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AMIA 2017 NLM booth presentation

SNOMED CT to ICD-10-CM map and the I-MAGIC tool

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Motivation to map

- Before Meaningful Use, most EHRs were encoding clinical information by ICD codes
- ICD-9-CM / ICD-10-CM have been shown to be inferior to SNOMED CT to support clinical care
 - **Insufficient content coverage and granularity**
 - **Not clinically oriented**
 - **Not computable – no logical definitions, no post-coordination**
- A SNOMED CT to ICD-10-CM map will
 - **Encourage EHRs to switch to SNOMED CT**
 - **Enable re-use of SNOMED CT-coded data to generate administrative codes**
 - **Support data analytics – allow integration of clinical and claims data**



Mapping method

- “Rule-based map” - to accommodate one-to-many maps
- Combination of ICD-10-CM codes
 - SNOMED CT: Escherichia coli urinary tract infection
 - ICD-10-CM:
 - N39.0 Urinary tract infection, site not specified **AND**
 - B96.20 Unspecified Escherichia coli as the cause of diseases classified elsewhere
- More than one possible target codes
 - SNOMED CT: Sleep apnea
 - ICD-10-CM:
 - P28.3 Primary sleep apnea of newborn (*for neonates*) **OR**
 - G47.30 Sleep apnea, unspecified (*for adults*)



Mapping procedure

- “Dual independent mapping” – built-in quality assurance
- Each map has to be corroborated by 2 independent sources
 - For most concepts, 2 map specialists independently create maps which are compared:
 - If identical → final
 - Otherwise, map reviewed by a third specialist and difference reconciled
 - For some concepts, an existing map is available (e.g. donated content from Kaiser Permanente), map created by 1 specialist is compared to existing map:
 - If identical → final
 - Otherwise, disregard external map and follow workflow above

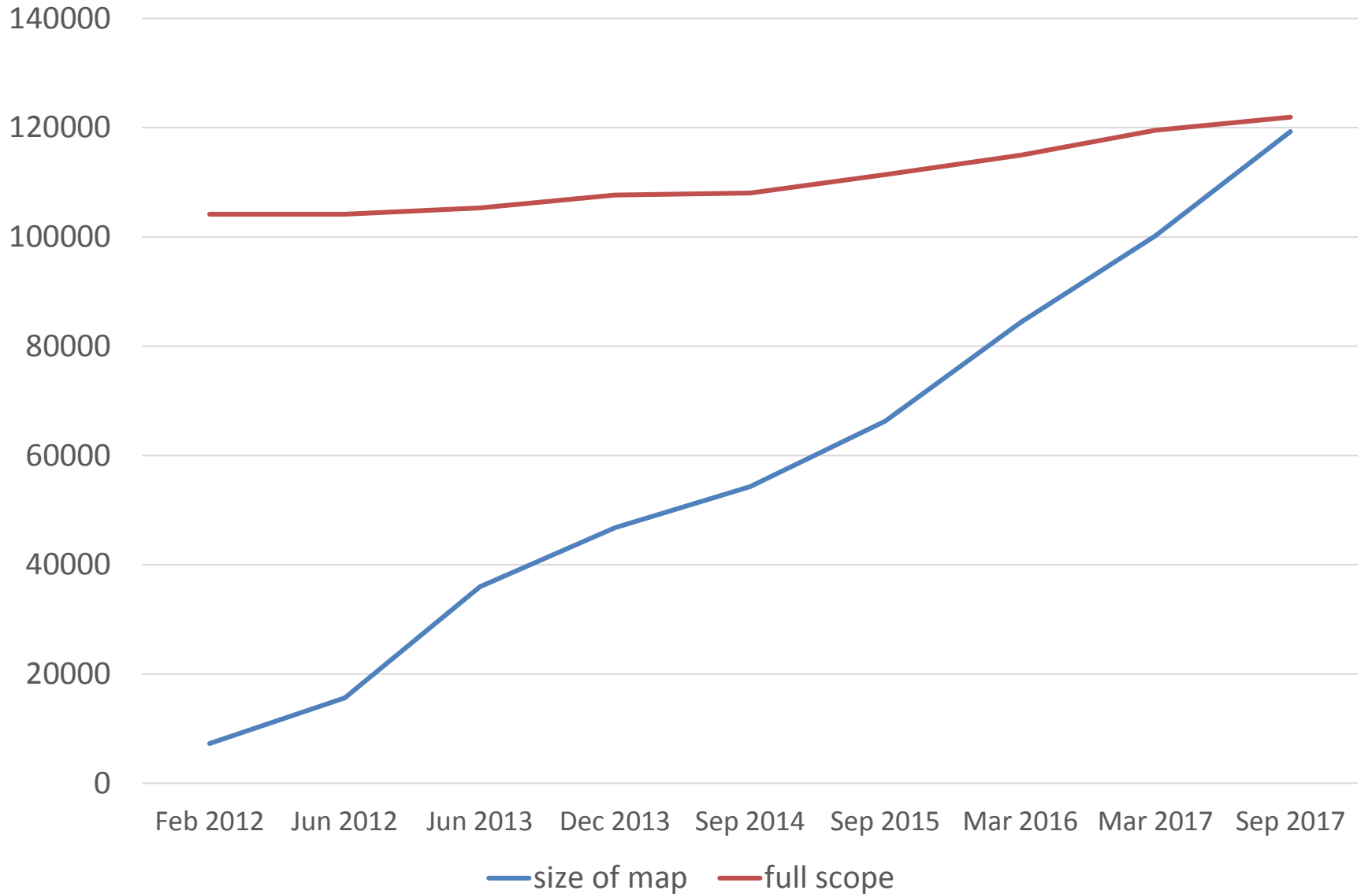


Scope of mapping

- Any SNOMED CT concept which can appear in a problem list and are considered in scope for mapping
- This includes most concepts from the 3 hierarchies
 - Clinical finding
 - Event
 - Situation with explicit context
- Altogether about 120,000 concepts in scope



Coverage of the SNOMED CT to ICD-10-CM map



Usage of the map

- 2017 UMLS user report: 2,357 users are using the SNOMED CT to ICD-10-CM map
- Users include health care providers (e.g., Partners HealthCare, Indian Health Service), EHR vendors, terminology services vendors
- Some SNOMED International member countries also use the map. To expedite the creation of the map, Belgium contributed a map specialist who worked on the project for one year

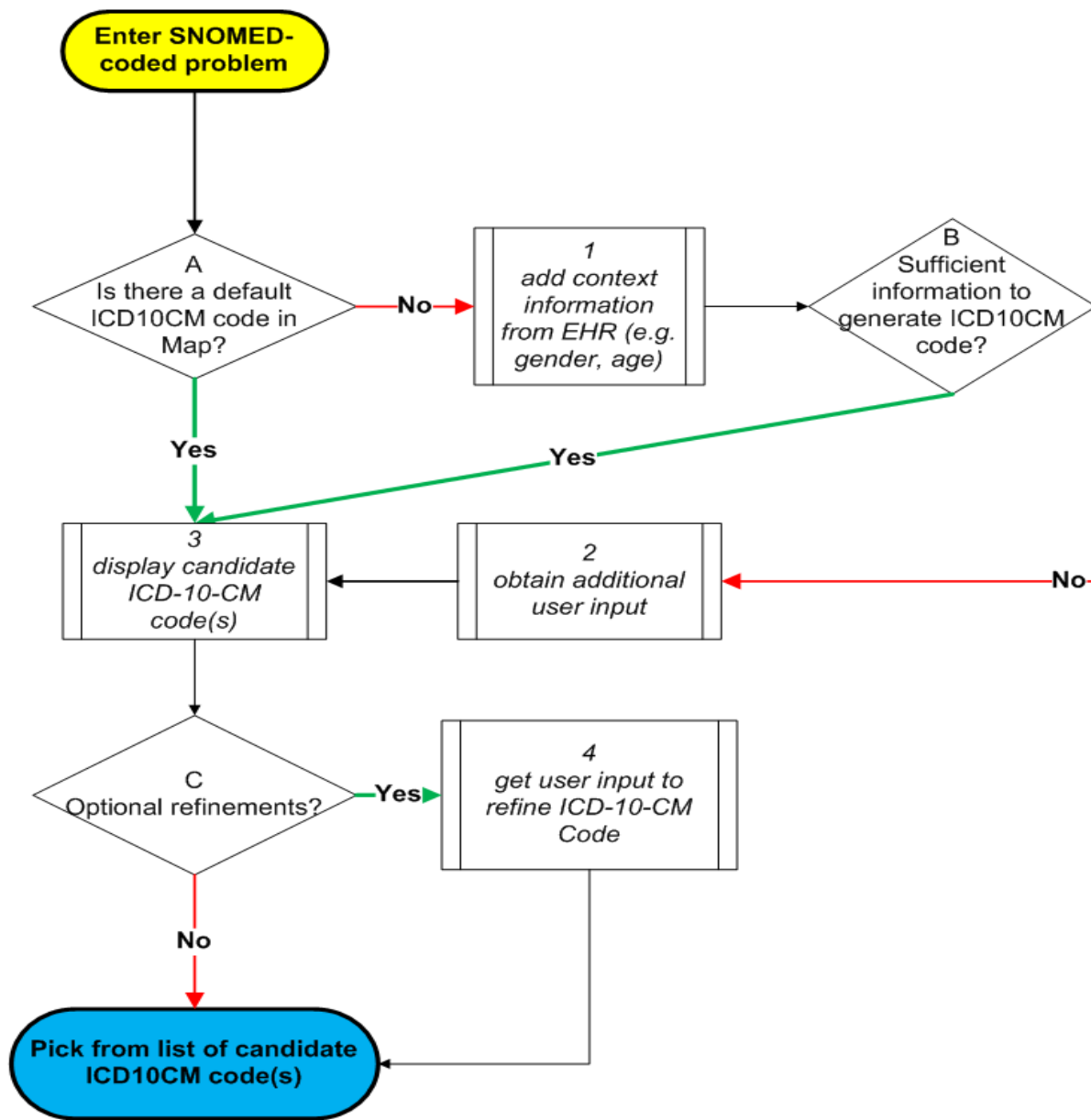


Intended uses of the map

- Embedded in the EHR for real-time, interactive ICD codes generation with the **I-MAGIC** algorithm (Interactive Map-Assisted Generation of ICD Codes)
- To assist coding professionals by suggesting ICD codes based on SNOMED CT-encoded problem list entries
- To facilitate integration of administrative and clinical data for data analytics



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Interactive Map-Assisted Generation of ICD Codes (I-MAGIC) Algorithm

I-MAGIC demo tool for the ICD-10-CM map

- <http://imagic.nlm.nih.gov/imagic/code/map>



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The I-MAGIC (Interactive Map-Assisted Generation of ICD Codes) Algorithm utilizes the [SNOMED CT to ICD-10-CM Map](#) in a real-time, interactive manner to generate ICD-10-CM codes. This demo simulates a problem list interface in which the user enters problems with SNOMED CT terms, which are then used to derive ICD-10-CM codes using the Map.

Name: Gender: Date of Birth:

Problem List (SNOMED-CT terms)

What's wrong with the patient? Please add problem(s) here. (Hint: type 'dizzy')

Information from EHR

Action	SNOMED-CT Name
Add	Problem: <input type="text"/>

(Only SNOMED CT terms included in the published SNOMED CT to ICD-10-CM Map are shown.)

Update List

Get ICD Codes

Add Complex Examples:

Problem list entry interface

Kin Wah Fung [Contact Us](#)

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I-MAGIC

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Name: Gender: Date of Birth:

Problem List (SNOMED-CT terms)

What's wrong with the patient? Please add problem(s) here. (Hint: type 'dizzy')

Action	SNOMED-CT Name
Add	Problem: <input type="text" value="otitis"/>
(Only SNOMED-CT terms)	<ul style="list-style-type: none">Labyrinthitis (23919004)Otitis externa (3135009)Otitis media (65363002)Epidemic vertigo (186738001)Acute exudative otitis media (19399000)Chronic otitis media (21186006)Chronic non-suppurative otitis media (232254004)Acute otitis media (3110003)Acute eczematoid otitis externa (54272002)Acute suppurative otitis media with spontaneous rupture of ear drum (86279000)
Update	

SNOMED CT terms included in the published map



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Name: Gender: Date of Birth:

Problem List (SNOMED-CT terms)

What's wrong with the patient? Please add or remove problem(s) here.

Action	SNOMED-CT Name
<input type="checkbox"/> Remove	Otitis media
<input type="checkbox"/> Remove	Failure to gain weight
<input type="checkbox"/> Remove	Herniated urinary bladder
Add	Problem: <input type="text"/>

Click here to see
ICD-10-CM
codes

(Only SNOMED CT terms included in the published SNOMED CT to ICD-10-CM Map are shown.)

Add Complex Examples:

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	Laterality ICD notes
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

ICD-10-CM codes

Options to refine ICD-10-CM codes

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="button" value="Laterality"/> <input type="button" value="ICD notes"/>
<p>Laterality refinement</p> <p>Refine "Otitis media, unspecified":</p> <ul style="list-style-type: none"> <input type="radio"/> Otitis media, unspecified, unspecified ear <input type="radio"/> Otitis media, unspecified. right ear <input type="radio"/> Otitis media, unspecified, left ear <input type="radio"/> Otitis media, unspecified, bilateral 			
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

Laterality refinement choices

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="button" value="Laterality"/> <input type="button" value="ICD notes"/>
<p>ICD coding notes</p> <p>ICD notes for "Suppurative and unspecified otitis media"</p> <p>Use additional code for any associated perforated tympanic membrane (H72.-)</p> <p>Use additional code to identify:</p> <ul style="list-style-type: none"> exposure to environmental tobacco smoke (Z77.22) exposure to tobacco smoke in the perinatal period (P96.81) history of tobacco use (Z87.891) occupational exposure to environmental tobacco smoke (Z57.31) tobacco dependence (F17.-) tobacco use (Z72.0) 			
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="text" value="Laterality"/> <input type="text" value="ICD notes"/>
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

ICD-10-CM code for adult

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="button" value="Laterality"/> <input type="button" value="ICD notes"/>
Failure to gain weight (36440009)	R62.51	Failure to thrive (child)	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

ICD-10-CM code for child

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="button" value="Laterality"/> <input type="button" value="ICD notes"/>
Failure to gain weight (36440009)	P92.6	Failure to thrive in newborn	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

ICD-10-CM code for newborn

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="button" value="Laterality"/> <input type="button" value="ICD notes"/>
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N32.89	Other specified disorders of bladder	

ICD-10-CM code for male

I-MAGIC

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Otitis media (65363002)	H66.90	Otitis media, unspecified, unspecified ear	<input type="text" value="Laterality"/> <input type="text" value="ICD notes"/>
Failure to gain weight (36440009)	R62.7	Adult failure to thrive	
Herniated urinary bladder (410070006)	N81.10	Cystocele, unspecified	

ICD-10-CM code for female

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Name: Gender: Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Chorioamnionitis (11612004)			
	o41.1290	Chorioamnionitis, unspecified trimester (not applicable or unspecified)	<input type="button" value="Trimester"/> <input type="button" value="Multiple fetuses"/>
<p>Trimester refinement</p> <p>Refine Trimester:</p> <ul style="list-style-type: none"> <input type="radio"/> unspecified trimester <input type="radio"/> first trimester <input type="radio"/> second trimester <input type="radio"/> third trimester <p>Multiple fetuses refinement</p> <ul style="list-style-type: none"> <input type="radio"/> not applicable or unspecified <input type="radio"/> fetus 1 <input type="radio"/> fetus 2 <input type="radio"/> fetus 3 <input type="radio"/> fetus 4 <input type="radio"/> fetus 5 <input type="radio"/> other fetus 			
			<p>Trimester specification</p> <p>Fetus specification</p>

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Name:

Gender:

Date of Birth:

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Simple goiter (267369002)			<input type="button" value="Refine problem"/>
Problem refinement			
Would one of the following diagnoses apply? Choose the most specific one:			
<input type="radio"/> Non-toxic multinodular goiter			
<input type="radio"/> Non-toxic uninodular goiter			
<input type="radio"/> Non-toxic nodular goiter			
<input type="radio"/> The above choices are not applicable			
<input type="checkbox"/> Replace the original problem with the more specific diagnosis			
E04.0		Nontoxic diffuse goiter	

Different ICD-10-CM codes if these more specific conditions apply

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Name: Trauma 1 (modified)

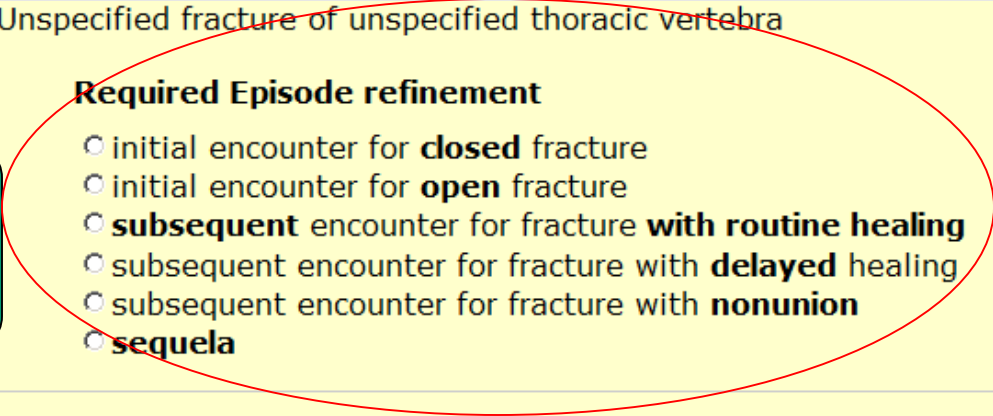
Gender: Male

Date of Birth: 25 Sep 1989

Mapping Problems to ICD-10-CM

SNOMED-CT	ICD-10-CM Code	ICD-10-CM Name	Optional refinement
Fracture of thoracic spine (125607007)	s22.009-	Unspecified fracture of unspecified thoracic vertebra	ICD notes
Required Episode refinement <ul style="list-style-type: none"><input type="radio"/> initial encounter for closed fracture<input type="radio"/> initial encounter for open fracture<input type="radio"/> subsequent encounter for fracture with routine healing<input type="radio"/> subsequent encounter for fracture with delayed healing<input type="radio"/> subsequent encounter for fracture with nonunion<input type="radio"/> sequela			

No valid default ICD-10-CM code



Mandatory refinement choices

Submit Refinement

Back to Problem List



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Thank you!