"Maintaining Mapping SNOMED CT for the Canadian Emergency Department Diagnosis Shortlist and comparison of maps from other source"

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- **Purpose**

  – To inform on the mapping from a classification to a terminology

- **Audience**

  – Anyone interested in learning about mapping and maintenance of maps

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Presentation Outline

1. CED-DxS presentation

2. Mapping to a terminology

3. Updating the maps

4. Tooling and Validation

5. Comparing the results

6. Conclusion

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CIHI Snapshot

- **Independent, not-for-profit corporation**

- **30 health databases and registries**
  - Types of care: acute and ambulatory, rehab, mental health, long-term care and home care
  - Health spending
  - Health workforce
  - Patient experience

- **5 offices**

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CIHI's Strategic Plan 2016 to 2021

Vision

**Better data.
Better decisions.
Healthier Canadians.**

Mandate

Deliver comparable and actionable information to accelerate improvements in health care, health system performance and population health across the continuum of care

Strategic goals

Be a trusted source of standards and quality data

Expand analytical tools to support measurement of health systems

Produce actionable analysis and accelerate its adoption

Priority themes and populations

Themes
Patient experience
Quality and safety
Outcomes
Value for money

Health system performance

Populations
Seniors and aging
Mental health and addictions
First Nations, Inuit and Métis
Children and youth

Foundation

Our people

Stakeholder engagement and partnerships

Privacy and security

Information technology

Values Respect • Integrity • Collaboration • Excellence • Innovation

What does CIHI do?

- **We collect, analyze and publish data in a *standardized* way**

- **Giving all jurisdictions the ability to:**
  - Understand
  - Compare
  - Learn from best practices

- **To make the decisions that lead to healthier Canadians**

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Canadian Emergency Department Diagnosis Shortlist (CED-DxS)

- Project for an Emergency Department Discharge Diagnosis project undertaken in 2008

- Partnership with the Canadian Institute for Health Information (CIHI) and the Canadian Association of Emergency Physicians (CAEP) and its working group, the Canadian Emergency Department Information Systems (CEDIS)

- Develop a list of the *most common and important discharge diagnoses in emergency departments* for clinical and administrative use in emergency rooms in Canada

- This involved clinical input and feedback from over 80 physicians and Medical Directors from across Canada.

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CED-DxS

Infectious and parasitic diseases		Hematologic/Endocrine etc.		Nervous system etc.		Circulatory etc.		Diseases of the respiratory system	
Infectious and parasitic diseases		D369	Benign tumor unspecified site	F489	Neurotic disorder	H669	OM - Otitis media	**Diseases of the respiratory system**	
A047	Clostridium difficile	D489	Tumor of unknown behaviour	F509	Eating disorder	H709	Mastoiditis	J019	Sinusitis, acute
A051	Botulism	**Hematologic and immunologic diseases**		F609	Personality disorder	H729	Perforation tympanic membrane	J029	Pharyngitis, acute
A059	Bacterial foodborne intox	D570	Sickle-cell anemia crisis	F99	Mental disorder, other	H810	Ménière's disease	J039	Tonsillitis, acute
A099	GE - Gastroenteritis / Diarrhea	D649	Anemia	**Diseases of the nervous system**		H811	BPV - Benign paroxysmal vertigo	J040	Laryngitis, acute
A1691	TB - Tuberculosis	D65	DIC - Dissem intravasc coag	G009	Meningitis, bacterial	H813	Vertigo, peripheral other	J041	Tracheitis, acute
A35	Tetanus	D689	Coagulation defect	G039	Meningitis, other	H814	Vertigo of central origin	J042	Laryngotracheitis, acute
A379	Pertussis / Whooping cough	D6938	ITP - Idiop thrombocytopen purpura	G049	Encephalomyelitis	H919	Hearing loss	J050	Croup - A obstruct laryngitis
A38	Scarlet fever	D696	Thrombocytopenia	G060	Intracranial abscess	H920	Otalgia	J051	Epiglottitis, acute
A390	Meningitis, meningococcal	D700	Neutropenia	G061	Intraspinal abscess	H931	Tinnitus	J069	URTI
A392	Meningococcemia, acute	D759	Disease of heme organs	G062	Extradural / Subdural abscess	H939	Ear disorder, other	J118	Influenza / Flu syndrome
A419	Septicemia	D899	Immune mechanism disorder	G20	Parkinson's disease	**Diseases of the circulatory system**		J189	Pneumonia
A46	Erysipelas	**Endocrine, nutritional and metabolic diseases**		G210	Malignant neuroleptic syndrome	I099	Rheumatic heart disease	J209	Bronchitis, acute
A480	Gas gangrene	E039	Hypothyroidism	G249	Dystonia	I100	HT - Hypertension, benign	J219	Bronchiolitis, acute
A481	Legionnaire's disease	E059	Thyrotoxicosis	G259	Extrapyramidal disorder	I101	Hypertension, malignant	J329	Sinusitis, chronic
A483	TSS - Toxic shock syndrome	E069	Thyroiditis	G35	MS - Multiple sclerosis	I200	UA - Unstable angina	J36	Peritonsillar abscess
A499	Bacteremia	E100	DM type 1 coma	G379	Demyelinating disease CNS	I209	Angina pectoris	J387	Laryngeal disorder
A549	Gonorrhea	E1010	DM type 1 DKA	G4090	Epilepsy	I219	AMI - Myocardial infarct, acute	J390	Retro / Parapharyngeal abscess
A630	Genital warts	E1063	DM type 1 hypoglycemia	G419	Status epilepticus	I241	Dressler's syndrome	J439	Emphysema
A64	Sexually transmitted infection	E109	DM type 1	G439	Migraine	I269	PE - Pulmonary embolism	J440	COPD with respiratory infection
A692	Lyme disease	E110	DM type 2 coma	G448	HA - Headache syndrome	I270	PPH - Primary pulm hypertension	J441	COPD exacerbation
A86	Encephalitis, viral	E1163	DM type 2 hypoglycemia	G454	TGA - Transient global amnesia	I309	Pericarditis, acute	J4590	Asthma
A879	Meningitis, viral	E119	DM type 2	G459	TIA - Transient isch attack	I313	Pericardial effusion	J47	Bronchiectasis
B009	Herpes	E149	DM unspecified	G500	Trigeminal neuralgia	I339	Endocarditis, acute	J689	Toxic inhalation
B019	Chickenpox / Varicella	E162	Hypoglycemia (non-DM)	G510	Bell's palsy	I409	Myocarditis, acute	J690	Aspiration pneumonia
B029	Shingles / Zoster	E215	Parathyroid gland disorder	G529	Cranial nerve disorder	I429	Cardiomyopathy	J80	ARDS - Acute resp distr synd

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Canadian Emergency Department Diagnosis Shortlist (CED-DxS) – Map to Terminology

- Mapped manually to SNOMED CT® in 2009 using July 2009 version using CliniClue® browser

- Specific use case

- One to one map (not always possible)

- Difficulties encountered
    - Modelling issues in SNOMED CT
    - CED DxS terms unclear

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CED-DxS – Parameters

In order to ensure consistency, reproducibility and validation, the following parameters must be determined prior to locating SNOMED CT concepts:

- The use case of the source/target list

- The match type between the source and target terminologies (semantic vs. lexical)

- Acceptable SNOMED CT hierarchies to match the source terminology (i.e. Clinical findings, Event, Situations with explicit context, Organism, etc.)

- The version or edition of the SNOMED CT, CliniClue ® browser and source term reference (e.g. ICD-10) to be used

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CED-DxS – Pre Mapping Assumptions

- SNOMED CT concepts will be chosen in the context of diagnostic statements used in a clinical record.
    - *Example*: Amputation leg means traumatic amputation of leg rather than amputation of leg as a procedure

- All SNOMED CT concepts from the determined hierarchies can be chosen with the exception of concepts with limited or inactive status

- SNOMED CT concepts will be chosen as semantic matches where the concept selected most closely reflects the intended meaning of the source term

- The Preferred Term or Preferred Term and Synonym of the concept will be chosen to match the meaning of the source term(s)

- When the source terminology is or linked to an ICD-10/ICD-10-CA code, ICD-10 conventions and guidance will be applied wherever applicable

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Mapping to SNOMED CT® Approach

- Perform search in the CliniClue® browser for each common term.

- Use synonymous terms when the common term could not be located in CliniClue®

- Evaluate target concepts based on hierarchy, meaning and defining relationships to determine a semantic match for the common term.

- Select the preferred term of the target concept in most matches.

- Select a synonym of the target concept if it is closer in wording to the common term.

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Analysis of first mapping exercise

Findings		
Match to preferred term (1:1)	591	71%
Match to synonym of the preferred term	155	19%
Multiple matches for a common term	68	8%
No match	6	7%

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Major SNOMED CT findings

- **Modeling inconsistencies**

  - With/without complication

  - Open/close, traumatic

  - Different structure from one concept to another

  - Incomplete modelling

- **Lack of concept representing open wound or no wound forcing the use the same SNOMED CT concept for two different clinical meanings**

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Maintenance of maps

- Required updating as part of the maintenance in versioning cycle of the CED-DxS.

- Updated for CED-DxS v2015 Common Terms manually mapped using Cliniclue Xplore® browser

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Mapping support tools

- **Tools available to map ICD-10-CA to SNOMED CT ®**

  – Cliniclue Xplore®

  – Requires individual search of each common term and manual copy of the results

  – Difficult to triage changes with new versions of SNOMED CT®

    – IHTSDO

      – Requires individual search of each common term and manual copy of the results

      – Not all versions are displayed

  And

    – Apelon

      – TermWorks Excel Add-Inn that has an Auto completion Mapping Feature

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Maintaining SNOMED CT® Maps - Method

- Search in the Cliniclue Xplore® browser for each common term and IHTSDO browser for difficult terms to match.

- Evaluate target concepts based on hierarchy, meaning and defining relationships to determine a semantic match for the common term.

- Select the preferred term of the target concept in most matches.

- Chose a synonym of the target concept if it was closer in wording to the common term
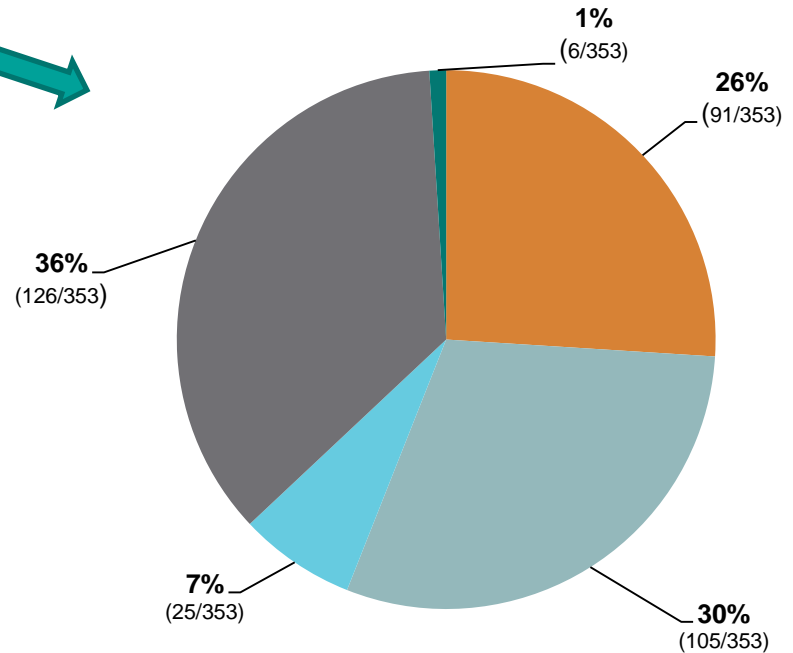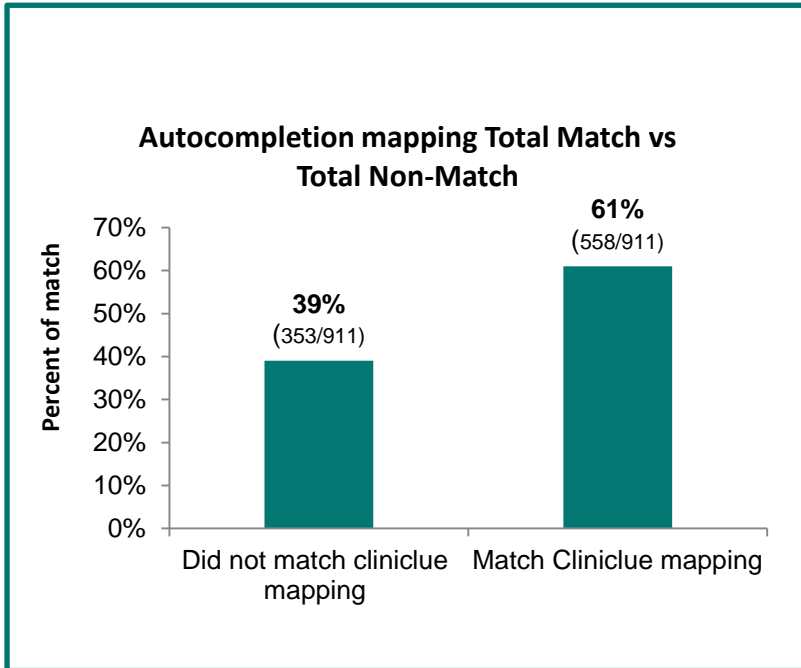
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Validation and Quality Assurance

- **Apelon TermWorks Version 6.0 was used with two objectives**

  - Validation of the manual maps

  - Evaluation of the relevance of the output of the tool

    Also

  - Evaluate the quality of the maps by comparison to outsourced maps

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Autocompletion Mapping Results

Autocompletion mapping Total Match vs Total Non-Match

Percent of match

- **39%** (353/911) — Did not match cliniclue mapping
- **61%** (558/911) — Match Cliniclue mapping

Y-axis: 0% to 70%
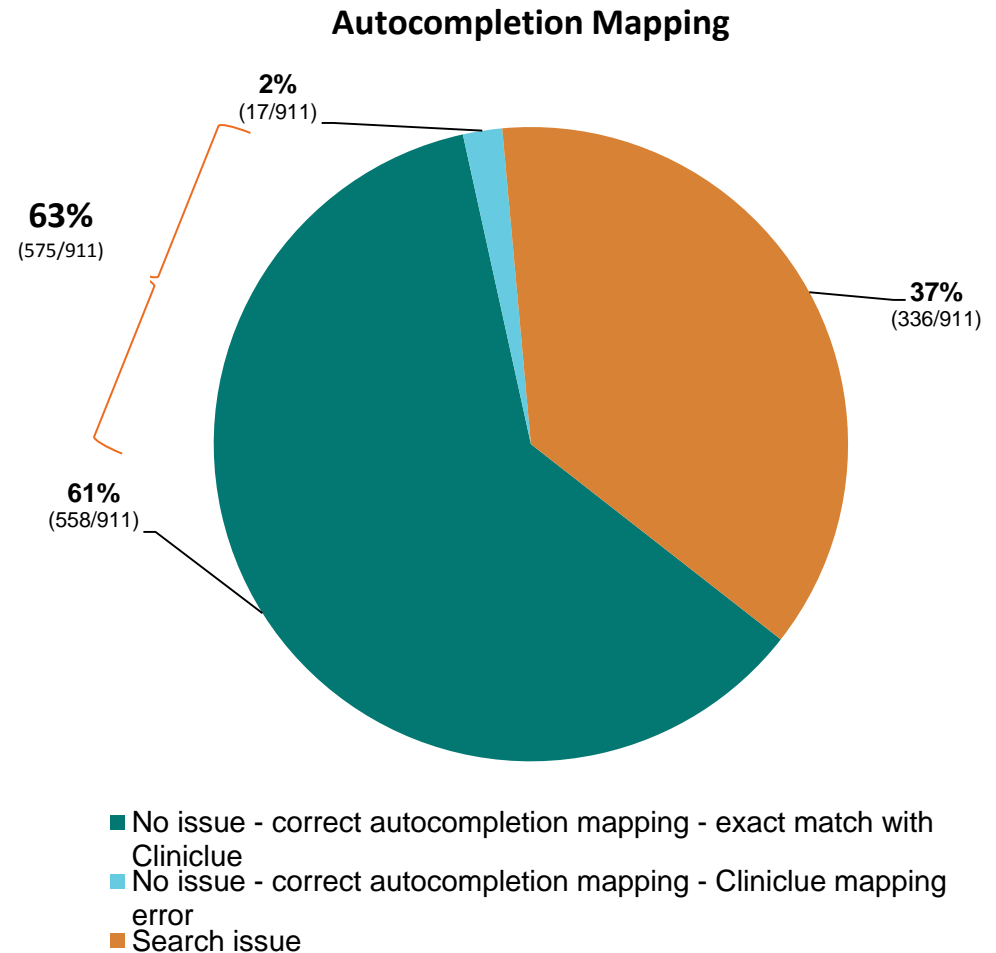
Review of Total Non-Match Records

- **74%** (262 of 353) – <u>Correct</u> concept found when search results provided by autocompletion reviewed

- **26%** (91 of 353) - <u>No correct concept</u> found in search results provided by autocompletion

Pie chart:
- **1%** (6/353)
- **26%** (91/353)
- **36%** (126/353)
- **7%** (25/353)
- **30%** (105/353)

Legend:
- No match could be found in any of choices search results displayed
- Match found hierachy Level 5 and under
- Match found in hierarchy Level 6-10
- Match found in hierarchy Level 11 and over
- Autocompletion correct/Error with Cliniclue mapping

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Issues with Autocompletion Mapping

Search issues:

- Abbreviations not always recognized
- Inconsistency between which abbreviation was recognized
- Selected an ID that was more specific than the Common Term searched
- Sort alphabetically function is useful (but page forward buttons inconsistent, sometimes skips pages when move forward by one page)
- Doesn't always recognize a 'negative term' in the Common Term
- Doesn't appear to look within the description for a synonym that might be an exact match in order to get the right ID for auto-completion
- Can only see the 'synonyms' when you click on 'details' for a specific Concept ID
- No consistency (or couldn't figure out any logic) behind when autocompletion would select an 'organisms' concept over a 'disorder' concept

Autocompletion Mapping

2%
(17/911)

63%
(575/911)

37%
(336/911)

61%
(558/911)

■ No issue - correct autocompletion mapping - exact match with Cliniclue
■ No issue - correct autocompletion mapping - Cliniclue mapping error
■ Search issue

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TermWorks Add-In

Pros	Cons

Pros

- Add on tool for Excel spreadsheets
- Columns for mapped results can be automatically incorporated into existing spreadsheet.
- Semi-automated -can search one, many or all terms at once.
- Auto completion – faster than searching each common term
- Customizable search features
- Status change allows means of validating (no not) the concept choice selected by auto-completion.
- No need to copy/type each term into a browser
- Match/No Match feature to validate the autocompletion selection
- Feature of sorting alphabetically is a good idea –although limited in its functionality
- Details provides the 'synonyms' to assist with validating the Concept ID chosen.
- Additional concepts can be added to the spreadsheet from the search results box.
- Inactive concepts are not included, eliminating the chance of being used in maps
- Browser experience not required
- Can be used in tandem with a browser to have benefits of each tool

Cons

- Cost
- Add-In doesn't work from a group directory
- Can only select the preferred term of the concept (no synonyms)
- SNOMED CT ® is the only built in data source at this point
- Search Results is 'small font' and difficult to view
- Sort Alphabetically only sorts per page that is visible – so still have to go through each page to find the term you are looking for
- Termworks had a newer SNOMED CT® version versus Cliniclue ®. Want to be able to have a version selection in both
- Auto-completion
  - Not clear on the 'hierarchy'
  - Even though can expand the search filter to search only on e.g. 'disorder' over other concepts, doesn't always resolve the issue
  - Fewer matches when performing autocompletion by using the expanded search
  - Does not always recognize abbreviations
  - Can't see the parents unless you open the 'detail' for each concept

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Conclusion

- This exercise was beneficial in developing parameters for locating SNOMED CT® concepts for diagnosis terms on pick-lists

- Knowledge and expertise related to SNOMED CT® and mapping activities was enhanced, particularly regarding concept selection, validation and versioning activities

- Work to be continued

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