Mapping CRIM to HL7 vMR

Dr Robert Dunlop
InferMed Ltd
HL7 v3 Reference Information Model

• The RIM is a static model of health and health care information
  – Pertinent to HL7 standards development
  – Consensus view of information re HL7 working group and international affiliates.

• Ultimate source from which all HL7 version 3.0 protocol specification standards draw their information-related content
HL7 v3 Reference Information Model

• RIM is modeled using a subset of the semantics embodied in UML (see next slide for simplified UML Metamodel)

• Comprises a set of UML classes
  – Each class contains one or more attributes
  – Each attribute is assigned a data type based on an independent specification of Version 3 data types
  – Classes are linked either by a set of association relationships, identified by unique role names, or by generalization relationships
UML Metamodel (simplified)
HL7 v3 Foundation Classes

• There are 3 Foundation Classes in the HL7 RIM
  – Acts
    • A collection of classes that relate to the actions and events that constitute health care services.
  – Entities
    • A collection of classes that represent health care stakeholders and other things of interest to health care.
  – Roles
    • A collection of classes that focus on the roles participants may play in health care.
HL7 v3 RIM “Back-bone” Classes

The RIM comprises six ‘back-bone’ classes (coloured boxes) that are linked by associations (illustrated by the red lines):

- **Act**
  - Specialising Acts
- **Participation**
  - Specialising Acts
- **ActRelationship**
  - Specialising Acts
- **Entity**
  - Specialising Entities
- **Role**
  - Specialising Roles
- **RoleLink**
  - Specialising Roles
UML Basis for HL7 v3 Classes

The base classes are instances of the Class element in the UML Metamodel.
UML Basis for HL7 v3 Classes

The associations are instances of the Association and AssociationEnd elements in the UML Metamodel.
HL7 v3 RIM Classes

**Patient** Class for other patient information
- **Person** Class for patient date of birth and ethnicity
- **ManufacturedMaterial** Class for information about stents and drugs
- **SubstanceAdministration** Class for prescribing information
- **PatientEncounter** Class for outpatient and other visits
- **ActRelationship** relates acts together, such as a procedure related to a diagnosis
- **Observation** Class for diagnoses, clinical findings, radiology and lab results
- **Procedure** Class for diagnostic tests, interventions and surgery

NB: Only a small subset of the RIM is required for @neurIST purposes, as illustrated above
Implications of RIM for @neurIST

• HL7 v3 RIM represents an internationally standardised way for modelling @neurIST clinical data
  – Enable wider exploitation of @neurIST, not just for unruptured cerebral aneurysms

• Most significant impact is on @neuRisk
  – Messaging data to and from the clinical decision support tool requires standardisation
HL7 Message Models

• The RIM is an abstract model
  – Not implementable
  – Forms basis for Refined Message Information Models (R-MIMs), which are implementable

• @neurIST Project has been defining an R-MIM for transporting CDS data inputs & outputs
  – Standard is known as the Virtual Medical Record (vMR)
  – HL7 Development Framework Project #184
vMR Project

• Developed a set of use cases, including @neurlST risk assessment
• Modelled the data inputs and outputs from the @neuRisk decision support tool
• Took advice on which existing HL7 R-MIMs might be suitable
• Successfully balloted a recommendation to use the HL7 CareRecord R-MIM for the vMR
HL7 CareRecord R-MIM

- The diagram illustrates the CareRecord Class Model
- Two elements of the CareRecord are relevant to the vMR
  - CareStatement
    - Carries patient data, eg from the CRIM
  - CarePlan
    - Carries CDS recommendations
HL7 CareStatement R-MIM

• The CareStatement Class Model is expanded below:
vMR CareStatement Components

- CareStatement contains several relevant classes
  - Observation
    - Diagnoses; findings; results
  - SubstanceAdministration
    - Prescribing information
  - Procedure
    - Operation; intervention
  - Encounter
    - Outpatient visit; admission
  - Act
    - Other types of actions
vMR Classes & Associations

- CareEntry (A)
  - classCode (CS)
  - moodCode (CS)
  - id (SET<II>)
  - code (CD)
  - negationInd (BL)
  - text (ED)
  - effectiveTime (GTS)
  - reasonCode (SET<CE> CWE)
  - pertinentInformation3 [0..*] (PertinentInformation5)

- pertinentInformation5 (AR)
  - typeCode (CS)
  - contextConductionInd (BL)
  - careStatement [1..1] (A_CareStatementCare provision)

- A_CareStatement [care provision] (A)
  - CareStatement (A)
vMR Classes & Associations

• CareStatement (A)
  – CareEntry (A)

• CareEntry (A)
  – recordTarget [0..1] (RecordTarget)
  – Observation (class)
  – SubstanceAdministration (class)
  – Procedure (class)
  – Encounter (class)
  – Act (class)

• RecordTarget (P)
  – typeCode (CS)
  – negationInd (BL)
  – contextConductionInd (BL)
  – recordTargetChoice [1..1] (RecordTargetChoice)

• RecordTargetChoice
  – R_PatientUniversal (Patient)
  – or R_CaredEntityCare provision
vMR Classes & Associations

• Observation (A)
  – classCode (CS)
  – moodCode (CS)
  – id (SET<II>)
  – code (CD)
  – negationInd (BL)
  – text (ED)
  – effectiveTime (GTS)
  – value (ANY)
  – methodCode (SET<CE>)
  – targetSiteCode (SET<CD>)
  – referenceRange [0..*] (ReferenceRange2)

• ReferenceRange2 (AR)
  – typeCode (CS)
  – contextConductionInd (BL)
  – observationRange [1..1] (ObservationRange)

• ObservationRange (O)
  – classCode (CS)
  – moodCode (CS)
  – negationInd (BL)
  – text (ED)
  – value (ANY)
vMR Classes & Associations

- **Procedure (A)**
  - classCode (CS)
  - moodCode (CS)
  - id (SET<II>)
  - code (CD)
  - negationInd (BL)
  - text (ED)
  - effectiveTime (GTS)
  - methodCode (SET<CE>)
  - approachSiteCode (SET<CD>)
  - targetSiteCode (SET<CD>)

- **Encounter (A)**
  - classCode (CS)
  - moodCode (CS)
  - id (SET<II>)
  - code (CD)
  - text (ED)
  - effectiveTime (GTS)
  - lengthOfStayQuantity (PQ)
vMR Classes & Associations

- **SubstanceAdministration (A)**
  - classCode (CS)
  - moodCode (CS)
  - id (SET<II>)
  - code (CD)
  - negationInd (BL)
  - text (ED)
  - effectiveTime (GTS)
  - routeCode (CE)
  - approachSiteCode (SET<CD>)
  - doseQuantity (IVL<PQ>)
  - rateQuantity (IVL<PQ>)
  - *association*: consumable [1..1] (Consumable)

- **Consumable (P)**
  - typeCode (CS)
  - contextControlCode (CS)
  - consumableChoice [1..1]
    (ConsumableChoice)

- **ConsumableChoice**
  - R_MedicationUniversal
  - or AdministrableMaterial (P)

- **Material**
  - classCode (CS)
  - determinerCode (CS)
  - code (CE)
  - desc (ST)
vMR Classes & Associations

• R_MedicationUniversal
  – Medication (R)

• Medication (R)
  – classCode (CS)
  – administerableMedicine [1..1] (Medicine)

• Medicine (E)
  – classCode (CS)
  – determinerCode (CS)
  – code (CE)
  – name (SET<TN>)

• AdministrableMaterial (P)
  – classCode (CS)
  – administerableMaterial [1..1] (Material)

• Material (E)
  – classCode (CS)
  – determinerCode (CS)
  – code (CE)
  – desc (ST)
  – materialPart [0..*] (MaterialPart)

• MaterialPart (R)
  – classCode (CS)
  – partMaterial [1..1] (Material2)
vMR Classes & Associations

- **Patient (R)**
  - classCode (CS)
  - id (SET<II>)
  - patientEntityChoiceSubject [1..1] (EntityChoiceSubject)
- **EntityChoiceSubject (E)**
  - Person (E)
  - birthPlace [0..1] (BirthPlace)
- **Employee (R)**
  - classCode (CS)
  - statusCode (CS CNE)
  - asEmployee [0..*] (Employee)
- **Person (E)**
  - classCode (CS)
  - determinerCode (CS)
  - birthTime (TS)
  - deceasedInd (BL)
  - raceCode (SET<CE>)
  - ethnicGroupCode (SET<CE>)
  - birthPlace [0..1] (BirthPlace)
- **BirthPlace (R)**
  - classCode (CS)
  - birthplace [0..1] (E_PlaceUniversal)
vMR Classes & Associations

- E_PlaceUniversal (E)
  - Place (E)
- Place (E)
  - classCode (CS)
  - determinerCode (CS)
  - id (SET<II>)
  - code (CE CWE)
  - name (BAG<EN>)
  - desc (ED)

- Act
  - classCode (CS)
  - moodCode (CS)
  - id (SET<II>)
  - code (CD)
  - negationInd (BL)
  - text (ED)
  - effectiveTime (GTS)
vMR DataTypes

- **Basic Types**
  - ANY
  - CS
  - BL
  - CD
  - ED
  - GTS
  - ST
  - PQ
  - TS
  - EN
  - II
  - CE

- **Generic Collections**
  - IVL<PQ>
  - SET<TN>
  - BAG<EN>
  - SET<II>
  - SET<CE>
  - SET<CD>