SNOMED CT: Ontologies in support of global interoperation of the EHR Allergy List Interoperation

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Interoperability use case

➢ Mr. Jones, 75 years old, a retired school teacher, joined a round-the-world cruise and disembarked at Sydney, Australia for a city tour

➢ He had developed a fever of 38.5 degrees Celsius the night before, a mild cough and some pain in urination

➢ The ED physician wants to prescribe an antibiotic but needs to know if the patient has antibiotic allergies and is unfamiliar with some of the US drugs

FirstName J LastName "NickName"

Clinical Summary, generated on Feb. 28, 2019

Patient Demographics - Male; born Jan. 00, 1940

Patient Address	Communication	Language	Race / Ethnicity	Marital Status
1234 Street OMAHA, NE 681XX	NNN-NNN-NNNN (Mobile) NNN-NNN-NNNN (Home) notme@gmail.com	English (Preferred)	Unknown / Unknown	Married

Allergies

Active Allergy	Reactions	Severity	Noted Date	Comments
Gabapentin	Falls	Low		
Lisinopril	Hyperkalemia	High	09/18/2010	
Pioglitazone	Nausea And Vomiting	Low		
Propoxyphene	See Comments			Due to medication interaction
Rosiglitazone	Muscle inflammation	Low	04/19/2010	
Triamterene-Hydrochlorothiazid	Nausea	Low		

Current Medications

Prescription	Sig.	Disp.	Refills	Start Date	End Date	Status
EDEMA WEAR Indications: Durable Medical Equipment	Wear daily as needed	1 each	0	07/06/2010		Active
COCK-UP WRIST SPLINTS Indications: Durable Medical Equipment	1 each.	1 each	0	08/24/2010		Active
DME MISC Indications: Durable Medical Equipment	Dx (ICD code preferred): CHF, legally blind Duration: 99 yrs (lifetime)	1 Units	0	11/19/2010		Active
miscellaneous medical supply Misc Indications: Durable Medical Equipment	Hip protectors to use daily for osteoporosis.	2 each	1	05/14/2010		Active
atorvastatin (LIPITOR) 40 mg tablet	Take 1 tablet (40 mg total) by mouth 1 (one) time a day.	90 tablet	3	05/17/2010		Active
furosemide (LASIX) 20 mg tablet	Take 3 tablets (60 mg total) by mouth 2 (two) times a day.	540 tablet	3	05/17/2010		Active
nitroGLYCERIN (NITROSTAT) 0.4 mg SL tablet Indications: Atherosclerosis of other coronary artery bypass graft without angina pectoris	Place 1 tablet (0.4 mg total) under the tongue every 5 (five) minutes as needed for Chest pain. Go to ER after 1st dose.	25 tablet	3	05/17/2010		Active
pantoprazole (PROTONIX) 40 mg tablet Indications: Heartburn	Take 1 tablet (40 mg total) by mouth every morning before breakfast.	90 tablet	3	06/07/2010		Active

Drug Allergy Encoding

➢ The CDA record summary that the patient presents from Nebraska has Allergy records structured with RXNORM codes for allergen medication, SNOMED CT codes for reactions

➢ Gabapentin allergy: RXCUI=476673(Gabapentin IN), SNCT=416098002(Falls)

➢ Can the coded data support allergy checking software for the Australian physician?

– Merge CDA data into local EHR allergy list structures and coding

– Insinuate reference allergy fact and process with decision support software in local EHR
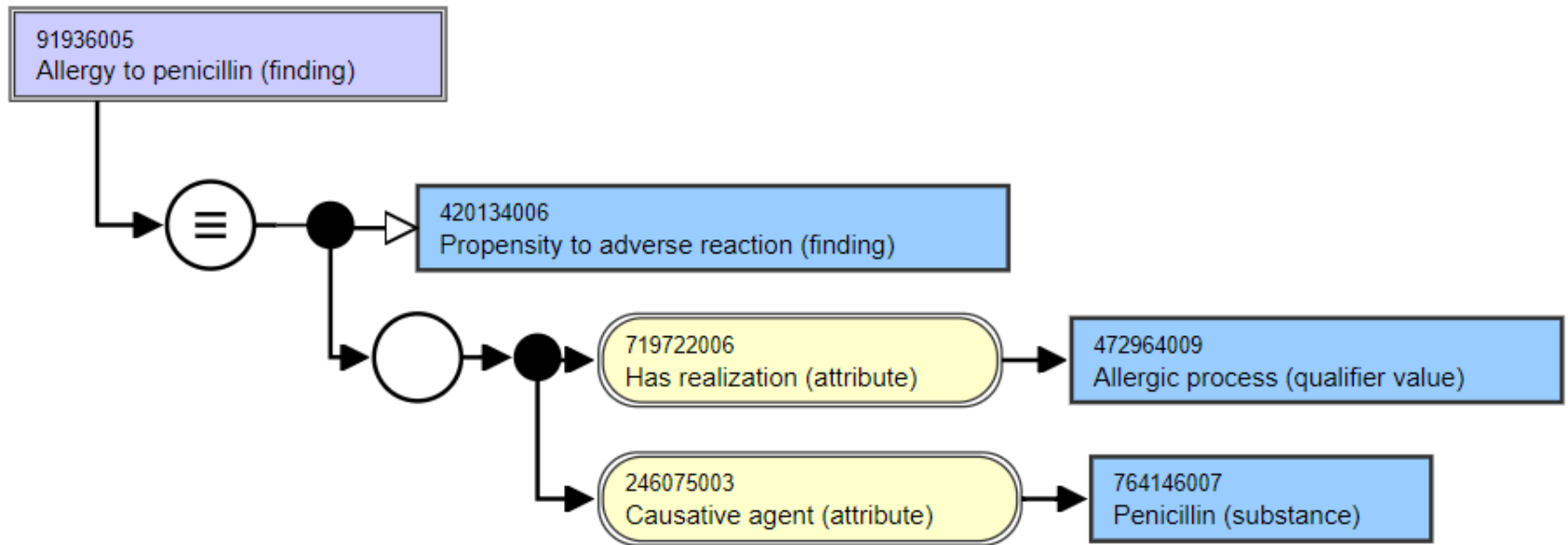
Allergy List Information Model

"Mind the gap!"

➢ Worldwide, there is no consistency in the way vendors have deployed and use drug allergy data:

1) Precoordinated concept in problem list: <<416098002|Allergy to drug(finding)|

2) Post-coordinated entry in problem list

3) Multi-attribute allergy data record with allergen coded as chemical ingredient or clinical drug

Allergy Lists (Precoordinated) SNOMED CT Allergy Concepts

Precoordinated SNOMED CT Clinical finding links Allergy fact to the SNOMED CT Substance that caused the reaction

Nebraska EHR Allergy List (Postcoordinated Allergy Record)

Allergy record

1) Date time stamp
2) Allergen: RXNORM(IN,PIN,MIN,BN, SCD,SBD,GPCK,BPCK)
3) Reaction: SNOMED CT Clinical finding
4) Severity code: Integer
5) Criticality code:Integer

Interoperation Protocol

➢ Convert CDA allergy fact data to local structures and codes
  - RXNORM concept to SNOMED CT Substance
  - SNOMED CT substance to local drug code
  - Map SNOMED Clinical finding to local diagnosis codes
➢ Update local instance of EHR with coded allergy facts in format deployed by vendor
➢ Employ local prescribing software with allergy checking

Convert from Precoordinated Allergy Problems to Substance

Annotations ➕

rdfs:label   [type: xsd:string]

Allergy to gabapentin (finding)

Description: Allergy to gabapentin (finding)

Equivalent To ➕

⬤ 'Propensity to adverse reaction (finding)'
   and ('Role group (attribute)' **some**
     (('Causative agent (attribute)' **some** 'Gabapentin (substance)')
      and ('Has realization (attribute)' **some** 'Allergic process (qualifier value)')))

SubClass Of ➕

Convert from RXNORM Medication Coding RXCUI=476673

Annotations: gabapentin 100 MG Oral Tablet (RXNORM476673)

Annotations ⊕

rdfs:label

gabapentin 100 MG Oral Tablet (RXNORM476673)

'has NDC'

true

'has RxCUI'

476673

prescribable

true

Description: gabapentin 100 MG Oral Tablet (RXNORM476673)

Equivalent To ⊕

● 'Medicinal product (product)'
  and ('Has manufactured dose form (attribute)' **some** 'Conventional release oral tablet (dose form)')
  and ('Role group (attribute)' **some**
   (('Has basis of strength substance (attribute)' **some** gabapentin)
   and ('Has presentation strength numerator value (attribute)' **some** '100 (qualifier value)')
   and ('Has presentation strength numerator unit (attribute)' **some** MG)
   and ('Has presentation strength denominator value (attribute)' **some** '1 (qualifier value)')
   and ('Has presentation strength denominator unit (attribute)' **some** 'Tablet (unit of presentation)')
   and ('Has precise active ingredient (attribute)' **some** gabapentin)))
  and ('Has unit of presentation (attribute)' **some** 'Tablet (unit of presentation)')
  and ('Count of base of active ingredient (attribute)' **some** '1 (qualifier value)')

SubClass Of ⊕

Convert Allergen to AMT drug code

Query (class expression)

'medicinal product (medicinal product) AMT'
and ('Role group (attribute)' **some** ('has intended active ingredient (attribute) AMT' **some** 'gabapentin (AU substance) AMT'))

Execute | Add to ontology

Query results

Subclasses (136 of 137)

- Gabaccord (gabapentin 600 mg) tablet (trade product unit of use) AMT
- Gabaccord (gabapentin 800 mg) tablet (trade product unit of use) AMT
- Gabacor (gabapentin 100 mg) hard capsule (trade product unit of use) AMT
- Gabacor (gabapentin 300 mg) hard capsule (trade product unit of use) AMT
- Gabacor (gabapentin 400 mg) hard capsule (trade product unit of use) AMT
- Gabacor (gabapentin 600 mg) tablet (trade product unit of use) AMT
- Gabacor (gabapentin 800 mg) tablet (trade product unit of use) AMT
- Gabahexal (gabapentin 300 mg) capsule (trade product unit of use) AMT
- Gabahexal (gabapentin 400 mg) capsule (trade product unit of use) AMT