Allergy Terminology in HL7

SNOMED CT Expo

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Wellington, New Zealand

Russell Leftwich, MD, FAAAI
“The Allergy List is the most inaccurate piece of data in the electronic record.”

Charles Jaffe, MD, PhD, FAAAAI
CEO HL7 International
AMIA Annual Conference
November 14, 2015
Recent reports in the US show drug-allergy alert override rates are around 90 percent in two academic medical centers.
Allergy in 1900

• No family history of allergy: the word did not exist

• von Pirquet coined the word in 1906 from Greek roots “other” + “work”

• He was referring to serum sickness
allergy (n.)

1. an abnormal reaction of the body to a previously encountered allergen
2. hypersensitivity to the reintroduction of an allergen
3. *Informal.* a strong dislike or aversion, as toward a person or activity
Patient Definition

allergy (n.)

Something I don’t want to happen again is going to happen if I am exposed to this substance again, because it happened before.
My Working Definition

allergy or intolerance (n.)

A propensity that is unique to this individual to have an adverse physiologic reaction upon exposure to a specific substance, based on a history of a past reaction to this substance.
There is no single classification system – chemical structure, pharmacologic action, indication, etc – which can be used to predict cross reactivity. Overall, an unfounded assumption of cross reactivity is contrary to providing the most effective and least costly treatment.
Non-steroidal Anti-inflammatory Drugs

• Aspirin sensitive asthma. Looks for all the world like anaphylaxis. Assumed for decades to be IgE immediate hypersensitivity reaction.

• Cross reacts with all NSAID that have same pharmacologic mechanism

• Susceptible individuals have acquired change in metabolism of leukotrienes which are 60 times more potent than histamine
ACE Inhibitors

- Because all have the same mechanism of action, there is 100% cross reactivity
- Angioedema episodes recur for weeks
- May not have an immediate recurrence
- No cross react w/ ARB (angiotensin receptor blockers)
Penicillin allergy in the US

• 10% of US has “penicillin allergy” on their list
• When tested and challenged only 1 of 10 with penicillin allergy has any reaction
• The cross reactivity of that 1 of 10 is expected to be low
• The cross reactivity of the other 9 is zero
Foods and cross reactivity for anaphylaxis

• Bony fish have high cross-reactivity
• Crustacean shellfish have high cross-reactivity
• Tree nuts have low cross-reactivity, none w/ peanuts
• Allergen is always protein based, not oil
The most frequent description of reaction type on the Allergy List is “drug rash” or just “rash”.
The most commonly held misconception about allergic reactions is that there is laboratory or in vivo testing to determine the causative substance. There is not.
HL7 Version 3

Domain Analysis Model
Clinical Models
HL7 Allergy and Intolerance DAM

1. 14 use cases
2. Basis for clinical models, C-CDA and FHIR
3. Available through HL7 [www.hl7.org](http://www.hl7.org)
## HL7 Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Allergies and Intolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2</td>
<td>✓</td>
</tr>
<tr>
<td>V3</td>
<td>✓</td>
</tr>
<tr>
<td>C-CDA</td>
<td>✓</td>
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<tr>
<td>Clinical Decision Support</td>
<td>✓</td>
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<tr>
<td>Quality Reporting</td>
<td>✓</td>
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<tr>
<td>FHIR</td>
<td>✓</td>
</tr>
</tbody>
</table>
Key Concepts

- Adverse Reaction
  - Severity

- Condition of Allergy or Intolerance or Unclear
  - Criticality
  - The “List”

- Causative material
Value Set: Problem Severity 2.16.840.1.113883.3.88.12.3221.6.8
This is a description of the level of the severity of the problem. Specific URL Pending

<table>
<thead>
<tr>
<th>Code</th>
<th>Code System</th>
<th>Print Name</th>
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<tbody>
<tr>
<td>255604002</td>
<td>SNOMED CT</td>
<td>Mild (qualifier value)</td>
</tr>
<tr>
<td>371923003</td>
<td>SNOMED CT</td>
<td>Mild to moderate (qualifier value)</td>
</tr>
<tr>
<td>6736007</td>
<td>SNOMED CT</td>
<td>Moderate (severity modifier) (qualifier value)</td>
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<tr>
<td>371924009</td>
<td>SNOMED CT</td>
<td>Moderate to severe (qualifier value)</td>
</tr>
<tr>
<td>24484000</td>
<td>SNOMED CT</td>
<td>Severe (severity modifier) (qualifier value)</td>
</tr>
<tr>
<td>399166001</td>
<td>SNOMED CT</td>
<td>Fatal (qualifier value)</td>
</tr>
</tbody>
</table>
Terminology: Criticality

• HIGH - Definition: Exposure to substance may result in a life threatening or organ system threatening outcome.

• LOW – Definition: Exposure to substance unlikely to result in a life threatening or organ system threatening outcome.

• Unable to Determine – Definition: Unable to assess with information available.

• Unknown – Definition: A proper value is applicable but it is not known.
Interoperability Requires: Convergence, alignment, Harmonization
C-CDA R2

• grouping value set intended to provide broad coverage of all kinds of agents; substance concept identifier for a drawn from the available code systems in the following priority order: NDFRT, then RXNORM, then UNII, then SNOMED CT.

• This overarching grouping value set is intended to support identification of drug classes, individual medication ingredients, foods, general substances and environmental entities.

• Value Set: Medication Drug Class (2.16.840.1.113883.3.88.12.80.18) (NDFRT drug class codes);

• Value Set: Clinical Drug Ingredient (2.16.840.1.113762.1.4.1010.7) (RxNORM ingredient codes);

• Value Set: Unique Ingredient Identifier - Complete Set (2.16.840.1.113883.3.88.12.80.20) (UNII ingredient codes);

• Value Set: Substance Other Than Clinical Drug (2.16.840.1.113762.1.4.1010.9) (SNOMED CT substance codes).
HL7 FHIR Allergy Intolerance Resource

4.1.3 Resource Content

UML Diagram

Allergy/intolerance (Resource)

- identifier : Identifier 0..*
- recordedDate : dateTime 0..1
- recorder : Reference(Practitioner | Patient) 0..1
- subject : Reference(Patient) 1..1
- substance : CodeableConcept 1..1 « (SubstanceType) »
- status : code 0..1 « AllergyIntoleranceStatus »
- criticality : code 0..1 « AllergyIntoleranceCriticality »
- type : code 0..1 « AllergyIntoleranceType »
- category : code 0..1 « AllergyIntoleranceCategory »
- lastOccurrence : dateTime 0..1
- comment : string 0..1

Event

- substance : CodeableConcept 0..1 « (SubstanceType) »
- certainty : code 0..1 « AllergyIntoleranceCertainty »
- manifestation : CodeableConcept 1..* « (Manifestation) »
- description : string 0..1
- onset : dateTime 0..1
- duration : Duration 0..1
- severity : code 0..1 « AllergyIntoleranceSeverity »
- exposureRoute : CodeableConcept 0..1 « (RouteOfAdministration) »
- comment : string 0..1
Terminology: Substances

- Name
- Ingredient
- Class

- Name
- Class

- Environmental

- Devices
Substances – Terminology options

- **Drugs**
  - Name - RxNorm
  - Ingredient – RxNorm, UNII
  - Class – NDFRT
  - Immunizations - CVX

- **Food**
  - Name – UNII, SNOMED-CT, Langua
  - Class – SNOMED-CT

- **Environmental**
  - Name – UNII, SNOMED-CT

- **Devices**
  - Name – SNOMED-CT
Allergy Terminologies

- Compared:
  - SNOMED CT
  - NDF-RT
  - MedDRA
  - UNII
  - RxNorm

- Findings:
  - SNOMED-CT and RxNORM provide best content coverage

Allergy Data Sets

- Cerner, US Veterans Admin, US DoD, Kaiser
- 63 million allergy list entries
- 300 drug ingredients account for 98%
- Less than 100 drug ingredients account for 100%
- Many entries that are not actionable, but small percent total
Seafood is a type of restaurant...... not a class of allergenic substance.

There is risk of cross reactivity across crustacean shellfish and mollusks, and separately across the bony fishes.

Iodine is a normal component of our bodies and could not be an allergen.
SNOMED CT offers great potential for aligning HL7 standards with the HL7 Allergy-Intolerance Domain Analysis Model and providing the basis for effective decision support and improved patient safety.

The ultimate solution lies in decision support around what goes on to the list. But this requires standards and terminology be in place in order to achieve this.