

**OBSERVATIONAL
MEDICAL
OUTCOMES
PARTNERSHIP**

Use of Standardized Terminologies
across an
Active Surveillance Network

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Overview

- Need for Standardized Terminology
- Drugs
 - Standard Terminology
 - Characterization and Challenges
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 - Characterization and Challenges

Need for Standard Terminologies

Use of terminologies across data providers

Domain	Purpose	Common	Other
Drugs	Terminology	NDC	SNOMED, GPI (Medi-Span), Multum (Cerner), NDDDB (FDB), Multilex (FDB UK), NDF (VA), home-grown
	Class	-	USC (IMS), AHFC, Multum, ETC (FDB), ATC (WHO), NDF-RT (VA, NLM)
Condition	Terminology	ICD9-CM, Read	SNOMED, ICD10, ICD8, Oxmis, MedDRA, homegrown
	Class	-	ICD9, SNOMED, MedDRA
Procedures	Terminology	CPT4, HCPCS, ICD9-Proc	home-grown, OPCS-4 (NHS)
Observations	Terminology	LOINC	home-grown

Claims databases: Mostly ICD9 + NDC, in 2013 adding ICD-10
 EMR: Wide variety of standards

Challenges in Using Standard Terminologies

1. Information loss

- What if all source codes aren't mapped?
- What if standard concept is less precise than original source?

2. Misclassification

- What if source codes are mapped to different concepts than I expect?

3. Complexity of terminologies and classifications

- How do I move from one terminology to another, what are the pitfalls?

4. Resource

- Who builds them, who maintains them, who validates them?

Advantages of using Standardized Terminologies

1. Standardization

- Example: Estimate relationship between Drug XX and AMI.
Develop one query, apply to each database

2. Support Health Outcome definition

- Optimize through navigation of disease hierarchies and pick most precise concept(s)
- Example: Liver injury = disease of liver (anatomical site) + toxic organ failure (pathology) + of non-infectious and non-vascular origin (cause)

3. Aggregation through classification

- Hierarchies are built on relationships between medical concepts, which can be leveraged to explore higher-order effects
- Example: “AMI left ventricular wall” vs. “AMI”.

Examples: Standardizing Patient Demographics

Gender:

Concept	Vendor 1	Vendor 2	OMOP Concept ID
Male	1	MALE	8507
Female	2	FEMALE	8532
Unknown		UNKNOWN/NOT STATED	8551
Ambiguous		AMBIGUOUS	8570
Other		OTHER	8521

Race:

Vendor 1	Vendor 2	Vendor 3	Vendor 4	Vendor 5	Vendor 6	Vendor 7
African American	Open Text	African American	African-American	Black	Black	Black
Asian	Hispanic	Asian Indian	Asian	Asian/Pacific Islander	Asian	Asian
Caucasian	Non-Hispanic	Caucasian	White	White	White	White
Chinese		Chinese	Hispanic	Hispanic	Hispanic	Hispanic, white
Japanese		American Indian	Other	American Indian	North American Native	Hispanic, black
American Indian		Cuban	Unknown	Other		American Indian
Hispanic/Latino		Filipino				Missing Unknown
Filipino		Guamanian/Chamorro				
Multi-racial		Hawaiian				
		Japanese				
		Korean				
		Mexican				
		Portuguese				
		Puerto Rican				
		Samoan				
		Vietnamese				
		Other Pacific Islander				
		Other Asian				
		Unknown				

Drugs

Example Usage of Drug Terminologies

NDC – National Drug Codes, issued by FDA

- Total number of NDC codes: ca. 400k (over 3 decades)
- % Used in database at a given time: 12%
- % Mapped to Standard Terminology: 43.9% of codes
89.1% of data

GPI – Generic Drug Identifier, issued by Medi-Span

- Total number of GPI codes: 19,783
- % Used in database at a given time: 81.0%
- % Mapped to Standard Terminology: 68.8% of codes
93.9% of data

Features of Drug Terminologies

- Product attributes

- Ingredients (active compounds) RxNorm
- Administration route (oral table, ointment) RxNorm
- Strength (500 mg) RxNorm
- Lot numbers

- Market coverage

- Brands RxNorm
- Manufacturers

- Life Cycle

- Active marketing of drug over time
- Re-branding, re-marketing

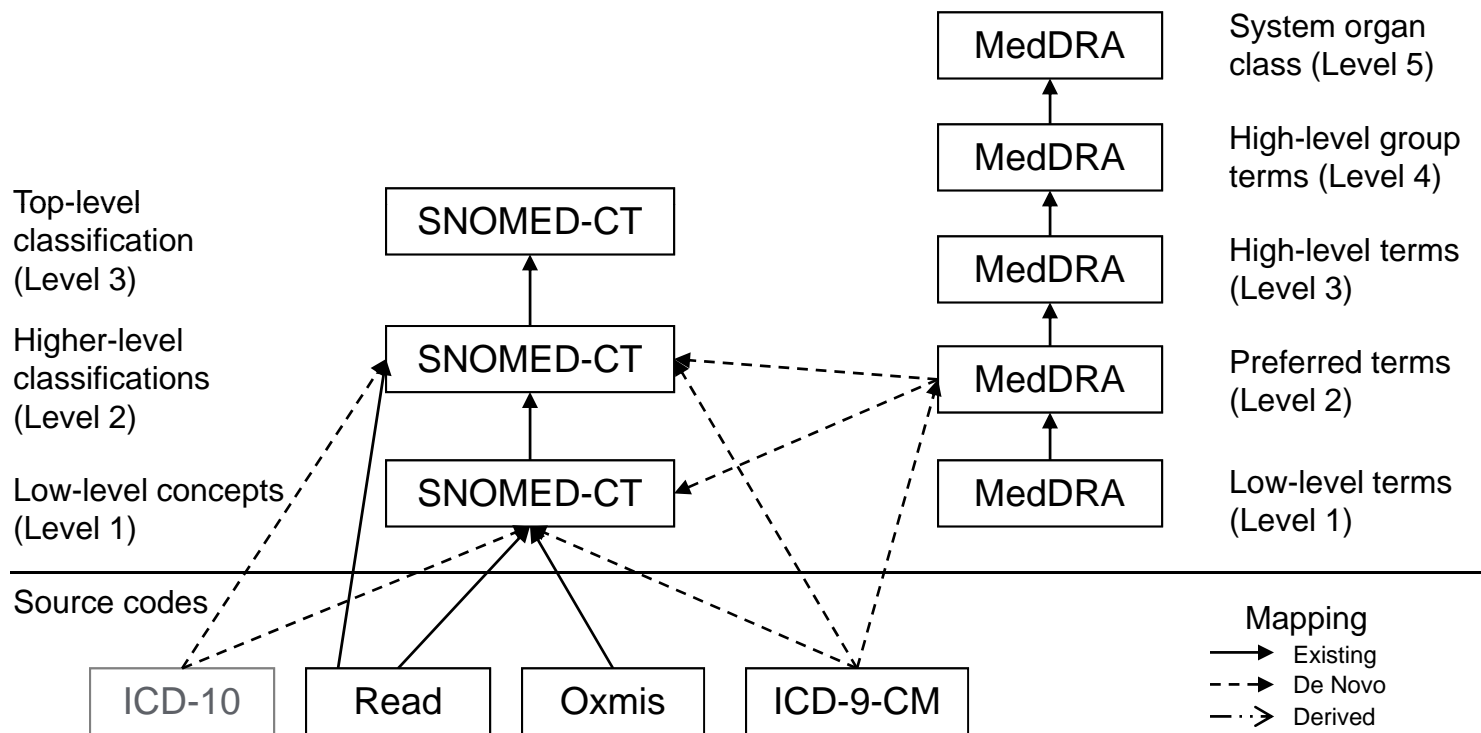
- Classification

- Indication (approved, off-label) NDF-RT FDB
- Contra-indication NDF-RT FDB
- Chemical class (Benzodiazepines) NDF-RT
- Target, agonist – antagonist (β -Blockers) NDF-RT
- Mechanism of action (Cox-2 inhibition) NDF-RT
- Therapeutic class FDB

Conditions

OMOP Standard Condition Terminology

All terminologies available at <http://omop.fnih.org/vocabularies>



Example Usage of ICD-9-CM

ICD-9-CM, issued by WHO and CMS

- Total number of SNOMED codes: 16,893

SNOMED CT, issued by IHTSDO

- Total number of SNOMED codes: 106,609
- % Used in database at a given time: 94.6%
- % Mapped to Standard Terminology: 99.4% of codes
99.6% of data

MedDRA, issued by IIFPMA

- Total number of MedDRA codes: 87,705
- % Used in database at a given time: 94.6%
- % Mapped to Standard Terminology: 99.4% of codes
99.3% of data

Criteria for Condition Codes

Criteria

Criterion	Explanation	Good	Bad	Ugly
Coverage	Coverage of entire diagnostic space, no missing diagnoses.	MedDRA	"Acute liver failure" missing from ICD9	SNOMED: 106,609 clinical findings
Semantic precision	Concepts = medically unambiguously commonly understood.	ICD9 410 "Acute Myocardial Infarction"	ICD9 432 "Other and unspecified intracranial hemorrhage"	ICD9 729.90 "Disorders of soft tissue, unspecified"
Concept independence	Concept not defined through distinction from other concepts.	SNOMED 197270009 "Acute Liver Failure"	ICD9 070.49 "Other specified viral hepatitis with hepatic coma"	MedDRA 10002472 "Angioneurotic edema, not elsewhere classified"
Semantic breadth	Support for broadly defined concepts and fine grained ones	ICD9 410.0 "Acute myocardial infarction of anterolateral wall"		ICD9 796.9 "Other nonspecific abnormal findings"

Three condition terminologies considered:

- ICD-9, SNOMED-CT, MedDRA
- Further testing required to evaluate against above criteria

Summary and Outlook

- Standardized Terminologies fulfills needs:
 - Enable Common Data Model
 - Conduct drug outcome research across a network of data providers
 - Use of classification to define HOI
- More research is needed to inform the appropriate use of terminologies to evaluate:
 - The use of quantitative mapping precision scores
 - The use of terminology quality scores
 - Drug classes for high-level drug-outcomes
 - Alternative condition terminologies
 - Indication information for defining control populations
 - Indication for discriminating between adverse drug events and legitimate drug-condition association

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Thank you

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