Role of SNOMED CT in Public Health Surveillance

Mihai D. Georgescu,
FEC, P.Eng, MBA, PMP
Certified IT Consultant – Healthcare
mihai@ca.ibm.com
IBM Canada Ltd.

Version 2.1 11 October 2013
Agenda

- Introduction to PH SDSM
- SNOMED-CT and PH SDSM:
  - SNOMED-CT Examples in PH SDSM
  - Configuring PH SDSM with SNOMED-CT
  - Role of SNOMED-CT in PH SDSM
  - Lessons Learned
- Conclusions
- Questions and Answers
Public Health Surveillance (PH SDSM)
Public Health - SDSM

Major Activities of Public Health:

- Case Management
- Outbreak Management
- Immunization Management
- Family Health Management
- Vaccine/Materials Inventory Management
- Work Management

Shared Services & Administration

Lab Systems, Hospitals, Registries, Alerts, Physician Offices
Shared Services – Terminology Overview

Terminology Services are a collection of content (data), UI, APIs, and process

- Solution repository for standard and customized terminology elements.
- Used throughout the solution functions for contents of drop down (or multi-select) lists in the UI, reporting and standardized information exchange through HL7 messages.
- Centralized administration, maintenance and customization of clinical terminology elements.
- Implements international and Canadian standard terminology code systems (SNOMED-CT, Canadian LOINC, Health Canada Drug Product Database, HL7 V3 messaging standard as defined by Canada Health Infoway).
- Implements code systems specific to the Canadian application.
Shared Services – Terminology Overview
Example of Usage
PH SDSM and SNOMED-CT

- SNOMED-CT is mandated in Canada by Canada Health Infoway as the preferred terminology for clinical systems.
- All Canadian Public Health jurisdictions are licensed to use SNOMED-CT.
- SNOMED-CT is a reference code set provided by PH SDSM, together with LOINC (pCLOCD) for lab tests and results, UCUM for units of measure, Health Canada DPD for drugs and active ingredients.
- SNOMED-CT is implemented using PH SDSM terminology services, a component of the PH SDSM shared services.
PH SDSM and SNOMED-CT

- PH-SDSM includes all active SNOMED-CT concepts for SNOMED-CT (pan-Canadian version from Feb 2010).
- PH-SDSM implements all concept relationships exiting in the implemented version SNOMED-CT.
- PH-SDSM configuration makes explicit use of the SNOMED-CT hierarchies and causative relationships in defining value sets.
- Concept descriptions (preferred) in English and French (pan-Canadian version of SNOMED), with functionality for jurisdictions to add descriptions in other languages or customize descriptions.
PH SDSM Modules Using SNOMED-CT

- 99 vocabulary domains in PH SDSM are based on SNOMED-CT and extensions. This represents about 10% of all PH SDSM vocabulary domains.

- **HL7 Messaging Component** - Vocabulary Domains examples:
  - ActCareProvisionRequestType
  - ActImmunizationReason (Immunization Management)
  - ActiveIngredientDrugEntityTypeForPh (Investigations – Rx)
  - ActProcedureCategoryList (Investigations Management)
  - ActProfessionalServiceCode
  - ActServiceDeliveryLocationService
  - DiagnosisValue (Investigations Management)
  - EncounterDischargeDisposition (Investigations Management)
  - EncounterReferralSource (Investigations Management)
**Investigation Management Module**
(examples of 25 domains):
- Diseases
- Symptoms
- Causative agents
- Investigation site
- ADR symptom
- Drug therapy
- Disease complications
- Cause of death
### Disease Event Details

**Warnings**

- **Client ID:** 35
- **Name:** First, Middle, Last / Gender: Male
- **Health Card No.:** -
- **Date of Birth / Age:** 1983 Sep 9 / 30 yrs
- **Phone Number:** (-)
- **Jurisdiction Info:** BC Ministry of Health
- **Additional ID Type / Additional ID:** Provincial health service provider identifier

**Investigation ID:** 12
**Status:** OPEN
**Disposition:** Became a case
**OB No.:** 36, 79, 191, 192
**Disease:** AIDS
**PHAC Date / Type:** 2009 Sep 9 / Report Received
**Causative Agent:** Human immunodeficiency virus type 2
**Authority / Classification:** National / Case - Confirmed / 2009 Sep 9

### Disease Event Details

- **PHAC Date / Date Type:** /
- **Disease Origin:** Indigenous
- **Living on Reserve Most of the Time:** No (during initial investigation)

### Disease Event History

- **Disease:** Gonorrhoea
- **Causative Agent:**
  - Neisseria gonorrhoeae
  - Cephalosporin-resistant Neisseria gonorrhoeae
  - Fluoroquinolone-resistant Neisseria gonorrhoeae
  - Neisseria gonorrhoeae, beta lactamase negative
  - Penicillasse-producing Neisseria gonorrhoeae
  - Spectinomycin-resistant Neisseria gonorrhoeae
  - Tetracycline-resistant Neisseria gonorrhoeae

**Site(s):** Hold Ctrl and Available

**Selected Sites(s):**
PH SDSM Modules Using SNOMED-CT

- **Laboratory Component** in the Investigation module uses SNOMED-CT for (examples of the 13 domains in this category):
  - Specimen type
  - Specimen site
  - Antimicrobial drug
  - Result sensitivity value interpretation
  - Diagnostic imagining requisition test view
  - Diagnostic imagining test view
  - Diagnostic imagining site abnormality
Laboratory Component
Laboratory Component

**Specimens**

- **Required field (for Add/Update only)**
- **Specimen Type:** Fluid sample
- **Site:**
  - Amniocentesis fluid sample
  - Amniotic fluid cytologic material
  - Mid-stream urine sample
  - Spot urine sample
  - Urinary catheter specimen

**Collection Date/Time:**

**Specimen Description:**

**Row Actions:**

- Update
- Delete
- Select All
- Deselect All

<table>
<thead>
<tr>
<th>Specimen ID</th>
<th>Specimen Type</th>
<th>Site</th>
<th>Collection Date/Time</th>
<th>Specimen Description</th>
</tr>
</thead>
</table>

**Lab Tests**
PH SDSM Modules Using SNOMED-CT

- **Subject Management Component** – examples:
  - Allergen type – with embedded find component and SNOMED hierarchy browser
  - Allergy severity
  - Allergy reaction
### List of Allergies for Client

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Severity</th>
<th>Reaction</th>
<th>Onset Date</th>
<th>Effective From Date</th>
<th>Effective To Date</th>
<th>Client Warnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish - dietary</td>
<td>High</td>
<td>Rigor - symptom</td>
<td>2009 Nov 06</td>
<td>2009 Nov 06</td>
<td></td>
<td>Client Warnings</td>
</tr>
<tr>
<td>Food allergen</td>
<td></td>
<td>C/O: itching</td>
<td>2009 Nov 30</td>
<td>2009 Nov 30</td>
<td></td>
<td>Client Warnings</td>
</tr>
</tbody>
</table>

### Allergy Detail

- **Show as Client Warning**: [ ]
- **Allergen Type**: Drug allergen or pseudoallergen
- **Status**: Active

#### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillamine</td>
<td>334498</td>
</tr>
<tr>
<td>Penicillin - class of antibiotic</td>
<td>330076</td>
</tr>
<tr>
<td>Penicillase sensitive penicillins</td>
<td>316198</td>
</tr>
<tr>
<td>Penicillin G potassium</td>
<td>11934</td>
</tr>
<tr>
<td>Penicillin G benzathine (substance)</td>
<td>301588</td>
</tr>
</tbody>
</table>

**Total: 7**
PH SDSM Modules Using SNOMED-CT

- Immunizations Management Module:
  - Agents
  - Antigens
  - ImmunizationHistoryDisease
  - ImmunizationReason
  - InformationSource
  - ImmunizationRoute
  - SpecialConsiderationReason
**Client Immunization Profile**

Double-click in any date field below to enter the default date:

<table>
<thead>
<tr>
<th>Immunizing Agent</th>
<th>2011 Apr 14</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera-Unspecified</td>
<td>2012 Oct 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reminder/Recall Count**

**Antigen Count**

<table>
<thead>
<tr>
<th>Doses by Antigen</th>
<th>Valid Doses</th>
<th>Invalid Doses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Measles</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mumps</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Rubella</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Varicella</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**TB Skin Tests and Follow Ups**
Configuring PH SDSM With SNOMED-CT

- Terminology services is a shared component of PH SDSM, containing configuration data for all drop down lists on the system's user interface (UI), HL7 messaging and reports.

- Elements of the terminology services are:
  - Vocabulary domains – symbolic references to drop down lists, massaging or report elements.
  - Value sets – define contents of the vocabulary domains
  - Code sets – collections of terminology concepts, managed by the code set owners (e.g. standards organizations – IHTSDO, reference implementation, jurisdictional customizations).
Terminology services in PH SDSM provide SNOMED specific facilities to benefit from the full features offered by SNOMED-CT:

- Include an individual SNOMED concept in a value set.
- Include a complete SNOMED-CT hierarchy under a selected parent concept.
- Capability to include or exclude the hierarchy parent in the value set.
- Exclude any individual concepts from a hierarchy.
- SNOMED-CT search capability.
- Imbedded SNOMED-CT browser
- Leverage on the disease causative relationship to define causative agents
Configuring PH SDSM With SNOMED-CT

Value Set

Source Value Set: RiHumanLaboratorySpecimenSpecimenType

Select Value Set Entry Type: Include

Select Code Set: SNOMED

Include Concept: This Concept, Children of this Concept

Search Code

Enter a description text to search: blood

Selected Target Coded Concept: 53130003

Selected Target Coded Concept Description: Venous blood

Biopsy of blood vessel
Blast count, blood
Blood
Blood (WBC) screen for α-fucosidosis
Blood (WBC) screen for a-mannosidosis
Blood (WBC) screen for b-mannosidosis
Blood (WBC) screen for GM1 gangliosidosis
Blood (WBC) screen for I-cell disease
Blood (WBC) screen for infantile neuronal lipofuscinosis
Blood (WBC) screen for Krabbe's leukodystrophy
Blood (WBC) screen for metachromatic leukodystrophy
Blood (WBC) screen for MPS type VII
Blood (WBC) screen for Sandhoff disease
Blood (WBC) screen for Schindler disease
Blood (WBC) screen for Tay Sachs disease
Blood - infectious titre negative
Blood A-fucosidase measurement
Blood A-galactosidase measurement
Blood A-mannosidase measurement
Blood acetyl galactosaminidase measurement

Blood
Banked whole blood
Serous blood
Extracorporeal blood
Circulating blood
Extravascular blood
Venous blood
Banked autologous blood
Menstrual blood
Peripheral blood
Blood from surgical drain
Arterial blood
Capillary blood
Cord blood
Operative salvaged blood
SNOMED-CT extensions are defined at PH SDSM program level using the terminology services.

Jurisdictions have the ability to define own extensions to SNOMED-CT.

Capability to customize concept descriptions

Define mappings from/to SNOMED-CT to/from other terminologies.
Example of imbedded SNOMED browser in values set entry.
Role of SNOMED-CT in Public Health Surveillance (PH-SDSM)

- Standardize on the clinical information captured by the system (e.g. diseases, causative agents, agents and antigens, …)
- Exchange of clinical information between clinical systems, through HL7 messages, for centralization of data, notifications on reportable diseases at provincial and national level, outbreak alerts, and information exchange among clinical systems.
Lessons Learned

- All jurisdictions will customize PH-SDSM configuration to an extent that varies from jurisdiction to jurisdiction.

- SNOMED-CT version supported by PH-SDSM may not match requirements for all the jurisdictions. Switching to a different version of SNOMED-CT requires in-depth analysis and possible remediation of existing jurisdictional configuration.

- The complexity of SNOMED-CT makes it difficult for users to select individual concepts in a hierarchy (e.g. selecting an allergen in a hierarchy like Drug or Food Allergen).

- Users like pre-defined drop lists (e.g. disease causative agents), but need the capability to customize these lists at the same time.

- Users are not familiar with SNOMED-CT descriptions and ask to customize the descriptions. This creates maintenance problems.
Lessons Learned

- Drop lists are displaying concepts as a flattened list, in alphabetical order. The hierarchical relationships, that may be the logical order, are lost.
- Navigating SNOMED-CT hierarchies is slow and unnecessary if the user knows exactly what concept to select. Based on users’ feedback, we added to the SNOMED-CT embedded browser also a search function.
- Focus groups or working groups that define the jurisdictional customizations of terminology services do not think in terms of SNOMED-CT, but in terms of meeting the business needs. The IBM implementation team suggested SNOMED-CT equivalent terms and received clients’ approval.
- Providing alternate descriptions to SNOMED-CT concepts help users’ transition to the new system and stimulate system adoption by all categories of users.
- Finding subject matter expert (SME) support to validate customized configuration definitions is a challenge.
Conclusions

- The presentation introduced a use case of a public health surveillance system (PH-SDSM) currently deployed in several Canadian and international jurisdictions. The system uses SNOMED-CT as a reference terminology.
- We demonstrated how SNOMED-CT is used to encode the main clinical information throughout PH-SDSM, in several system components.
- We presented how PH-SDSM terminology services have specific SNOMED-CT functionality to leverage the full set of features in SNOMED-CT.
- We highlighted the flexibility of our SNOMED-CT implementation through program or jurisdictional extensions.
- We wrapped-up by presenting the role of SNOMED-CT in public health surveillance and the lessons learned from working with our customers.
Questions and Answers
Thank you!