IIS HL7 Interfaces

How to Align to National Standards

October 2014
AIRA Post NIC Workshop
Atlanta Georgia
Agenda

- Introduction
- IIS Interoperability Status Check
- Update on Standardization Efforts
- NIST Tool Review
- Aligning Your Immunization Guide
Introduction
Complexity of Health IT

• Why is interoperability for health systems so hard?
• Why are health technology standards so complex?
• Isn’t there an easier way?
Stephen Naylor and Jake Y. Chen write:

Historically, our understanding of human biology has suffered from a paucity of data and information content. This has been compounded by the complexity and variability of human individuals and populations.
The Human Body is Complex

…consider that each one of us consists of approximately **100 trillion cells**, but approximately 70% of the cells do not belong to us – these are symbiotic bacteria located primarily in our gut.

… each human cell is made up of 95 trillion water molecules, 60 billion proteins, 2 trillion fat molecules, 5 trillion sugars and amino acids, 60 billion RNA molecules and **six feet of DNA**.

A ‘simple’ organ such as the brain comprises **100 billion neurons**, each one possessing approximately 10,000 connections, which creates a synaptic network of 1 quadrillion components.
Technology is Critical

All these numbers demand our attention and emphasize human individuality and complexity. Without technological advances and biological insights, we cannot hope to cure individual maladies.

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2888109/

Stephen Naylor and Jake Y. Chen.
Complexity

• What is currently known is immense
• But health knowledge continues to increase exponentially
• It’s not humanly possible to understand and manage all there is to know
• Information technology is a critical tool in managing this complexity
• The work you are doing is just one small piece of this critical effort
<medication xmlns="urn:hl7-org:greencda:c32">
  <id>1234</id>
  <code code="122" codeSystem="2.16.840.1.113883.6.88" name="Aspirin" />  
  <status>completed</status>
  <effectiveTime>
    <start value="2012-01-30T09:00:00" />
    <end value="2012-02-30T09:00:00" />
  </effectiveTime>
  <administrationTiming institutionSpecified="true">
    <period amount="1" unit="2h" />
  </administrationTiming>
  <route code="C38288" codeSystem="2.16.840.1.113883.3.26.1.1" />
  <dose amount="2" unit="pills" />
  <site code="12354-2" codeSystem="2.16.840.1.113883.6.96" />
  <doseRestriction>
    <numerator amount="5" unit="pills" />
    <denominator amount="1" unit="day" />
  </doseRestriction>
  <fulfillmentHistory fillStatus="completed" fillNumber="1">
    <prescriptionNumber>12</prescriptionNumber>
    <dispenseDate>2012-01-31T09:00:00</dispenseDate>
    <quantityDispensed amount="100" unit="tablets" />
  </fulfillmentHistory>
  <orderInformation orderNumber="123" fills="3">
    <quantityOrdered amount="500" unit="tablets" />
    <orderDateTime>2012-01-29T09:00:00</orderDateTime>
    <expirationDateTime>2013-01-31T09:00:00</expirationDateTime>
  </orderInformation>
</medication>
Standards for Immunizations

- IIS Community is an example of success to other Public Health projects
- Standards were first set in the 1990’s
- Domain is relatively quiet and well defined
- IIS pushed for adoption of national standards
IIS Interoperability Status Check
Status Check Process Born

AIRA meeting 2012
• Discussed preliminary results from Indian Health Service IIS profiling project

December 2013
• CDC Immunization Information Systems Support Branch announced short term project to check status of IIS interfaces

Identified Need:
• Check and see if IIS are ready to accept the new NIST certified messages that EHR systems will be sending in 2014

Who could participate:
• Any IIS with an HL7 interface
Status Check Process

1. Seven (7) NIST test messages were submitted to each IIS
2. The results were reviewed to determine if each message was accepted
3. If a message was rejected, changes were made to the message, and the process was repeated starting from step 1
4. After all messages are accepted, the changes made to the message were documented and analyzed
5. Any change made that was not anticipated by NIST certification was labeled as a “local requirement” or in other words local constraint
Results Overall

• All IIS that participated supported the HL7 2.5.1 or HL7 2.3.1 standard
• The IIS that didn’t participate are known to already have or will have soon HL7 2.5.1 interfaces
  • IIS have shown great support for the HL7 community standard by universally adopting it
  • There are minor local variations that must be considered by any EHR system integrating with IIS across the US
Results

The most common reasons for minor local variations are:

- Local requirements for identifying the sender of the message
- Inability to correctly handle vaccination refusals or history of disease
- Rigid enforcement of minor technical requirements based on local interpretations of current or previous standards
- Problems correctly accepting or ignoring certain types of vaccination information

![Local Requirements Found Pie Chart]

- 22 - Local
- 11 - None Found
- 2 - Undetermined
Update on Standardization Efforts
Immunization Standards

• **HL7 v2**
  • First developed in the late 1980’s
  • A usable and likable standard but a bit “crusty”
  • Used in United States

• **Limitations of HL7 v2**
  • Structure and content are directly linked
  • Does not leverage other common standards such as XML
  • Expressly defined to not include transport
  • Standard was not built with strong support for conformance testing
  • Local variation at many levels is supported
Immunization Standards

• **HL7 v3**
  • Developed in the 1990’s to address shortcomings in V2
  • Uses other standards such as XML
  • Created Reference Information Model (RIM)
  • A “modeler’s paradise”
  • In use in Canada, UK and other countries

• **Limitations of HL7 v3**
  • The complexity of the model is daunting
  • “Your team is not smart enough to implement”
Immunization Standards

- Fast Healthcare Interoperability Resources (FHIR)
  - Implementable after a weekend of training
  - Written by three software developers
  - Builds on lessons learned from V2 and V3
  - Combines HL7 knowledge with industry standards

- Impact for Immunization Community
  - Highly recommend for new types of interfaces
  - May eventually be a good replacement for V2
HL7 Update

• HL7 User Group meetings are being held the second Thursday of every month
• New standards are coming out for writing implementation guides in HL7 version 2
• AIRA is taking lead within the HL7 community to help refine and improve HL7 v2 standards
NIST Update

• EHR Testing Tool for Immunizations
• IIS Testing Tool for Immunizations
• Immunization Guide Authoring Management Tool (IGAMT)
• Test Case Authoring Management Tool (TCAMT)
Building Blocks

- Testing Process and Software for Immunization Information Systems - *not yet created*
- NIST MU Certification Testing
- Functional Profile - *not yet created*
- CDC Implementation Guide
- International Standard HL7 v2 Messaging
NIST Tool Review
Aligning Your Implementation Guide
General Philosophy

• Different agendas:
  • HL7: Create standards
  • CDC: Foster data exchange
  • NIST: Verify EHR software meets the standards
  • IIS: Collect and share quality data

• IIS work within constraints:
  • State law, agency policies and regulations
  • HL7 v2 message standard
  • CDC Implementation Guide and other standards
  • Software architecture and resources
General Philosophy

• Goal of IIS is:
  • Collect complete immunization histories
  • Manage inventory and track VFC usage
  • Ensure that data quality problems are prevented or detected early and fixed

• IIS must focus on data quality
  • Validation and conformance testing is part of the toolkit
  • But data quality can not be assured simply by writing a good implementation guide or by validating the format of HL7 messages
General Philosophy

• Rigid enforcement of HL7 rules by IIS
  • Not an effective way to increase data quality
  • Increases potential for IIS to make a mistake and violate the HL7 standard
  • Increases the likelihood that small issues will prevent quality data from reaching the IIS
  • Saddles the IIS with a task that has been assigned to NIST to perform

• IIS should focus on enforcement of rules and policies that lead to higher data quality and support IIS needs
Example #1

Find the mistake:

MSH|^~\&|Test EHR Application|X68||NIST Test Iz Reg|201207010822|
   |\VXU^V04\VXU_V04|NIST-IZ-001.00|P|2.5.1|||AL|ER
PID|1||D26376273^^^^NIST MPI^MR||Snow^Madelynn^Ainsley^^^^L|Lam^Morgan
   |20070706|F||2076-8^Native Hawaiian or Other Pacific Islander^CDCREC
   |32 Prescott Street Ave^^Warwick^MA^02452^USA^L|
   |^PRN^PH^^^657^5558563|||2186-5^non Hispanic or Latino^CDCREC
PD1|||02^Reminder/Recall - any method^HL70215|||A|20120701
   |20120701
NK1|1|Lam^Morgan^^^^^L|MTH^Mother^HL70063
   |32 Prescott Street Ave^^Warwick^MA^02452^USA^L|^PRN^PH^^^657^5558563
ORC|RE||IZ-783274^NDA|||I-23432^Burden^Donna^A^^^^^NIST-AA-1|
   |57422^RADON^NICHOLAS^^^^^NIST-AA-1^L
RXA|0|1|20120814|
   |140^Influenza, seasonal, injectable, preservative free|0.5
   |mL^MilliLiter [SI Volume Units]^UCUM|
   |00^New immunization record^NIP001|7832-1^Lemon^Mike^A^^^^^NIST-AA-1
   |^^^X68|||Z0860BB|20121104|CSL^CSL Behring^MVX||CP^A
Example #2

Find the mistake:

MSH|^~\&|Test EHR Application|X68||NIST Test Iz Reg|201207010822|
   |VXU^V04^VXU_V04|NIST-IZ-001.00|P|2.5.1|||AL|ER
PID|1||D26376273^^^NIST MPI^MR||Snow^Horatio^Nelson^^^L|Lam^Morgan
   |20031107|M|2076-8^Native Hawaiian or Other Pacific Islander^CDCREC
   |32 Prescott Street Ave^^Warwick^MA^02452^USA^L|
   |^PRN^PH^^^657^5558563|12186-5^non Hispanic or Latino^CDCREC
PD1|2^Reminder/Recall - any method^HL70215||A|20120701|
NK1|1|Lam^Morgan^^^L|MTH^Mother^HL70063
   |32 Prescott Street Ave^^Warwick^MA^02452^USA^L|^PRN^PH^^^657^5558563
ORC|RE||IZ-783274^NDA|1^I-23432^Burden^Donna^A^^^^^NIST-AA-1|
   |57422^RADON^NICHOLAS^^^^^^NIST-AA-1^L
RXA|0|1|20120814|
   |28^DT (Pediatric)^CVX|0.5
   |mL^MilliLiter [SI Volume Units]^UCUM|
   |00^New immunization record^NIP001|7832-1^Lemon^Mike^A^^^^^NIST-AA-1
   |^^^X68|||Z0860BB|20121104|CSL^CSL Behring^MVX|||CP|A
Good Manners

• Generally accepted rules of conduct
• Facilitate social interaction and help maintain good relationships
• Rules for good manners are focused on your behavior not others
• But a display of good manners is a positive indication that good behavior is more likely in the future
HL7 Standard

• Generally accepted rules for encoding data
• Facilitates exchange and helps maintain good data quality
• Rules are focused on construction of a proper message
• Good message construction is a positive indication that the data is likely to be of a good quality
Gaps in Manners

• Reasons for not following the rules of manners or messaging?
  • Not willing follow the rules
  • Not able to follow the rules
  • Different understanding of the rules
  • Following a different set of rules
Rules for Broken Rules

1. Be careful when creating rules
2. Enforce only the rules that are important or critical
3. If a rule is broken
   • If important, discuss to see why it is happening and how it could be changed
   • If critical, clearly explain what needs to change
4. Be ready to accommodate differences
Pointers on developing your Implementation Guide
Usage Definitions

• **R**: Required
  - Value must always be sent
  - In general, value can not be understood unless this data is present

• **RE**: Required but may be empty
  - Value should be sent if known
  - May not be known in some cases

• **O**: Optional
  - Only used in constrainable profiles

• **X**: Not supported
  - Do not send any data here
Proper Use of Required

• Use required to ensure proper structure
• Do not move fields to required to improve data quality
• Changing an RE to R can have unintended consequences
  • PID-5 Patient Name
  • RXA-6 Administered Amount
• Improve data quality by creating process for assessing data quality
## Constraining Usage

<table>
<thead>
<tr>
<th>National Profile</th>
<th>IIS Profile</th>
<th>Specific Interface Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>R : Required</td>
<td>R : Required</td>
<td>R : Required</td>
</tr>
<tr>
<td>RE : Required but may be empty</td>
<td>R : Required but may be empty</td>
<td>R : Required but may be empty</td>
</tr>
<tr>
<td>O : Optional</td>
<td>R : Required but may be empty</td>
<td>R : Required but may be empty</td>
</tr>
<tr>
<td>X : Not supported</td>
<td>X : Not supported</td>
<td>X : Not supported</td>
</tr>
<tr>
<td>X : Not supported</td>
<td>X : Not supported</td>
<td>X : Not supported</td>
</tr>
</tbody>
</table>
Preparing for the Future
Preparing for the Future

• Today: Integrate the seven NIST test cases into your current testing process
• Next Month: Participate in the HL7 Immunization User Group meetings
• Next Year: Stay tuned or updates on releases of new software to assist in testing HL7 interfaces