IIS HL7 Interface Testing Process

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Date: November 11, 2013

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# Background

In 2013 the Immunization Information Systems Support Branch (IISSB) of the Centers for Disease Control and Prevention (CDC) conducted an Immunization Information Systems (IIS) Interoperability Status Check project to test and verify that IIS HL7 interfaces were able to accept the 7 NIST test messages that certified EHR’s must be capable of sending to IIS in 2014. The results of this project showed that IIS have made great progress in supporting HL7 2.5.1 standards but that still some work remained in order to bring all IIS in conformance to the same standard.

After the status check project, IISSB convened an HL7 Interface training for IIS implementers in Chicago to provide additional training on HL7 standards and to discuss the technical results obtained by the status check project.

It was clear from both projects that there is a need for a standardized and automated process for ensuring that an IIS interface meets national standards. While IIS have done a good job creating HL7 interfaces there is no technical process in place to ensure that every piece was done correctly.

## Proposed Solution

Expand the work of the Status Check project, using the tools of the Open Immunization (OIS) Software Data Quality Assurance Tester (DQA Tester) to create a software application and testing process that all IIS and IIS implementers can use to quickly ensure that HL7 interface solutions meet national standards. The end result would include three major items:

* A documented and clear testing process.
* Example HL7 test messages and expected results.
* Open source automated tool that realizes the documented testing process.

# Testing Process

The testing process would be largely automated and complement the National Institute of Standards and Technology (NIST) testing process. The testing would verify that the IIS can

1. **Accept update from EHR**: IIS must accept all 7 NIST messages than an EHR is required to be able to send in 2014. In addition the IIS should be able to store all IIS required core fields for 2007, and if possible all the IIS core data fields for 2013-2017.
2. **Recognize valid codes**: IIS must accept all valid codes for IIS core required and optional fields, and not reject messages because of invalid or unrecognized codes in optional fields. In addition the IIS should be able to store all IIS required core fields for 2007, and if possible all the IIS core data fields for 2013-2017.
3. **Identify quality issues**: IIS must be able to identify critical data quality issues in messages. These include items that were documented and detailed as part of the 2008 Data Quality Assurance for IIS: Incoming Data project.
4. **Allow for minor differences**: IIS must be able to accept input outside of what the IIS expects which does not directly impact HL7 message structure or the quality of core IIS fields. In short the IIS should be tolerant of minor message format and content issues.
5. **Reply quickly**: The IIS must be able to return an ACK or an RSP within a reasonable amount of time. Ideally an ACK should return within 3 seconds and an RSP within 5 seconds.
6. **Respond correctly to requests**: IIS must be able to return an ACK message that meets HL7 and CDC Standards for format and structure. IIS should also be able to return RSP messages in response to QBP messages that meet HL7 and CDC Standards for format and structure.

These four categories are then labeled as follows:

1. The IIS can accept update from EHR: **Basic** Interoperability
2. The IIS can recognize valid codes: **Intermediate** Interoperability
3. The IIS can identify quality issues: **Advanced** Interoperability
4. The IIS can allow for minor differences: **Exceptional** Interoperability
5. The IIS can reply quickly: **Performance** Interoperability
6. The IIS can respond correctly to requests: **Exceptional** Interoperability

In addition each of these categories are further divided into three tiers of support:

* **Level 1**: The IIS must support because the HL7 and CDC standards **require** it.
* **Level 2**: The IIS should support because the HL7 and CDC standards **expect** it.
* **Level 3**: The IIS may support because the HL7 and CDC standards **intend** it.

## Testing Definitions

For the purposes of testing the following definitions are used:

|  |  |
| --- | --- |
| **Accept** | A message is considered to be accepted by the IIS if the acknowledgement message indicates that the message was not rejected and that there were no errors in the message. The IIS may or may not have loaded all data, and some issues may be noted with warnings.  By default a message is considered to be accepted if the value of MSA-1 is ‘AA’, or ‘AE’ and no ERR-4 Severity field has a value of ‘E’. As many IIS currently use alternate standards for the format of ACK messages, the testing process can be modified to match the current IIS standard for the purposes of determining if the message was accepted or not. |
| **Ack** | An HL7 Acknowledgment message or other text message that indicates the final status of the received message. |
| **IISSB** | Immunization Information Systems Support Branch of the Centers for Disease Control and Prevention (CDC). This division of CDC works directly with the community to develop and promote common standards for IIS. |
| **Core Data** | A set of fields defined by IISSB that all IIS should work towards supporting. The original version labeled “2007 Core Data” included fields with designations of required and optional. The current version labeled “2013-2017 Core Data” includes a much more expanded set of fields that are not labeled required or optional. |
| **NIST Messages** | For 2014 EHR certification NIST defined seven (7) scenarios that EHR’s had to support for messaging information to IIS. Each of these scenarios included a set of three (3) sets of data and corresponding example messages, for a total of 21 unique sample messages. For the purposes of this testing, replicas of the original 7 messages are created with the same characteristics as the original messages. These replicas have different data than the originals but test the same data. |
| **CDC Implementation Guide** | The HL7 Version 2.5.1 Implementation Guide for Immunization Messaging published by IISSB and posted here: <http://www.cdc.gov/vaccines/programs/iis/technical-guidance/hl7.html>  Testing is currently built around verifying basic support for release 1.4. |
|  |  |

# Testing Grid

The testing is broken into the following grid:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Level 1 Meets Requirements** The IIS must… | **Level 2 Meets Expectations** The IIS should… | **Level 3**  **Meets Intentions** The IIS may… |
| **Basic IIS can accept updates from EHR** | Be able to accept replicas of all NIST messages. | Return all **required 2007 IIS Core Data** included in the NIST messages. *See Compare Response to Request section.* | Return all **IIS 2013-2017 Core Data** that was included in the NIST messages. *See Compare Response to Request section.* |
| **Intermediate IIS can recognize valid codes** | Be able to accept all valid codes, defined by the current CDC Implementation Guide. | Return all **required 2007 IIS Core Data** that was submitted for Level 1 testing. *See Compare Response to Request section.* | Return all **IIS 2013-2017 Core Data** that was submitted for Level 1 testing. *See Compare Response to Request section.* |
| **Advanced IIS can identify quality issues** | Be able to identify all Level 1 priority issues. For each issue the ACK message returned should indicate that the IIS recognized the quality issue. The identified severity of the issue is not evaluated for this test. | Be able to identify all Level 2 priority issues. For each issue the ACK message returned should indicate that the IIS recognized the quality issue. The identified severity of the issue is not evaluated for this test. | Be able to identify all Level 3 priority issues. For each issue the ACK message returned should indicate that the IIS recognized the quality issue. The identified severity of the issue is not evaluated for this test. |
| **Exceptional IIS can allow for minor differences** | Be able to accept update messages with incorrect data in fields that are not critical to HL7 message format and are not used to transmit IIS core data; be able to accept example update messages from EHR systems that pass EHR certification; be able to accept sample update messages that transmit IIS core data that is defined by the IIS Implementation Guide but were not tested by EHR Certification. | Return all **required 2007 IIS Core Data** that was submitted for Level 1 testing. *See Compare Response to Request section.* | Return all **IIS 2013-2017 Core Data** that was submitted for Level 1 testing. *See Compare Response to Request section.* |
| **Performance IIS can reply quickly** | Can respond and return an ACK within 3 seconds, on average. | Can respond with query results to an exact match request within 5 seconds. | Not defined. |
| **Conformance IIS can respond correctly to requests** | Acknowledgement (ACK) message is returned and meets HL7 and CDC standards for format and content. Return message correctly indicates if message was rejected or accepted according to the CDC standard. | IIS supports QDP/RSP and RSP message meets HL7 and CDC standards for format and content. IIS must be able to return a single record match for a patient submitted by VXU when the patient is queried using the same information supplied in the VXU. The query results should also include a forecast recommendation. | Not defined. |

# Comparing Response to Request

For, Basic, Intermediate and Exceptional testing, the process indicates that the records submitted to the IIS should be queried back out and compared to what was submitted. In Level 2 this comparison verifies that all required 2007 core data fields are present in the response if they were sent in the original request, and Level 3 verifies that 2013-2014 core data fields are present in the response if they were sent in the original request.

The table below summarizes that status of fields as follows:

* **Required**: IISSB expect IIS to be able to store this field and NIST 2014 tested EHR’s ability to send the data. IIS is expected to be able to accept this data.
* **Optional**: IISSB recommends that IIS be able to store this field and/or NIST 2014 tested the EHR’s ability to send this data. IIS can expect this data to be sent by at least some EHR systems.
* **Extra**: IISB recommends that IIS be able to store this field but these fields are not covered by this testing process. This can occur for one of three reasons: the field is not normally sent by EHR’s but rather other systems like birth registries, some IIS prohibit the data to be sent (SSN), the IIS normally generates this information and does not expect EHR to submit it (dose number).
* **Not Supported**: The transport standard does not support this field. The IIS uses this field for other purposes but is not expected to directly receive it or send it.

|  |  |  |
| --- | --- | --- |
| **IIS Core Data Field** | **Test Status** | **Comments** |
| Patient name: first | Required |  |
| Patient name: middle | Required |  |
| Patient name: last | Required |  |
| Patient alias name: first | Optional | Not tested by NIST 2014 |
| Patient alias name: middle | Optional | Not tested by NIST 2014 |
| Patient alias name: | Optional | Not tested by NIST 2014 |
| Patient address: street | Optional |  |
| Patient address: city | Optional |  |
| Patient address: state | Optional |  |
| Patient address: zip | Optional |  |
| Patient address: country of residence | Optional |  |
| Patient telephone number | Optional |  |
| Patient telephone number type | Optional |  |
| Patient E-mail address | Optional | Not tested by NIST 2014 |
| Birthing facility | Optional | Not tested by NIST 2014 |
| Patient Social Security Number (SSN) | Extra | Not tested by NIST 2014 |
| Patient birth date | Required |  |
| Patient sex | Required |  |
| Patient race | Required |  |
| Patient ethnicity | Required |  |
| Patient primary language | Optional | Not tested by NIST 2014 |
| Patient multiple birth indicator | Optional | Not tested by NIST 2014 |
| Patient birth order | Required | Not tested by NIST 2014 |
| Patient birth registration number | Extra | Not tested by NIST 2014 |
| Patient birth state | Optional | Not tested by NIST 2014 |
| Patient birth country | Optional | Not tested by NIST 2014 |
| Patient ID | Optional | New 2013 IISSB requirement |
| Patient ID: Assigning Authority | Optional | New 2013 IISSB requirement |
| Patient Medicaid number | Extra | Not tested by NIST 2014 |
| Mother’s name: First | Required |  |
| Mother’s name: Middle | Required |  |
| Mother’s name: Last | Required |  |
| Mother’s name: Maiden | Required |  |
| Mother’s SSN | Extra | Not tested by NIST 2014, some IIS can NOT store |
| Father’s name: First | Optional | Not tested by NIST 2014 |
| Father’s name: Middle | Optional | Not tested by NIST 2014 |
| Father’s name: Last | Optional | Not tested by NIST 2014 |
| Father’s SSN | Extra | Not tested by NIST 2014 |
| Responsible Person Name: First | Optional |  |
| Responsible Person Name: Middle | Optional |  |
| Responsible Person Name: Last | Optional |  |
| Responsible Person Name: Relationship to Patient | Optional |  |
| Vaccine product type administered | Not Supported | No field in standard to send this |
| Vaccine type | Required |  |
| Vaccine manufacturer | Required |  |
| Vaccine dose number | Extra | Not tested by NIST 2014, not expected to be sent during interfacing |
| Vaccine dose volume | Optional |  |
| Vaccine dose unit | Optional |  |
| Vaccine expiration date | Optional |  |
| Vaccine site of administration | Optional |  |
| Vaccine ordering provider name | Optional |  |
| Vaccine administering provider name | Optional |  |
| Vaccine administering provider suffix (e.g. MD, RN, LPN) | Optional |  |
| Vaccination date | Required |  |
| Vaccine lot number | Required |  |
| Vaccine provider | Optional | RXA-10 or RXA-11.4? |
| Historical vaccination flag indicator | Optional |  |
| VFC eligibility | Optional |  |
| History of varicella disease indicator | Optional |  |
| Date of history of vaccine preventable disease | Optional |  |
| Patient status indicator – Provider Level | Optional | Not tested by NIST 2014 |
| Patient status indicator – IIS level | Not Supported | Can test this as it is not messaged |
| VIS type and publication | Optional |  |
| VIS date given to patient | Optional |  |
| Contraindications/precautions | Optional | Not tested by NIST 2014 |
| Contraindication/precaution observation dates | Optional | Not tested by NIST 2014 |
| Vaccine reaction(s) | Optional | Not tested by NIST 2014 |
| Exceptions/parent refusals of vaccine | Required and Optional | Not in the CORE fields but was tested by NIST 2014, an IIS is required to report this field back or to NOT report back the administered vaccination |
| Date of exceptions/parent refusals of vaccine | Optional |  |

# Basic Test

The Basic Test is modeled after the IIS Interoperability Status Check, conducted by IISSB in 2013. During this project, 7 NIST test messages were submitted to IIS to verify they were able to process these messages as they were.

In comparison to the Status Check, the Basic Test has the following improvements:

* The messages submitted are replicas of the originals. Each replica has the same characteristics as the original NIST message but with uniquely generated patient identification. This is to ensure that the test can be run over and over again without conflicting with previously submitted records.
* The new process is fully automated. The status check process was manually conducted and the results manually tabulated.
* The new process takes testing to the next level by querying out the data that was submitted. This verifies if the data was received as expected. The status check project could not confirm if the data was being accepted properly.

## Level 1

This level includes 7 tests, one for each NIST scenario.

### NIST IZ #1: Administered for Child (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.1.1377623526871|P|2.5.1|

PID|1||A1.1^^^OIS-TEST^MR||Tansberg^Pat^Everley^^^^L|Hillsdale^Leah| 20090822|M||2054-5^Black or African-American^HL70005|368 Umatilla Cir^^Cadillac^MI^49601^USA^P||^PRN^PH^^^231^6557094|||||||||2186-5^not Hispanic or Latino^CDCREC|

PD1|

NK1|1|Tansberg^Leah|MTH^Mother^HL70063|

ORC|RE||L44B1.3^OIS|

RXA|0|1|20130827||94^MMRV^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||S4121RG||MSD^Merck and Co^MVX||||A|

RXR|SC^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V03^VFC eligible - Uninsured^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|94^MMRV^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20100521||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111209-0600||ACK^V04|20130827111209-0600.1|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.1.1377623526871|

ERR|||0|I|||||Message accepted with 1 vaccination|

### NIST IZ #2: Administered for Adult (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.2.1377623526974|P|2.5.1|

PID|1||A1.2^^^OIS-TEST^MR||Skamania^Emer^^^^^L||19460828|F||2054-5^Black or African-American^HL70005|274 Hellicoski Pl^^Woodhaven^MI^48183^USA^P| |^PRN^PH^^^734^2858434|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||I01C2.3^OIS|

RXA|0|1|20130827||52^Hep A^CVX|1|mL^milliliters^UCUM||00^Administered^NIP001||||||F15VX||MSD^Merck and Co^MVX||||A|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible - Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|85^Hepatitis A^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20111025||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111211-0600||ACK^V04|20130827111211-0600.2|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.2.1377623526974|

ERR|||0|I|||||Message accepted with 1 vaccination|

ERR|||0|W|157|||Patient guardian responsible party is missing|

### NIST IZ #3: Historical for Child (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.3.1377623526977|P|2.5.1|

PID|1||A1.3^^^OIS-TEST^MR||Pendleton^Morrison^Dermot^^^^L||20000827|M||2054-5^Black or African-American^HL70005|20 Butte Pl^^Fife Lake^MI^49633^USA^P||^PRN^PH^^^231^6820154|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||I87C3.3^OIS|

RXA|0|1|20130827||62^HPV^CVX|999|||01^Historical^NIP001||||||||||||A|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111212-0600||ACK^V04|20130827111212-0600.3|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.3.1377623526977|

ERR|||0|I|||||Message accepted with 1 vaccination|

ERR|||0|W|157|||Patient guardian responsible party is missing|

### NIST IZ #4: Consented for Child (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.4.1377623526978|P|2.5.1|

PID|1||A1.4^^^OIS-TEST^MR||Hood^Istvan^^^^^L||20000906|M||2106-3^White^HL70005|246 Landberg St^^Southfield Township^MI^48025^USA^P||^PRN^PH^^^248^7486543|||||||||2135-2^Hispanic or Latino^CDCREC|

PD1||||||||||||N|

ORC|RE||X32Y4.3^OIS|

RXA|0|1|20130827||115^Tdap^CVX|999|||01^Historical^NIP001||||||||||||A|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111212-0600||ACK^V04|20130827111212-0600.4|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.4.1377623526978|

ERR|||0|I|||||Message accepted with 1 vaccination|

ERR||PD1^1^12^1|0|W|199|||Patient protection indicator is valued as no|

ERR|||0|W|157|||Patient guardian responsible party is missing|

### NIST IZ #5: Refused for Toddler (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.5.1377623526980|P|2.5.1|

PID|1||A1.5^^^OIS-TEST^MR||Bingham^Yelena^Mekia^^^^L||20090901|F||2131-1^Other Race^HL70005|307 Kiernan Ln^^Luce Township^MI^48118^USA^P||^PRN^PH^^^734^4364687|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||L24L5.3^OIS|

RXA|0|1|20130827||140^Influenza^CVX|999||||||||||||00^Parental Decision^NIP002||RE|A|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111213-0600||ACK^V04|20130827111213-0600.5|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.5.1377623526980|

ERR|||0|I|||||Message accepted with 0 vaccinations|

ERR|||0|W|157|||Patient guardian responsible party is missing|

### NIST IZ #6: Varicella History for Child (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.6.1377623526981|P|2.5.1|

PID|1||A1.6^^^OIS-TEST^MR||Stephens^Lehel^Barega^^^^L||20000906|M||2131-1^Other Race^HL70005|263 San Mateo St^^Hudsonville^MI^49426^USA^P||^PRN^PH^^^616^3634206|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||A34W6.3^OIS|

RXA|0|1|20130827||998^No vaccine administered^CVX|999|||||||||||||||A|

OBX|1|CE|59784-9^Disease with presumed immunity^LN|1|38907003^Varicella infection^SCT||||||F|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111213-0600||ACK^V04|20130827111213-0600.6|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.6.1377623526981|

ERR|||0|I|||||Message accepted with no vaccinations|

ERR|||0|W|157|||Patient guardian responsible party is missing|

### NIST IZ #7: Complete Record (replica)

Example test message:

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.7.1377623526983|P|2.5.1|

PID|1||A1.7^^^OIS-TEST^MR||San Francisco^Fudo^P^^^^L||20090828|M||1002-5^American Indian or Alaska Native^HL70005|201 Dixon St^^Waterford^MI^48327^USA^P||^PRN^PH^^^248^3225652|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||Z77G7.1^OIS|

RXA|0|1|20100903||140^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||K1608IF||NOV^Novartis^MVX||||A|

RXR|IM^^HL70162|LA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible - Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|140^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20100903||||||F|

ORC|RE||Z77G7.2^OIS|

RXA|0|1|20110328||140^Influenza^CVX|999|||01^Historical^NIP001||||||||||||A|

ORC|RE||Z77G7.3^OIS|

RXA|0|1|20130827||140^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||W1356FE||SKB^GlaxoSmithKline^MVX||||A|

RXR|IM^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible - Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|140^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Example response:

MSH|^~\&|MCIR|MCIR|||20130827111214-0600||ACK^V04|20130827111214-0600.7|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|A1.7.1377623526983|

ERR|||0|I|||||Message accepted with 3 vaccinations|

ERR|||0|W|157|||Patient guardian responsible party is missing|

## Level 2 and Level 3

After submitting the update messages the next step is to query the data back out of the IIS and compare to what was originally submitted. The query process is conducted all at once for both Level 2 and Level 3 but the results are different for each level depending on which fields are supported in the response. To pass Level 2 an IIS need only demonstrate support the 2007 IIS Required Core Data fields. For Level 3, the IIS must demonstrate support for all data sent in 2013-2017 IIS Core Data fields.

The testing process for these two levels is also the same as the testing that is done for Intermediate and Exceptional testing Levels 2 and 3. For details on the fields used for comparison please see [Comparing Response to Request](#_Comparing_Response_to) section.

### Sample Test

Original VXU message submitted (in Level 1 testing):

MSH|^~\&|||||20130827111206||VXU^V04^VXU\_V04|A1.1.1377623526871|P|2.5.1|

PID|1||A1.1^^^OIS-TEST^MR||Tansberg^Pat^Everley^^^^L|Hillsdale^Leah|20090822|M||2054-5^Black or African-American^HL70005|368 Umatilla Cir^^Cadillac^MI^49601^USA^P||^PRN^PH^^^231^6557094|||||||||2186-5^not Hispanic or Latino^CDCREC|

PD1|

NK1|1|Tansberg^Leah|MTH^Mother^HL70063|

ORC|RE||L44B1.3^OIS|

RXA|0|1|20130827||94^MMRV^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||S4121RG||MSD^Merck and Co^MVX||||A|

RXR|SC^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V03^VFC eligible - Uninsured^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|94^MMRV^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20100521||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Query message submitted:

MSH|^~\&|||||20130827111206||QBP^Q11^QBP\_Q11|A1.1.1377623526871.1|P|2.5.1|||NE|AL|||||Z34^CDCPHINVS|

QPD|Z34^Request Immunization History^HL70471|A1.1.1377623526871.1|A1.1^^^OIS-TEST^MR|Tansberg^Pat^Everley^^^^L|Hillsdale^Leah|20090822|M|368 Umatilla Cir^^Cadillac^MI^49601^USA^P|^PRN^PH^^^231^6557094|||||

RCP|I|20|

Query response received back:

MSH|^~\&|MCIR|MCIR|||20130827111804-0600||RSP^K11^RSP\_K11|20130827111804-0600.873|P|2.5.1|||NE|AL|||||Z32^CDCPHINVS|

MSA|AA|A1.1.1377623526871.1|

QAK|A1.1.1377623526871.1|OK|Z34|QPD|Z34|A1.1.1377623526871.1|A1.1^^^OIS-TEST^MR|Tansberg^Pat^Everley^^^^L|Hillsdale|20090822|M|368 Umatilla Cir^^Cadillac^MI^49601^USA^P^^|^PRN^PH^^^231^6557094^|||

PID|||A1.1^^^OIS-TEST^MR||Tansberg^Pat^Everley^^^^L|Hillsdale|20090822|M||2054-5^^HL70005|368 Umatilla Cir^^Cadillac^MI^49601^USA^P^^||^^^^^231^6557094^|||||||||2186-5^^CDCREC||||

NK1|1|Tansberg^Leah^^^^^|MTH^^HL70063|^^^^^^^^||

ORC|RE|L44B1.3||

RXA|0|1|20130827||94^^CVX|0.25|mL^^UCUM||00^^NIP001||||||S4121RG||MSD^^MVX|

RXR|SC^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^^LN||V03^^HL70064|||||F|||||||

Comparison results:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PID** | **Field** | **Core Data** | **Original Value** | **Returned Value** | **Status** |
| PID-3.1 | MRN | Optional | A1.1 | A1.1 | Pass |
| PID-3.4 | MRN Assigning Authority | Optional | OIS-TEST | OIS-TEST | Pass |
| PID-5.1 | Name Last | Required | Tansberg | Tansberg | Pass |
| PID-5.2 | Name First | Required | Pat | Pat | Pass |
| PID-5.3 | Name Middle | Required | Everley | Everley | Pass |
| PID-5.7 | Name Type Code | Extra | L | L | Pass |
| PID 6 | Mother's Maiden Name | Required | Hillsdale | Hillsdale | Pass |
| PID-7 | Date/Time of Birth | Required | 20090822 | 20090822 | Pass |
| PID-8 | Administrative Sex | Required | M | M | Pass |
| PID-10 | Race | Required | 2054-5 | 2054-5 | Pass |
| PID-11.1 | Address Street | Optional | 368 Umatilla Cir | 368 Umatilla Cir | Pass |
| PID-11.3 | Address City | Optional | Cadillac | Cadillac | Pass |
| PID-11.4 | Address State | Optional | MI | MI | Pass |
| PID-11.5 | Address Zip | Optional | 49601 | 49601 | Pass |
| PID-13.2 | Phone Tel Use Code | Optional | PRN |  | Fail |
| PID-13.3 | Phone Tel Equipment | Optional | PH |  | Fail |
| PID-13.6 | Phone Area Code | Optional | 231 | 231 | Pass |
| PID-13.7 | Phone Number | Optional | 6557094 | 6557094 | Pass |
| PID-22 | Ethnic Group | Required | 2186-5 | 2186-5 | Pass |
| **NK1** | **Field** | **Core Data** | **Original Value** | **Returned Value** | **Status** |
| NK1-2.1 | Mother's Name Last | Required | Tansberg | Tansberg | Pass |
| NK1-2.2 | Mother's Name First | Required | Leah | Leah | Pass |
| **RXA** | **Field** | **Core Data** | **Original Value** | **Returned Value** | **Status** |
| RXA-3 #1 | Vaccination date | Required | 20130827 | 20130827 | Pass |
| RXA-5 #1 | Vaccine type | Required | 94 | 94 | Pass |
| RXA-6 #1 | Administered Amount | Optional | 0.25 | 0.25 | Pass |
| RXA-7 #1 | Administered Units | Optional | mL | mL | Pass |
| RXA-9 #1 | Historical vaccination flag indicator | Optional | 00 | 00 | Pass |
| RXA-15 #1 | Vaccine lot number | Required | S4121RG | S4121RG | Pass |
| RXA-17 #1 | Vaccine manufacturer | Required | MSD | MSD | Pass |
| RXA-21 #1 | Action Code | Extra | A |  | Fail |
| **RXR** | **Field** | **Core Data** | **Original Value** | **Returned Value** | **Status** |
| RXR-2 #1 | Vaccine injection site | Optional | RA | RA | Pass |
| **OBX** | **Field** | **Core Data** | **Original Value** | **Returned Value** | **Status** |
| OBX-5 #1.1 | VFC elgibility | Optional | V03 | V03 | Pass |
| OBX-5 #1.2 | VIS Type | Optional | 94 |  | Fail |
| OBX-5 #1.3 | VIS Type Published | Optional | 20100521 |  | Fail |
| OBX-5 #1.4 | VIS Presentation Date | Optional | 20130827 |  | Fail |

Analysis of Results:

The lines in blue with a status of Pass indicate core data fields that were submitted in the original VXU update and were returned in the RSP query response. The lines in red with the status of Fail indicate core data fields that were submitted in the original VXU update and were NOT returned in the RSP query response.

It is important to note the Core Data column that indicates the status of the data item for the purposes of testing. To pass Level 2 testing the response must include all core data items labeled as Required. To pass Level 3 testing the response must include all core data items labeled Required or Optional.

In the example shown above, the test passes Level 2 criteria but fails Level 3.

# Intermediate Test

During this phase of testing, every appropriate valid code defined or referred to in the CDC Implementation Guide is tested to ensure the receiving system will accept properly formatted update messages. In addition, this phase includes an additional scenarios, such as deceased patient and vaccination add/delete that were not included in the original NIST certification but that CDC Implementation Guide defines.

The purpose of Intermediate Testing is to ensure that the receiving IIS does not unduly reject a message for containing a coded value that is considered valid in the CDC Implementation Guide. The IIS not necessarily required to save or retain the coded value. The ability of the IIS to return core data elements is tested in Level 2 and Level 3.

### Criteria for Selecting Valid Codes

Some code tables from the CDC Implementation Guide were not selected for testing. A code table was not tested if:

* The code table was used for message construction and the value was explicitly defined for a particular scenario or message.
* The CDC Implementation Guide constrained the allowable values to only one possible value and this value is already covered by other tests.
* The CDC Implementation Guide indicated that the field was expected to be empty.
* The value is sent in responses but not in VXU messages.
* The value is locally defined. For example physician or location ids.
* Coded data set is very large, beyond the control of the CDC Implementation Guide, and not directly critical to receiving immunization information. For example US state codes, US county codes, and country codes.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table** | **Description** | **Tested** | **Comments** |
| HL70001 | Sex | Yes |  |
| HL70003 | Event type | No | This is an HL7 message construction requirement |
| HL70004 | Patient class | No | The only value supported is R |
| HL70005 | Race | Yes | Both old and new values are tested. |
| HL70008 | Acknowledgement Code | No | This is returned by receiver |
| HL70010 | Physician ID | No | Specific to IIS |
| HL70061 | Check digit scheme | No | Not expecting senders to use this field |
| HL70063 | Relationship | Yes |  |
| HL70064 | Financial Class | Yes |  |
| HL70076 | Message type | No | This is an HL7 message construction requirement |
| HL70078 | Abnormal flags | No | Expected to be empty. |
| HL70085 | Observation result status code interpretation | No | Expected to be F for final. |
| HL70102 | Delayed acknowledgment type | No | Expected to be empty. |
| HL70103 | Processing ID | No | Controls how message is processed, outside scope of testing, IIS determines which the sender should set |
| HL70105 | Source of comment | No | Expected to be empty. |
| HL70119 | Order Control Codes | No | Only RE is supported. |
| HL70126 | Quantity limited request | No | Expected to be RD. |
| HL70136 | Yes/No indicator | No | Trivial, better covered by other tests |
| HL70155 | Accept/Application acknowledgment conditions | No | Part of HL7 message construction requirement |
| HL70162 | Route of administration | Yes | The test goes through every permutation that does not necessarily match the vaccination given. While it is incorrect to administer a vaccination using the wrong route, IF it happens the IIS should be capable of storing the information. Even if the information represents bad practice. |
| HL7063 | Administrative site | Yes | The test goes through every permutation that does not necessarily match the vaccination given. While it is incorrect to administer a vaccination using the wrong site, IF it happens the IIS should be capable of storing the information. Even if the information represents bad practice or a very improbable scenario. |
| HL70189 | Ethnic Group | Yes | Both old and new codes are tested. |
| HL70190 | Address Type | Yes | Tested by adding an addition address after primary address. |
| HL70200 | Name Type | Yes | Tested by adding an extra name after the legal name. |
| HL70201 | Telecommunications use code | Yes |  |
| HL70202 | Telecommunications equipment type | Yes |  |
| HL70203 | Identifier type | Yes |  |
| HL70204 | Organizational name type | No | Not very well documented and not likely to ever be used, skipping this test |
| HL70207 | Processing mode | No | Guide expects this table not to be used |
| HL70208 | Query response status | No | Not sent in VXU messages, part of query process |
| HL70211 | Alternate character sets | No | Expected to be empty |
| HL70215 | Publicity code | Yes |  |
| HL70220 | Living arrangement | No | Expected to be empty |
| HL70227 | Manufacturers of vaccines | Yes | Only manufacturers that are currently producing vaccinations that are administered in the US are tested |
| HL70288 | Census tract | No | Expected to be empty |
| HL70289 | County/parish | No | Very large set, only a few tested for birth county |
| HL70292 | Codes for vaccines administered | Yes | Only CVX codes that appear on the CDC “Product Name Mapped to CVX/MVX” are tested for administered. All CVX code that are known to have ever been manufactured and given are tested as historical. |
| HL70296 | Language | Yes | Full set from guide is supported, one additionally randomly selected language is also supported. |
| HL70297 | CN ID source | No | Not defined in guide, locally defined if used |
| HL70300 | Namespace ID | No | Locally defined, other fields preferred |
| HL70301 | Universal ID type | No | No specific universal id type is defined |
| HL70322 | Completion status | Yes |  |
| HL70323 | Action code | Yes |  |
| HL70354 | Message Structure | No | Values set by HL7 and CDC standard |
| HL70357 | Message error status code | No | Value returned by sender |
| HL70360 | Degree | Yes | Testing in the |
| HL70361 | Application | No | Locally defined |
| HL70362 | Facility | No | Locally defined |
| HL70363 | Assigning Authority | No | Locally defined |
| HL70396 | Coding system | No | Testing support of LOINC and then support for other unknown coding system |
| HL70441 | Immunization registry status | Yes |  |
| HL70516 | Error Severity | No | Value returned by sender |
| HL70533 | Application Error Code | No | Value returned by sender |
| NIP001 | Immunization information source | Yes |  |
| NIP002 | Substance refusal reason | Yes |  |
| NIP003 | Observation identifiers | No | Tested using scenario specific testing |
|  | History of disease | Yes |  |
|  | VIS type and publication date | Yes |  |
|  | Contraindications | Yes |  |
|  | Vaccine reaction(s) | Yes |  |

## Level 1

To begin testing a series of messages are created, most of them based off the first NIST test message replica, with a few others built off of one of the other NIST test message replicas. The testing process verifies each coded value and each testing scenario by constructing a message with entirely unique patient identifying information and then setting the coded value(s) in the message. Thus every coded value and scenario is tested in its own unique message.

### Sample Messages

VFC Status is Not VFC eligible:

MSH|^~\&|||||20130827111214||VXU^V04^VXU\_V04|B05.1.1377623534586|P|2.5.1|

PID|1||B05.1^^^OIS-TEST^MR||Creaser^Rory^M^^^^L|Newberry^Farfalla |20090901|M||1002-5^American Indian or Alaska Native^HL70005|28 Choctaw Pl^^Bruce^MI^48065^USA^P||^PRN^PH^^^586^6445034|||||||||2186-5^not Hispanic or Latino^CDCREC|

PD1|

NK1|1|Laurel^Farfalla|MTH^Mother^HL70063|

ORC|RE||S48Q43.3^OIS|

RXA|0|1|20130827||03^MMR^CVX|0.5|mL^milliliters^UCUM||00^Administered^NIP001||||||P3400YX||MSD^Merck and Co^MVX||||A|

RXR|SC^^HL70162|LA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V01^Not VFC eligible^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|03^MMR^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120420||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

VFC Status is VFC eligible-Medicaid/Medicaid Managed Care

MSH|^~\&|||||20130827111214||VXU^V04^VXU\_V04|B05.2.1377623534592|P|2.5.1|

PID|1||B05.2^^^OIS-TEST^MR||Highland^Theora^Tiana^^^^L|Alofson^Giana |20090912|F||2106-3^White^HL70005|300 Madison Ave^^Bingham Farms^MI^48025^USA^P||^PRN^PH^^^248^2144144|||||||||2186-5^not Hispanic or Latino^CDCREC|

PD1|

NK1|1|Highland^Giana|MTH^Mother^HL70063|

ORC|RE||J55I44.3^OIS|

RXA|0|1|20130827||141^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||Y9789ZR||PMC^sanofi pasteur^MVX||||A|

RXR|IM^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible-Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|141^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

As can be seen from these two messages, they have very similar format and similar kinds of information but have two major differences:

1. The patient identifying information is different. These will not be matched by the IIS deduplication system.
2. The VFC status is different between the two records.

Level 1 test verifies that both of these messages, with valid VFC codes, are accepted.

## Level 2 and Level 3

The testing process for these two levels is also the same as the testing that is done for Basic and Exceptional testing Levels 2 and 3. For details on the fields used for comparison please see [Comparing Response to Request](#_Comparing_Response_to) section.

It is important to note that Level 2 and Level 3 testing do verify that the core data fields were returned properly but not necessarily that all the coded values submitted were returned properly. The distinction is important because not all coded values in the CDC Implementation Guide are part of the core data set. The IIS is required to accept all the values from the CDC Implementation Guide but is not required to permanently store them unless they are associated with a core data field. The IIS should not reject good information simply because the message contains valid codes that the IIS is unwilling to store.

# Advanced Test

For the Advanced Test the process is changed to focus on the ability of the IIS to identify potential and actual data quality issues in a message. In the previous tests the focus was on determining if the IIS would accept a valid message with different types of data in it. In this test many of the test messages will have bad or incomplete data that would normally be rejected by the IIS. The focus of this test will rather be whether the IIS identified the issue in the message and will ignore whether the message was actually reject or not.

It is important to separate the concept of a data quality issue and the severity attached to it by the IIS. The severity of an issue indicates how critical the issue is to an IIS. Generally if an issue would cause the IIS to not accept a vaccination or a patient record then this record would be assigned a severity of “E” for Error. In this way the IIS can communicate to the sender if any issues were identified that caused a severe loss of data. The IIS is free to assign a severity level to every issue based on its local needs.

Instead of focusing on the severity of the issue, the Advanced Test will be focused on determining if the IIS noticed the issue injected into the test message. For the purposes of automated testing the Advanced Test reads all the values in ERR-8 and looks for human readable phrases that it has been pre-programmed to look for that indicate the issue was captured. These human readable phrases are specific to the IIS and must be determined during the pre-testing evaluation phase.

## Data Quality Issues

The current list of known or potential data quality issues is derived from the Open Immunization Software (OIS) Data Quality Assurance (DQA) application. This project tries to identify all possible and potential issues that an IIS may want to be sensitive list. This list of issues is meant to be comprehensive but can range from the critical to the trivial.

Please note that an IIS NOT expected to be able to necessarily respond to every one of these issues. Indeed, some of these issues are not problems but rather normal conditions of a message. This list is comprehensive and will continue to expand as additional potential data quality issues are identified. The identification of the actual issues to be tested is discussed in the next section.

| **Data Quality Issue** | **HL7 Severity** |
| --- | --- |
| HL7 segment is unrecognized | W |
| HL7 segment is invalid | W |
| HL7 segments out of order | W |
| HL7 MSH accept ack type is deprecated | W |
| HL7 MSH accept ack type is ignored | I |
| HL7 MSH accept ack type is invalid | W |
| HL7 MSH accept ack type is missing | - |
| HL7 MSH accept ack type is unrecognized | W |
| HL7 MSH accept ack type is valued as always | - |
| HL7 MSH accept ack type is valued as never | - |
| HL7 MSH accept ack type is valued as only on errors | - |
| HL7 MSH alt character set is deprecated | W |
| HL7 MSH alt character set is ignored | I |
| HL7 MSH alt character set is invalid | W |
| HL7 MSH alt character set is missing | - |
| HL7 MSH alt character set is unrecognized | W |
| HL7 MSH app ack type is deprecated | W |
| HL7 MSH app ack type is ignored | I |
| HL7 MSH app ack type is invalid | W |
| HL7 MSH app ack type is missing | - |
| HL7 MSH app ack type is unrecognized | W |
| HL7 MSH app ack type is valued as always | - |
| HL7 MSH app ack type is valued as never | - |
| HL7 MSH app ack type is valued as only on errors | - |
| HL7 MSH character set is deprecated | W |
| HL7 MSH character set is ignored | I |
| HL7 MSH character set is invalid | W |
| HL7 MSH character set is missing | - |
| HL7 MSH character set is unrecognized | W |
| HL7 MSH country code is deprecated | W |
| HL7 MSH country code is ignored | I |
| HL7 MSH country code is invalid | W |
| HL7 MSH country code is missing | - |
| HL7 MSH country code is unrecognized | W |
| HL7 MSH encoding character is invalid | E |
| HL7 MSH encoding character is missing | E |
| HL7 MSH encoding character is non-standard | E |
| HL7 MSH message control id is missing | E |
| HL7 MSH message date is in future | E |
| HL7 MSH message date is invalid | E |
| HL7 MSH message date is missing | E |
| HL7 MSH message date is not precise | - |
| HL7 MSH message date is missing timezone | W |
| HL7 MSH message profile id is deprecated | W |
| HL7 MSH message profile id is ignored | I |
| HL7 MSH message profile id is invalid | W |
| HL7 MSH message profile id is missing | - |
| HL7 MSH message profile id is unrecognized | W |
| HL7 MSH message structure is missing | E |
| HL7 MSH message structure is unrecognized | E |
| HL7 MSH message trigger is missing | E |
| HL7 MSH message trigger is unrecognized | E |
| HL7 MSH message trigger is unsupported | E |
| HL7 MSH message type is missing | E |
| HL7 MSH message type is unrecognized | E |
| HL7 MSH message type is unsupported | E |
| HL7 MSH processing id is deprecated | W |
| HL7 MSH processing id is ignored | I |
| HL7 MSH processing id is invalid | E |
| HL7 MSH processing id is missing | E |
| HL7 MSH processing id is unrecognized | E |
| HL7 MSH processing id is unsupported | E |
| HL7 MSH processing id is valued as debug | W |
| HL7 MSH processing id is valued as production | - |
| HL7 MSH processing id is valued as training | W |
| HL7 MSH receiving application is invalid | W |
| HL7 MSH receiving application is missing | - |
| HL7 MSH receiving facility is invalid | W |
| HL7 MSH receiving facility is missing | - |
| HL7 MSH segment is missing | E |
| HL7 MSH sending application is invalid | W |
| HL7 MSH sending application is missing | - |
| HL7 MSH sending facility is invalid | W |
| HL7 MSH sending facility is missing | - |
| HL7 MSH version is missing | E |
| HL7 MSH version is unrecognized | E |
| HL7 MSH version is invalid | W |
| HL7 MSH version is valued as 2.3.1 | - |
| HL7 MSH version is valued as 2.4 | - |
| HL7 MSH version is valued as 2.5 | - |
| HL7 NK1 segment is missing | W |
| HL7 NK1 segment is repeated | - |
| HL7 NK1 set id is missing | I |
| HL7 OBX segment is missing | - |
| HL7 ORC segment is missing | W |
| HL7 ORC segment is repeated | E |
| HL7 PD1 segment is missing | - |
| HL7 PID segment is missing | E |
| HL7 PID segment is repeated | W |
| HL7 PV1 segment is missing | - |
| HL7 PV1 segment is repeated | W |
| HL7 RXA admin sub id counter is missing | I |
| HL7 RXA give sub id is missing | I |
| HL7 RXA segment is missing | I |
| HL7 RXA segment is repeated | - |
| HL7 RXR segment is missing | - |
| HL7 RXR segment is repeated | - |
| Next-of-kin address is different from patient address | - |
| Next-of-kin address is missing | - |
| Next-of-kin address city is invalid | W |
| Next-of-kin address city is missing | - |
| Next-of-kin address country is deprecated | W |
| Next-of-kin address country is ignored | I |
| Next-of-kin address country is invalid | W |
| Next-of-kin address country is missing | - |
| Next-of-kin address country is unrecognized | W |
| Next-of-kin address county is deprecated | W |
| Next-of-kin address county is ignored | I |
| Next-of-kin address county is invalid | W |
| Next-of-kin address county is missing | - |
| Next-of-kin address county is unrecognized | - |
| Next-of-kin address state is deprecated | W |
| Next-of-kin address state is ignored | I |
| Next-of-kin address state is invalid | W |
| Next-of-kin address state is missing | - |
| Next-of-kin address state is unrecognized | W |
| Next-of-kin address street is missing | - |
| Next-of-kin address street2 is missing | - |
| Next-of-kin address type is deprecated | W |
| Next-of-kin address type is ignored | I |
| Next-of-kin address type is invalid | W |
| Next-of-kin address type is missing | W |
| Next-of-kin address type is unrecognized | W |
| Next-of-kin address type is valued bad address | I |
| Next-of-kin address zip is invalid | W |
| Next-of-kin address zip is missing | - |
| Next-of-kin name is missing | I |
| Next-of-kin name first is missing | W |
| Next-of-kin name last is missing | W |
| Next-of-kin phone number is incomplete | W |
| Next-of-kin phone number is invalid | W |
| Next-of-kin phone number is missing | - |
| Next-of-kin relationship is deprecated | W |
| Next-of-kin relationship is ignored | I |
| Next-of-kin relationship is invalid | I |
| Next-of-kin relationship is missing | I |
| Next-of-kin relationship is not responsible party | I |
| Next-of-kin relationship is unexpected | W |
| Next-of-kin relationship is unrecognized | I |
| Next-of-kin SSN is missing | - |
| Observation value type is deprecated | W |
| Observation value type is ignored | I |
| Observation value type is invalid | I |
| Observation value type is missing | I |
| Observation value type is unrecognized | I |
| Observation observation identifier code is deprecated | W |
| Observation observation identifier code is ignored | I |
| Observation observation identifier code is invalid | I |
| Observation observation identifier code is missing | I |
| Observation observation identifier code is unrecognized | I |
| Observation observation value is missing | I |
| Observation date time of observation is missing | I |
| Observation date time of observation is invalid | I |
| Patient address is missing | W |
| Patient address city is invalid | W |
| Patient address city is missing | W |
| Patient address country is deprecated | W |
| Patient address country is ignored | I |
| Patient address country is invalid | W |
| Patient address country is missing | - |
| Patient address country is unrecognized | W |
| Patient address county is deprecated | W |
| Patient address county is ignored | I |
| Patient address county is invalid | W |
| Patient address county is missing | - |
| Patient address county is unrecognized | - |
| Patient address state is deprecated | W |
| Patient address state is ignored | I |
| Patient address state is invalid | W |
| Patient address state is missing | W |
| Patient address state is unrecognized | W |
| Patient address street is missing | W |
| Patient address street2 is missing | - |
| Patient address type is missing | - |
| Patient address type is deprecated | W |
| Patient address type is ignored | I |
| Patient address type is invalid | E |
| Patient address type is unrecognized | W |
| Patient address type is valued bad address | I |
| Patient address zip is invalid | W |
| Patient address zip is missing | W |
| Patient alias is missing | - |
| Patient birth date is after submission | E |
| Patient birth date is in future | E |
| Patient birth date is invalid | E |
| Patient birth date is missing | E |
| Patient birth date is underage | - |
| Patient birth date is very long ago | E |
| Patient birth indicator is invalid | W |
| Patient birth indicator is missing | - |
| Patient birth order is invalid | W |
| Patient birth order is missing | - |
| Patient birth order is missing and multiple birth indicated | W |
| Patient birth place is missing | - |
| Patient birth registry id is invalid | W |
| Patient birth registry id is missing | - |
| Patient class is deprecated | W |
| Patient class is ignored | I |
| Patient class is invalid | E |
| Patient class is missing | I |
| Patient class is unrecognized | W |
| Patient death date is before birth | E |
| Patient death date is in future | E |
| Patient death date is invalid | E |
| Patient death date is missing | - |
| Patient death indicator is inconsistent | W |
| Patient death indicator is missing | - |
| Patient ethnicity is deprecated | W |
| Patient ethnicity is ignored | I |
| Patient ethnicity is invalid | W |
| Patient ethnicity is missing | - |
| Patient ethnicity is unrecognized | W |
| Patient gender is deprecated | W |
| Patient gender is ignored | I |
| Patient gender is invalid | E |
| Patient gender is missing | W |
| Patient gender is unrecognized | W |
| Patient guardian address is missing | - |
| Patient guardian address city is missing | - |
| Patient guardian address state is missing | - |
| Patient guardian address street is missing | - |
| Patient guardian address zip is missing | - |
| Patient guardian name is missing | W |
| Patient guardian name is same as underage patient | - |
| Patient guardian name first is missing | W |
| Patient guardian name last is missing | W |
| Patient guardian responsible party is missing | W |
| Patient guardian phone is missing | - |
| Patient guardian relationship is missing | W |
| Patient immunization registry status is deprecated | W |
| Patient immunization registry status is ignored | I |
| Patient immunization registry status is invalid | W |
| Patient immunization registry status is missing | - |
| Patient immunization registry status is unrecognized | W |
| Patient Medicaid number is invalid | W |
| Patient Medicaid number is missing | - |
| Patient middle name is missing | - |
| Patient middle name may be initial | - |
| Patient mother''s maiden name is missing | - |
| Patient name may be temporary newborn name | - |
| Patient name may be test name | - |
| Patient name first is invalid | E |
| Patient name first is missing | E |
| Patient name first may include middle initial | - |
| Patient name last is invalid | E |
| Patient name last is missing | E |
| Patient name type code is deprecated | W |
| Patient name type code is ignored | I |
| Patient name type code is invalid | W |
| Patient name type code is missing | W |
| Patient name type code is unrecognized | W |
| Patient name type code is not valued legal | W |
| Patient phone is incomplete | W |
| Patient phone is invalid | W |
| Patient phone is missing | - |
| Patient phone tel use code is deprecated | W |
| Patient phone tel use code is ignored | I |
| Patient phone tel use code is invalid | W |
| Patient phone tel use code is missing | W |
| Patient phone tel use code is unrecognized | W |
| Patient phone tel equip code is deprecated | W |
| Patient phone tel equip code is ignored | I |
| Patient phone tel equip code is invalid | W |
| Patient phone tel equip code is missing | W |
| Patient phone tel equip code is unrecognized | W |
| Patient primary facility id is deprecated | W |
| Patient primary facility id is ignored | I |
| Patient primary facility id is invalid | E |
| Patient primary facility id is missing | - |
| Patient primary facility id is unrecognized | W |
| Patient primary facility name is missing | - |
| Patient primary language is deprecated | - |
| Patient primary language is ignored | I |
| Patient primary language is invalid | W |
| Patient primary language is missing | - |
| Patient primary language is unrecognized | W |
| Patient primary physician id is deprecated | W |
| Patient primary physician id is ignored | I |
| Patient primary physician id is invalid | W |
| Patient primary physician id is missing | - |
| Patient primary physician id is unrecognized | W |
| Patient primary physician name is missing | - |
| Patient protection indicator is deprecated | W |
| Patient protection indicator is ignored | I |
| Patient protection indicator is invalid | W |
| Patient protection indicator is missing | - |
| Patient protection indicator is unrecognized | W |
| Patient protection indicator is valued as no | W |
| Patient protection indicator is valued as yes | W |
| Patient publicity code is deprecated | W |
| Patient publicity code is ignored | I |
| Patient publicity code is invalid | W |
| Patient publicity code is missing | - |
| Patient publicity code is unrecognized | W |
| Patient race is deprecated | W |
| Patient race is ignored | I |
| Patient race is invalid | W |
| Patient race is missing | - |
| Patient race is unrecognized | W |
| Patient registry id is missing | - |
| Patient registry id is unrecognized | - |
| Patient registry status is deprecated | W |
| Patient registry status is ignored | I |
| Patient registry status is invalid | W |
| Patient registry status is missing | - |
| Patient registry status is unrecognized | W |
| Patient SSN is invalid | W |
| Patient SSN is missing | - |
| Patient submitter id is missing | E |
| Patient submitter id authority is missing | E |
| Patient submitter id type code is missing | E |
| Patient submitter id type code is deprecated | W |
| Patient submitter id type code is invalid | E |
| Patient submitter id type code is unrecognized | - |
| Patient submitter id type code is ignored | I |
| Patient VFC effective date is before birth | E |
| Patient VFC effective date is in future | E |
| Patient VFC effective date is invalid | E |
| Patient VFC effective date is missing | - |
| Patient VFC status is deprecated | W |
| Patient VFC status is ignored | I |
| Patient VFC status is invalid | W |
| Patient VFC status is missing | - |
| Patient VFC status is unrecognized | W |
| Patient WIC id is invalid | - |
| Patient WIC id is missing | - |
| Vaccination action code is deprecated | W |
| Vaccination action code is ignored | I |
| Vaccination action code is invalid | E |
| Vaccination action code is missing | - |
| Vaccination action code is unrecognized | W |
| Vaccination action code is valued as add | - |
| Vaccination action code is valued as add or update | - |
| Vaccination action code is valued as delete | - |
| Vaccination action code is valued as update | - |
| Vaccination admin code is deprecated | W |
| Vaccination admin code is ignored | I |
| Vaccination admin code is invalid | E |
| Vaccination admin code is invalid for date administered | E |
| Vaccination admin code is missing | I |
| Vaccination admin code is not specific | W |
| Vaccination admin code is not vaccine | W |
| Vaccination admin code is unexpected for date administered | W |
| Vaccination admin code is unrecognized | E |
| Vaccination admin code is valued as not administered | I |
| Vaccination admin code is valued as unknown | W |
| Vaccination admin code table is missing | W |
| Vaccination admin code table is invalid | W |
| Vaccination admin code may be variation of previously reported codes | W |
| Vaccination admin date is after lot expiration date | W |
| Vaccination admin date is after message submitted | E |
| Vaccination admin date is after patient death date | E |
| Vaccination admin date is after system entry date | E |
| Vaccination admin date is before birth | E |
| Vaccination admin date is before or after expected vaccine usage range | W |
| Vaccination admin date is before or after licensed vaccine range | E |
| Vaccination admin date is before or after when expected for patient age | W |
| Vaccination admin date is before or after when valid for patient age | E |
| Vaccination admin date is invalid | E |
| Vaccination admin date is missing | I |
| Vaccination admin date is on 15th day of month | - |
| Vaccination admin date is on first day of month | - |
| Vaccination admin date is on last day of month | - |
| Vaccination admin date is reported late | W |
| Vaccination admin date end is different from start date | W |
| Vaccination admin date end is missing | - |
| Vaccination administered amount is invalid | W |
| Vaccination administered amount is missing | - |
| Vaccination administered amount is valued as zero | - |
| Vaccination administered amount is valued as unknown | - |
| Vaccination administered unit is deprecated | W |
| Vaccination administered unit is ignored | I |
| Vaccination administered unit is invalid | W |
| Vaccination administered unit is missing | - |
| Vaccination administered unit is unrecognized | W |
| Vaccination body route is deprecated | W |
| Vaccination body route is ignored | I |
| Vaccination body route is invalid | W |
| Vaccination body route is invalid for vaccine indicated | W |
| Vaccination body route is missing | - |
| Vaccination body route is unrecognized | W |
| Vaccination body site is deprecated | W |
| Vaccination body site is ignored | I |
| Vaccination body site is invalid | W |
| Vaccination body site is invalid for vaccine indicated | W |
| Vaccination body site is missing | - |
| Vaccination body site is unrecognized | W |
| Vaccination completion status is deprecated | W |
| Vaccination completion status is ignored | W |
| Vaccination completion status is invalid | E |
| Vaccination completion status is missing | - |
| Vaccination completion status is unrecognized | W |
| Vaccination completion status is valued as completed | - |
| Vaccination completion status is valued as not administered | W |
| Vaccination completion status is valued as partially administered | W |
| Vaccination completion status is valued as refused | W |
| Vaccination confidentiality code is deprecated | W |
| Vaccination confidentiality code is ignored | I |
| Vaccination confidentiality code is invalid | E |
| Vaccination confidentiality code is missing | - |
| Vaccination confidentiality code is unrecognized | W |
| Vaccination confidentiality code is valued as restricted | W |
| Vaccination CPT code is deprecated | W |
| Vaccination CPT code is ignored | I |
| Vaccination CPT code is invalid | W |
| Vaccination CPT code is invalid for date administered | W |
| Vaccination CPT code is missing | - |
| Vaccination CPT code is unexpected for date administered | - |
| Vaccination CPT code is unrecognized | W |
| Vaccination CVX code is deprecated | W |
| Vaccination CVX code is ignored | I |
| Vaccination CVX code is invalid | W |
| Vaccination CVX code is invalid for date administered | W |
| Vaccination CVX code is missing | - |
| Vaccination CVX code is unexpected for date administered | - |
| Vaccination CVX code is unrecognized | W |
| Vaccination CVX code and CPT code are inconsistent | I |
| Vaccination facility id is deprecated | W |
| Vaccination facility id is ignored | I |
| Vaccination facility id is invalid | W |
| Vaccination facility id is missing | - |
| Vaccination facility id is unrecognized | W |
| Vaccination facility name is missing | - |
| Vaccination filler order number is deprecated | W |
| Vaccination filler order number is ignored | I |
| Vaccination filler order number is invalid | E |
| Vaccination filler order number is missing | I |
| Vaccination filler order number is unrecognized | W |
| Vaccination financial eligibility code is deprecated | W |
| Vaccination financial eligibility code is ignored | I |
| Vaccination financial eligibility code is invalid | W |
| Vaccination financial eligibility code is missing | - |
| Vaccination financial eligibility code is unrecognized | W |
| Vaccination given by is deprecated | W |
| Vaccination given by is ignored | I |
| Vaccination given by is invalid | W |
| Vaccination given by is missing | - |
| Vaccination given by is unrecognized | W |
| Vaccination id is missing | - |
| Vaccination id of receiver is missing | - |
| Vaccination id of receiver is unrecognized | W |
| Vaccination id of sender is missing | - |
| Vaccination id of sender is unrecognized | W |
| Vaccination information source is administered but appears to historical | W |
| Vaccination information source is deprecated | W |
| Vaccination information source is historical but appears to be administered | W |
| Vaccination information source is ignored | I |
| Vaccination information source is invalid | W |
| Vaccination information source is missing | W |
| Vaccination information source is unrecognized | W |
| Vaccination information source is valued as administered | - |
| Vaccination information source is valued as historical | - |
| Vaccination vis document type is deprecated | W |
| Vaccination vis document type is ignored | I |
| Vaccination vis document type is incorrect | W |
| Vaccination vis document type is invalid | W |
| Vaccination vis document type is missing | W |
| Vaccination vis document type is unrecognized | W |
| Vaccination vis document type is out-of-date | W |
| Vaccination vis version date is invalid | W |
| Vaccination vis version date is missing | W |
| Vaccination vis version date is unrecognized | W |
| Vaccination vis version date is in future | W |
| Vaccination vis delivery date is invalid | W |
| Vaccination vis delivery date is missing | W |
| Vaccination vis delivery date is not admin date | W |
| Vaccination vis delivery date is before version date | W |
| Vaccination vis delivery date is after admin date | W |
| Vaccination lot expiration date is invalid | W |
| Vaccination lot expiration date is missing | - |
| Vaccination lot number is invalid | W |
| Vaccination lot number is missing | W |
| Vaccination manufacturer code is deprecated | W |
| Vaccination manufacturer code is ignored | I |
| Vaccination manufacturer code is invalid | W |
| Vaccination manufacturer code is invalid for date administered | W |
| Vaccination manufacturer code is missing | W |
| Vaccination manufacturer code is unexpected for date administered | W |
| Vaccination manufacturer code is unrecognized | W |
| Vaccination order control code is deprecated | W |
| Vaccination order control code is ignored | I |
| Vaccination order control code is invalid | W |
| Vaccination order control code is missing | I |
| Vaccination order control code is unrecognized | I |
| Vaccination order facility id is deprecated | - |
| Vaccination order facility id is ignored | I |
| Vaccination order facility id is invalid | W |
| Vaccination order facility id is missing | - |
| Vaccination order facility id is unrecognized | W |
| Vaccination order facility name is missing | W |
| Vaccination ordered by is deprecated | W |
| Vaccination ordered by is ignored | I |
| Vaccination ordered by is invalid | W |
| Vaccination ordered by is missing | - |
| Vaccination ordered by is unrecognized | W |
| Vaccination placer order number is deprecated | W |
| Vaccination placer order number is ignored | I |
| Vaccination placer order number is invalid | E |
| Vaccination placer order number is missing | - |
| Vaccination placer order number is unrecognized | W |
| Vaccination product is deprecated | W |
| Vaccination product is invalid | E |
| Vaccination product is invalid for date administered | E |
| Vaccination product is missing | - |
| Vaccination product is unexpected for date administered | - |
| Vaccination product is unrecognized | E |
| Vaccination recorded by is deprecated | W |
| Vaccination recorded by is ignored | I |
| Vaccination recorded by is invalid | W |
| Vaccination recorded by is missing | - |
| Vaccination recorded by is unrecognized | W |
| Vaccination refusal reason conflicts completion status | E |
| Vaccination refusal reason is deprecated | W |
| Vaccination refusal reason is ignored | I |
| Vaccination refusal reason is invalid | E |
| Vaccination refusal reason is missing | I |
| Vaccination refusal reason is unrecognized | W |
| Vaccination system entry time is in future | E |
| Vaccination system entry time is invalid | E |
| Vaccination system entry time is missing | - |

## Testing Priority

As a part of the DQA testing process the DQA Testing work group is in the process of determining priorities for testing these issues. The work group is being asked to assign HIGH, MEDIUM, and LOW priorities to each issue. The HIGH priority items are ones that are critical for all IIS to be sensitive to and will be required for passing Level 1; MEDIUM priority will be required for Level 2; and LOW priority items for Level 3. There will also be a fourth set of items that are not tested at all, either because they are not even a LOW priority issue or because the testing process was not configured to test it.

## Sample Tests

This is an example of how the issue “Patient name first is missing” is tested.

Request message (notice the missing first name):

MSH|^~\&|||||20130827111711||VXU^V04^VXU\_V04|C1.224.1377623831081|D|2.5.1|

PID|1||C1.224^^^OIS-TEST^MR||Short^^Prema^^^^L||20090831|F||2076-8^Native Hawaiian or Other Pacific Islander^HL70005|45 Tulsa Ln^^Palms^MI^48465^USA^P||^PRN^PH^^^989^9443318|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||X00U893.1^OIS|

RXA|0|1|20100826||140^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||Z0860BB||CSL^CSL Behring^MVX||||A|

RXR|IM^^HL70162|LA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible - Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|140^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20100826||||||F|

ORC|RE||X00U893.2^OIS|

RXA|0|1|20110401||141^Influenza^CVX|999|||01^Historical^NIP001||||||||||||A|

ORC|RE||X00U893.3^OIS|

RXA|0|1|20130827||140^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||S9733RC||CSL^CSL Behring^MVX||||A|

RXR|IM^^HL70162|LA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V02^VFC eligible - Medicaid/Medicaid Managed Care^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|140^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Response Received:

MSH|^~\&|MCIR|MCIR|||20130827111711-0600||ACK^V04|20130827111711-0600.763|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AE|C1.224.1377623831081|

ERR||||E|||||Message rejected: Patient name first is missing|

ERR||PID^1^5.2^1||E|141|||Patient name first is missing|

ERR||MSH^1^11^1|0|W|24|||HL7 MSH processing id is valued as debug|

ERR|||0|W|157|||Patient guardian responsible party is missing|

ERR|||0|I|51|||HL7 PV1 segment is missing|

Please note that in this case the message was rejected. However the test only verified that the phrase “Patient name first is missing” appeared in the response.

Here is another example of an issue that would ideally not be rejected by the IIS.

Message sent (notice the second vaccination has a lot expiration of “never”):

MSH|^~\&|||||20130827111752||VXU^V04^VXU\_V04|C1.450.1377623872652|D|2.5.1|

PID|1||C1.450^^^OIS-TEST^MR||Johnston^Tyrone^Elliott^^^^L||20090831|M||2106-3^White^HL70005|214 Fayette St^^Caseville^MI^48725^USA^P||^PRN^PH^^^989^8996073|||||||||2186-5^not Hispanic or Latino^CDCREC|

ORC|RE||O09E1119.1^OIS|

RXA|0|1|20100901||21^Varicella^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||U6329BP||MSD^Merck and Co^MVX||||A|

RXR|SC^^HL70162|RA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V03^VFC eligible - Uninsured^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|21^Varicella^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20080313||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20100901||||||F|

ORC|RE||O09E1119.2^OIS|

RXA|0|1|20110331||140^Influenza^CVX|999|||01^Historical^NIP001|||||||Never|||||A|

ORC|RE||O09E1119.3^OIS|

RXA|0|1|20130827||141^Influenza^CVX|0.25|mL^milliliters^UCUM||00^Administered^NIP001||||||O6387ZU||NOV^Novartis^MVX||||A|

RXR|IM^^HL70162|LA^^HL70163|

OBX|1|CE|64994-7^Vaccine funding program eligibility category^LN|1|V03^VFC eligible - Uninsured^HL70064||||||F|||20130827|||VXC40^Eligibility captured at the immunization level^CDCPHINVS|

OBX|2|CE|30956-7^Vaccine Type^LN|2|141^Inactivated Flu^CVX||||||F|

OBX|3|TS|29768-9^Date vaccine information statement published^LN|2|20120702||||||F|

OBX|4|TS|29769-7^Date vaccine information statement presented^LN|2|20130827||||||F|

Here is the response:

MSH|^~\&|MCIR|MCIR|||20130827111752-0600||ACK^V04|20130827111752-0600.851|P|2.5.1|

SFT|OIS|1.06dev|DQA||

MSA|AA|C1.450.1377623872652|

ERR|||0|I|||||Message accepted with 3 vaccinations|

ERR||RXA^2^16^1|0|W|336|||Vaccination lot expiration date is invalid, in repeat #2|

Again, the test passes because the message has the phrase “Vaccination lot expiration date is invalid” not because the message was accepted or rejected.

## Pre Testing Setup

Prior to testing with an IIS, the list of HIGH, MEDIUM and LOW issues for Level 1, Level 2 and Level 3 will need to be compared with the expected out from the IIS to determine which phrases should be expected for each issue. These phrases must generally be unique to each issue, although some phrases may cover more than one issue in circumstances where a single message is used to cover several closely related problems.

# Exceptional Tests

These last set of update tests cover all other issues not tested in the previous tests and focus on ensuring that the IIS can accommodate minor differences from the standard. HL7 was built to be forwards/backwards compatible and to be tolerant of variation. While a sending system should do all that it can to write as closely as possible to the standard a receiving should be tolerant as possible when receiving information.

The basis for this concept can be well understood when comparing this to the issue to good manners in human relations. For example, a person with good manners must take care to exhibit right behavior at all times when working with other people, while at the same time tolerating less than optimal manners from others. People who insist on absolutely correct manners from all others are considered rude and difficult to work with. This is the same with an HL7 interfaces. All sending systems should do their upmost to meet and conform to every requirement and recommendation of the standard and all receiving system should be tolerant of variations that do not impact data quality.

## Tolerance Checks

A set of messages are created that have various problems with the messages including:

|  |  |
| --- | --- |
| **Message** | **Comment** |
| Message includes observation not typically sent to IIS | The current standard allows the sender to put any number of observations in an update message. IIS should ignore all observations that it does not recognize or accept. This test includes an observation an IIS should never expect to see. The IIS should just ignore this. This is critical so that when new observations are added to the standard the IIS can continue to process messages with the new observations added. |
| Message includes segment not defined by HL7 | HL7 requires the receiver to ignore segments it does not recognize. New segments can be added at any time by the HL7 standard and the current interface should just ignore these new segments. |
| Hospital service code is set to a non-standard value | This represents a field in PV1-10 that is not normally used by IIS but could be set. The IIS should just ignore this value. In this case the value set here is not in the user defined code table in the HL7 standard. An interface built to verify all fields, IIS related or not, might flag this field as having an incorrect value. At this point the IIS interface should remove the value from the hospital service code field and then check to see if this field must have a value for the immunization information to be received. In this case the IIS should accept the message because hospital service code does not impact immunization messaging. |
| Observation at patient level (HL7 2.8 capability) | In future versions of HL7 the observations may be placed at patient level. If the interface is unable to process OBX at the patient level they should be ignored. |

## Certified EHR Examples

This test also includes examples from certified EHR systems that have generated messages that pass the edit checks of the NIST 2014 certification parser. While these messages should be very similar to the checks made in the Basic Test they do have slight variations that the IIS should be able to handle.

## Level 2 and Level 3

The testing process for these two levels is also the same as the testing that is done for Basic and Intermediate testing Levels 2 and 3. For details on the fields used for comparison please see [Comparing Response to Request](#_Comparing_Response_to) section.

# Performance

For completeness and out of general interest of actual performance there is a section for measuring how quickly the IIS can reply to a query or update. This testing process is not built to perform a thorough analysis of processing speed, but rather ensure that the general operation is within some wide limits.

Currently the expectation is that updates should be acknowledged within 3 seconds, on average. And that queries should have results returned within 5 seconds.

# Conformance

The last set of tests returns to the previously submitted tests and verifies that the responses received from the IIS match the standard. In previous tests the ACK and RSP messages were read to ensure that the test conditions were met, but they were not analyzed for conformance to HL7 or CDC standards. In fact the testing process in these previous tests was extremely tolerant of variation and allows for a great deal of variability in implementing both the ACK and RSP standard. But the conformance tests take an opposite direction and verify that every single applicable requirement, as defined by the CDC Implementation Guide, is implemented properly in the response.

The requirements that are checked include the following:

* Existence of required segments, fields, repetitions and sub fields.
* Non-existence of not-supported fields, and sub fields.
* Data type conformance.
* Conditional predicates.
* Field length.
* Coded values.
* Conformance statements.

Level 1 tests all the acknowledgement messages returned. Level 2 tests all the query responses returned.