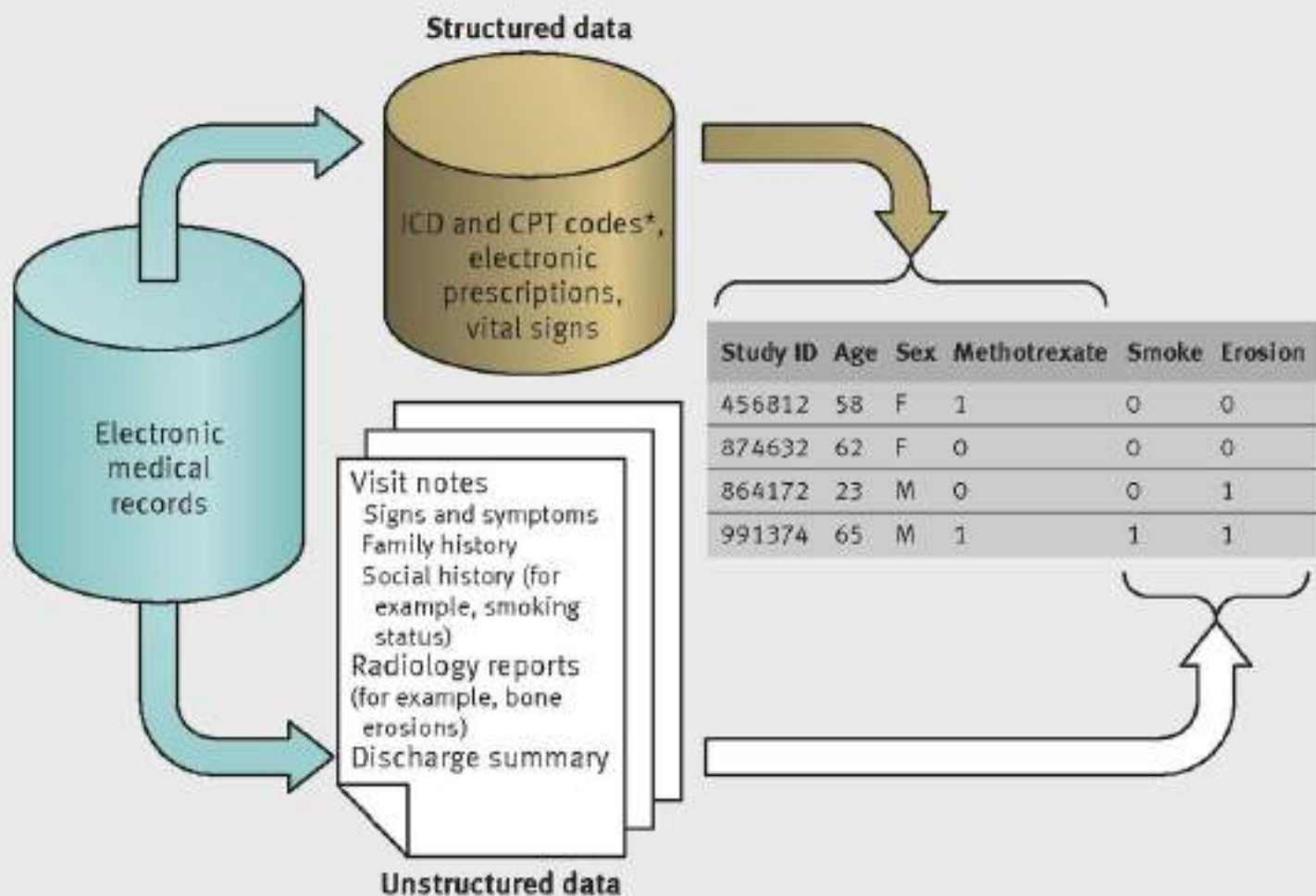
Katherine P Liao, assistant professor<sup>1 2</sup>, Tianxi Cai, professor<sup>3</sup>, Guergana K Savova, associate professor<sup>4</sup>, Shawn N Murphy, associate professor<sup>5</sup>, Elizabeth W Karlson, associate professor<sup>1 2</sup>, Ashwin N Ananthakrishnan, assistant professor<sup>6</sup>, Vivian S Gainer, senior analyst<sup>7</sup>, Stanley Y Shaw, assistant professor<sup>2 8</sup>, Zongqi Xia, assistant professor<sup>2 9</sup>, Peter Szolovits, professor<sup>10</sup>, Susanne Churchill, executive director<sup>2</sup>, Isaac Kohane, professor<sup>2 5</sup>

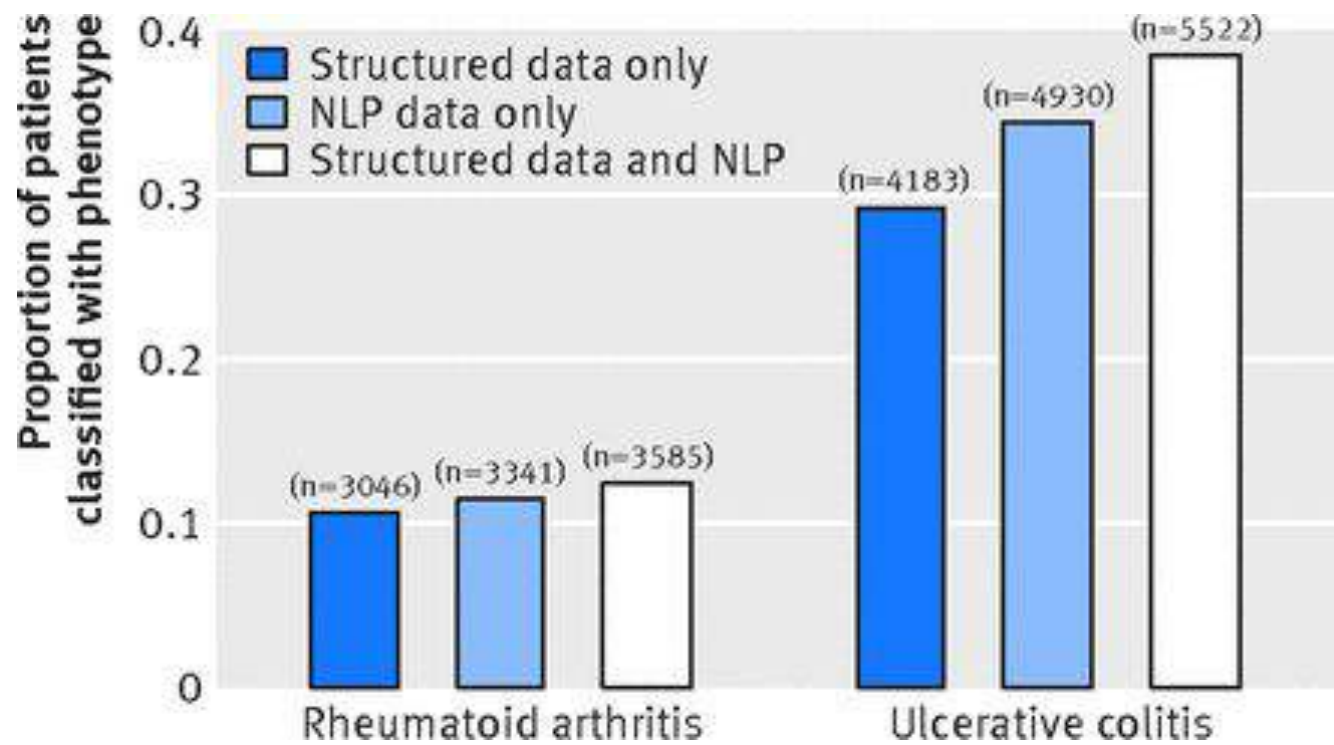
[Author affiliations ▾](#)

Correspondence to: K P Liao [kliao@partners.org](mailto:kliao@partners.org)

**Accepted** 2 February 2015







**Thanks for  
attending the class!**