



Introduction

The Israeli health system is highly automated, however, different coding standards and vocabularies are used to record clinical and administrative data in different care settings such as hospitals, outpatient departments, community providers and laboratories. The Israel Ministry of Health (MOH) Terminology Initiative is a national project to standardize the recording and coding of clinical information in all sectors of the Israeli health system. As part of the implementation process, we investigated the feasibility of implementing SNOMED CT as the standard for billing by providers.

Health care in Israel

Israel's National Health Insurance Law (NHL), enacted in 1995, guarantees universal health care coverage to citizens and permanent residents. Health services are managed by four competing health funds and delivered by a mix of public and private providers. The Israel MOH maintains a central price list of approximately 2200 procedures and services for which a standard reimbursement is set by regulation. Categories of services in this list include hospital admissions, inpatient and day surgery procedures, physician services, imaging, and laboratory. Characteristics of the service, such as priority, method, setting and target population, contribute to the determination of price. We investigated the feasibility of mapping the MOH price list to SNOMED CT.

MOH services price list categories

- Hospital admissions
- Procedures
- Physician services
- Laboratory testing
- Radiology
- Dental

MOH service description modifiers

- Target population: *Topical application of fluoride including prophylaxis, **adult** vs. Topical application of fluoride including prophylaxis, **child***
- Has intent: *Ureteroscopy, **diagnostic**, with/without biopsy vs. Ureteroscopy, **therapeutic**, including RIRS*
- Using substance: *Spirometry with **bronchodilator** vs. Spirometry, **simple***
- Method: ***ORIF** of distal humerus, closed fracture, including bone graft vs. **Closed reduction** of fracture of humerus without internal fixation*
- Revision status ***Prosthetic arthroplasty** of metacarpophalangeal joint of finger vs. **Revision** of metacarpophalangeal arthroplasty*
- Direct morphology: *ORIF of carpal(s), **closed fracture**, including bone graft vs. ORIF of carpal(s), **open/complex fracture**, including bone graft*
- Using access device: ***Open repair** of strangulated femoral hernia vs. **Laparoscopic repair** of strangulated femoral hernia*
- Priority: *Total hip replacement for fracture of neck of femur, **within 48 hours of hospitalization** vs. Total replacement of hip*





The mapping process

We used the mapping functionality of Clinical Architecture’s© Symedical© data quality software solution to identify SNOMED CT candidate matches for each item in the MOH price list. We limited potential targets to SNOMED CT to the 58,618 procedure concepts in the 31 July 2021 International (all descendants of SCTID 71388002).

The Symedical software offers a range of mapping algorithms to match source to target term descriptions. Lexical transformations of source and target descriptions offer alternate wording to increase the likelihood of a match. For example, normalization removes “stop words”, punctuation and genitives, while tokenization alphabetizes the order of the words in the term, and stemming normalizes word endings by removing suffixes (‘s’, ‘ing’, ‘ed’, etc.). “Domain-specific” transformations take the category of the term into account (Table 1). Digram and trigram string-matching algorithms compare the extent to which consecutive 2 or 3 character segments (respectively) in the target and source descriptions match.

The mapping process gave priority to lexical matches between the MOH service description (source) and the preferred term or alias of the SNOMED CT procedures. Trigram/digram matches to the SNOMED term or alias with scores of 87 or over were mapped automatically, lower scores generated candidates for manual review.

Table 1: Lexical transformations of source term

Term: Vitrectomy with scleral buckling, with/without implant	
Term normalized	VITRECTOMY WITH SCLERAL BUCKLING WITH WITHOUT IMPLANT
Term tokenized	BUCKLING IMPLANT SCLERAL VITRECTOMY WITH WITHOUT IMPLANT
Term domain lexical	RESECTION OF VITREOUS HUMOR WITH SCLERAL BUCKLING WITHOUT IMPLANT
Term domain lexical stem	RESECTION OF VITREOU HUMOR WITH SCLERAL BUCKLE WITHOUT IMPLANT
Term domain tokenized	BUCKLING HUMOR IMPLANT OF RESECTION SCLERAL VITREOUS WITH WITHOUT
Term domain tokenized stem	BUCKLE HUMOR IMPLANT OF RESECTION SCLERAL VITREOU WITH WITHOUT





Mapping local reimbursement codes to SNOMED-CT: Challenges and proposed solutions

Barbara G. Silverman, Yael Applbaum, Israel Ministry of Health, Medical Terminology Initiative; Andrew Frangleton, Clinical Architecture

Introduction

Lexical mapping algorithms alone identified appropriate targets for a small number of MOH price list terms (149, or 7%) in which the English language description closely matched the preferred term or alias of a SNOMED CT procedure concept. For an additional 1995 (90.5%), the software offered one or more candidates. No potential matches were identified for 118 (5%) of the MOH price list terms.

Methods

Table 2: Algorithm-generated matches

Source term	Target term	Target alias	Match
Gastroesophageal reflux study	Gastroesophageal reflux study	Gastroesophageal reflux study (procedure)	Lexical
Insertion of urethral catheter	Urethral catheterization	Insertion of urethral catheter	Lexical to alias
Spinal puncture, therapeutic	Therapeutic spinal puncture	Therapeutic lumbar puncture	Tokenized
Biopsy of breast, open, incisional	Incisional biopsy of breast	Incisional biopsy of breast	Lexical trigram (88.1356)
Low density lipoprotein (LDL) apheresis	Low density lipoprotein apheresis	Low density lipoprotein apheresis	Domain lexical
Bone marrow transplantation, autologous	Autologous bone marrow transplant	ABMT autologous bone marrow transplant	Domain tokenized stem

Results

Discussion

Candidates generated by the trigram, digram, and substring algorithms were individually reviewed to identify the best match. Higher trigram or digram weights were usually, but not always, indicative of the best match.

Table 3: Lexical trigram candidate identification

Source term: Biopsy of breast, needle core, not using imaging guidance

SCTID	Term	Weight
445437001	Core needle biopsy of breast using palpation guidance	75.9259
445171002	Core needle biopsy of breast using mammography guidance	74.5455
432550005	Core needle biopsy of breast using ultrasound guidance	75.2294
711508007	Percutaneous fine needle aspiration biopsy of breast using imaging guidance	70.7692

Source term: Lipoprotein, VLDL cholesterol

SCTID	Term	Weight
313988001	Lipoprotein cholesterol ratio measurement	63.7681
113079009	Low density lipoprotein cholesterol measurement	58.6667
28036006	High density lipoprotein cholesterol measurement	57.8947
104585005	VLDL cholesterol measurement	57.1429
166856001	Lipoprotein electroph. – VLDL	55.5556



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Mapping challenges:

- Source term broad, candidates narrow

Source: Biopsy of breast, MRI guidance

Laterality:

- MRI-guided biopsy, left breast
- MRI-guided biopsy, right breast

Using device:

- MRI-guided fine needle aspiration biopsy of breast
- MRI-guided core needle biopsy of breast

Methods

- Source term narrow, candidates broad

Source: Esophageal dilation and stent placement, ambulatory

- Dilation of esophagus
- Dilatation of esophageal stricture
- Insertion of esophageal stent

Results

- Source term specifies treatment setting

Source: Ankle arthroscopy complex, ambulatory care vs. Ankle arthroscopy, complex, inpatient care

- Arthroscopy of ankle

Discussion

- Source term lists units of service

Source: Hand radiology, up to 2 views vs Hand radiology, 3 or more addition views

- Radiography of hand

Potential solutions:

One-to-many matching between a single MOH term and multiple SNOMED-CT candidates

- REQUIRES: STAFF MEMBER INTERVENTION TO MANUALLY SELECT THE APPROPRIATE CODE FOR THE SITUATION

Post-coordination of the most appropriate SNOMED-CT term using a limited number of attributes (method, approach, priority, having focus)

- REQUIRES: CHANGES TO THE EHR SYSTEM TO ACCOMMODATE POST-COORDINATED EXPRESSIONS

Enable the use of a specified set of modifiers to identify quantity or setting of services (examples, number of radiographic views, hospital days, setting of treatment)

- REQUIRES: MODIFIER FIELDS IN EHR

Authoring a local extension to include concepts for MOH terms not adequately represented in SNOMED-CT.

- REQUIRES: AUTHORIZING AND MAINTAINENCE OF LOCAL EXTENSION

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SNOMED CT EXPO 2022

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Discussion



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