Introduction to:
HL7 Reference Information Model (RIM)

ANSI/HL7 RIM R4-2011 and ISO 21731

Presented by:
George W. Beeler, Jr.
Health Level Seven, Inc
RIM Milestones

- Concept proposed in 1992 by ANSI/HISPP Joint Working Group for a Common Data Model (in which HL7 was a key participant)
- HL7 undertook development formally in 1997, building on models contributed by members
- Process of Harmonization established to advance the state of the model
- RIM 1.0 (first non-draft RIM) – Published Jan 2001
- ANSI/HL7 RIM Release 1 – Approved July 2003
- ISO 21731 (RIM Release 1) approved 2006
- RIM changed to ANSI “Continuous Maintenance Process” January 2009
- Ballot of RIM R2 and R3 completed 2009 & 2010

Note: 20th & 15th Anniversaries
HL7 – Version 3

- Initial HL7 standards (Version 2) were based on a pragmatic ‘just do it’ approach to standards
- HL7 saw the need to revise and formalize the process
  - to assure consistency of the standards
  - to meet plug’n’play demands
  - to be able to adopt and leverage new technologies for both HL7 and its users
- Adopted the new methodology in 1997
  - based on best development & design practices
  - supports ‘distributed’ development across committees
  - is technology neutral
HL7 Version 3

- Methodology based on shared models
  - Reference Information Model (RIM)
    - of the health care information domain
  - Defined vocabulary domains
    - Drawn from the best available terminologies
    - Directly linked to the RIM
    - Supported by robust communication techniques
  - Data Types model

- Harmonization process that
  - Assures each member and committee a voice in the process, yet
  - Produces a **single** model as the foundation for HL7 standards

- Continuous balloting – begun in 2009 – produces a new release each year. R5 balloting begins May 2012
The “essence” of Version 3

- Apply the ‘best practices’ of software development to developing standards – a model-based methodology
- Predicate all designs on three semantic foundations – a reference information model, a robust set of data types, and a complete, carefully-selected set of terminology domains
- Require all Version 3 standards to draw from these three common resources
- Use software-engineering style tools to support the process.
Class Diagram – Normative
RIM Release 1

• 4 Primary Subject Areas
  • 35 Classes
  • 181 Attributes
  • 9 Associations
• 28 Generalizations
**Action** – the focus of health care communication and documentation

- The reason we want to automate health care data is to be able to document the *actions* taken to treat a patient:
  - A request or order for a test is an *action*
  - The report of the test result is an *action*
  - Creating a diagnosis based on test results is an *action*
  - Prescribing treatment based on the diagnosis is an *action*

- In simple terms, a medical record is a record of each of the individual *actions* that make up the diagnosis, treatment and care of a patient.
Five core concepts of the RIM

- Every happening is an **Act**
  - Procedures, observations, medications, supply, registration, etc.
- Acts are related through an **ActRelationship**
  - composition, preconditions, revisions, support, etc.
- **Participation** defines the context for an Act
  - author, performer, subject, location, etc.
- The participants are **Roles**
  - patient, provider, practitioner, specimen, employee etc.
- Roles are played by **Entities**
  - persons, organizations, material, places, devices, etc.
RIM  Core Classes

Entity

Role

Role Link

0..* 0..* 1 1

0..* 1 1

Role Participation

0..* 0..* 1

Act

Act Relationship

0..* 0..* 1 1
Associations between Roles and Entities: “Played and Scoped”

- Doctor
  - Plays
  - Scoped By Downtown Hospital
- Joe Smith
- Uptown Hospital
  - Scoped By
- Patient
  - Plays
  - Scoped By Downtown Hospital
Is “Act” sufficient?

How can a single act class represent all of the elements of clinical action – their definition, request, order, report?

Answer: the Act “mood” code – “A code specifying whether the Act is an activity that has happened, can happen, is happening, is intended to happen, or is requested/demanded to happen.
Principle Act ‘moods’

**definition** (DEF) – Definition of an act, formerly a “master file”

**intent** (INT) – an intention to plan or perform an act

**request** (RQO) – a request or order for a service from a request “placer” to a request “fulfiller”

**promise** (PRMS) – intent to perform that has the strength of a commitment

**confirmation** (CNF) – promise that has been solicited via an order

**event** (EVN) – an act that actually happens, includes the documentation (report) of the event

**Critical concept** – “Mood” is not a status code. Each instance of the Act class may have one and only one value for ‘mood’. Thus, an act in “order” mood that orders an act in definition mood and results in an Act in ‘event’ mood are three different acts, related through the act relationship.
Mood code example

Abstract

Act
- classCode : CS = ??
- moodCode : CS = ??
- id : II = ??
- otherAttributes

Orders a defined kind of observation to be performed

Type known Mood abstract

Observation
- classCode : CS = OBS
- moodCode : CS = ??
- id : II = ??
- otherAttributes

Performs the defined observation to fulfill the order

 Defines a specific kind of observation

ObservationDefinition
- classCode : CS = OBS
- moodCode : CS = DEF
- id : II = 123
- otherAttributes

ObservationEvent
- classCode : CS = OBS
- moodCode : CS = EVN
- id : II = 7986
- otherAttributes

ObservationRequest
- classCode : CS = OBS
- moodCode : CS = RQO
- id : II = O-02-35
- otherAttributes

instantiates

fulfills
Consider the Act of “Room Cleaning”

- Mood: Proposal
  - PRP
- Mood: Order/Request
  - RQO
- Mood: Promise
  - PRMS
- Mood: Event
  - EVN

Why don’t you clean your room today honey?

Clean your room!

I will already!

Room is cleaned.
RIM Core Classes

Entity

Role

Participation

Act

Role Link

0..*
0..*

1
1

0..*
1

0..*
1

0..*
1

0..*
1

Organizations
Living Subject
Person
Material
Place

Patient Employee LicensedEntity Access

Procedure Observation Patient Enc’nt’r Substance Adm Supply Referral Financial act Working list Account

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Brief Survey of RIM

- Basis of HL7 V3 is single model with only six back-bone classes and a couple of dozen specializations.
- Abstracted by type hierarchies and “mood”
- Displayed on a single 8-1/2 x 11 sheet ---
RIM Core Classes

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V3: All About Acts

<table>
<thead>
<tr>
<th>Act</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>classCode: CS</td>
<td></td>
</tr>
<tr>
<td>moodCode: CS</td>
<td></td>
</tr>
<tr>
<td>id: DSET&lt;II&gt;</td>
<td></td>
</tr>
<tr>
<td>code: CD</td>
<td></td>
</tr>
<tr>
<td>statusCode: CS</td>
<td></td>
</tr>
<tr>
<td>effectiveTime: QSET&lt;TS&gt;</td>
<td></td>
</tr>
</tbody>
</table>
Acts Have Class

- ENC - Encounter
- OBS - Observation (lab)
- SBADM - Substance Administration (pharmacy - admin)
- SPLY - Supply (pharmacy - dispense)
- CLINDOC - Document

Act.classCode :: CS (1..1) Mandatory
Concept domain: ActClass
Acts Can Have Codes

External coding systems:
  - Lab Observation Act Codes could be LOINC codes.
  - HL7 defined:
    - Encounter Type are Act Codes.

```xml
<code
  code="1554-5"
  codeSystemName="LN"
  displayName="Serum Glucose"
/>
```

**Act.code :: CD (0..1)**

Concept domain: ActCode
Acts Have States

Act.statusCode :: CS (0..1)

Concept domain: ActStatus
Acts Have Moods...

- Further clarifies the meaning of the Act (like Class and Code)
- Specifies if this act is an actual fact (event), or an intention to perform an act - such as a command, goal, appointment, or proposal.
- Signifies a major modality or stage for which a permanent record must be obtained.
- Never changes.
- Alternatively, status can change. Status does not define the Act.

**Act.moodCode :: CS (1..1) Mandatory**

Concept domain: ActMood
Acts happen at specific times: `Act.effectiveTime`

**Definition:** A time expression specifying the focal or operative time of the Act, the primary time for which the Act holds, the time of interest from the perspective of the Act's intention.

Data Type = General Timing Specification (GTS)
Similar to V2 TQ repeat interval

`Act.effectiveTime :: QSET<TS> (0..1)`
Types of Act Relationships

- COMP - has component
- PERT - has pertinent info
- SEQL - is sequel
- OPTN - has option
- FLFS - fulfills
- RSON - has reason
- INST - instantiates
- PRCN - has precondition
- OUTC - has outcome

ACTRelationship.typeCode :: CS (1..1) Mandatory

Concept domain: ActRelationshipType
Participation

- Describes the involvement of an *entity* in an *act*.
- The *entity* is playing a *role* (Joe Smith plays doctor).
- The *role* participates in an *act*. Examples:
  - Author [of an order] (Ordering Doctor)
  - Admitter [of an encounter] (Admitting Doctor)
Types of Participations

- AUT - author
- ENT - data entry person
- CBC - call back contact
- PATSBJ - patient subject
- ADM - admitter
- PRF - performer
- ATND - attender
- CNS - consenter
- DIS - discharger
- SPC - specimen
- LOC - location
- CON - consultant
- DST - destination
- DEV - device
- TPA - therapeutic agent
- CSM - consumable
- RESPROV - responsible provider

**Participation**.typeCode :: **CS** (1..1) Mandatory

Concept domain: ParticipationType
Attributes have Data Types

Release 2 of V3 Data Types was balloted jointly by HL7, ISO TC 215 and CEN TC 251

- **10 Foundation:** data types from which the rest are built, includes collection data types, boolean, etc.
- **10 Basic data types** including string, encapsulated data, coded data types, name, address, etc.
- **7 Numerical and quantity data types**, including numbers, money, and ratios
- **10 Quantity collection types** including intervals, discrete sets, unordered sets, etc.
- **2 Uncertainty data types**
- **33 Flavors** (specific constraints) of other data types, including “email address”, “organization name”,
Many Attributes also have Vocabulary Constraints

Expressed as Concept Domains

**Coding Strength:**
(for attributes with Vocabularies)

- **CNE** = Coded No Exceptions
- **CWE** = Coded With Exceptions

**Act.classCode :: CS (1..1) Mandatory**

**Concept Domain:**  **ActClass (CNE)**

bind HL7 attributes to value sets from external or internal terminologies
CDA Documents, V3 Messages and FHIR are based on the RIM.

Other objects could also be created from the RIM.

Do you have an application for the RIM?

Some vendors are making their internal data models consistent or mappable with the RIM. They are prepared for V3 communication. Are you?
Thank You!

George W. Beeler, Jr., Ph.D.
Emeritus Staff, Mayo Foundation
Principal, Beeler Consulting LLC
807 Tenth Ave. SW
Rochester, MN 55902
(507)254-4810
woody@beelers.com