AIRA
AMERICAN IMMUNIZATION REGISTRY ASSOCIATION

Measures and Tests for Assessment

Data Quality: Incoming/Ongoing

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Background and Context

The consolidation of immunization records from multiple sources is a primary function of immunization information systems (IIS)[1]. To ensure complete, accurate, and timely consolidated records, IIS must receive data from a high proportion of immunizers within their catchment area through standardized reporting channels. Messaging standards have been present across the IIS community for more than twenty years and have increasingly gained importance as Electronic Health Record (EHR)-IIS interoperability has grown in necessity across health care. The primary standard for IIS messaging is the HL7 Version 2.5.1 Implementation Guide for Immunization Messaging, Release 1.5[2]. As data is electronically exchanged, IIS must detect data quality errors during submission in an effort to improve the overall quality of IIS data.

In 2016, AIRA convened the Measurement for Assessment and Certification Advisory Workgroup (MACAW) to develop and propose measures for IIS Assessment. Data Quality: Incoming/Ongoing content area within the Measurement and Improvement Initiative (M&I) focuses on IIS detection of poor data quality during the submission of records. These measures and tests will be shared with the AIRA Board of Directors and the full AIRA community to ensure broad community input and agreement.

Assessment Program Details

MACAW defined the scope, measures, tests, outcomes, and testing methods for measuring data quality detections for incoming/ongoing EHR-IIS interfaces. This work was founded by the Functional Standards and numerous community documents focused on data quality. A collection of those resources has been provided in Appendix A.

Functional Standards

The importance of data quality is front and center in the IIS Functional Standards v4.0, updated in 2018[3]. The revised IIS Functional Standards were developed by the Immunization Information Systems Support Branch (IISSB) through a consensus-based process involving input from a variety of IIS managers and technical experts from across the United States. They are intended to reflect the functionality an IIS should strive to attain to fully support program and stakeholder immunization-related goals. The following overarching principle in the Functional Standards best describes the importance of Data Quality to the IIS.

> *As an IIS matures, the importance of data quality becomes more pronounced. Data quality is the cornerstone of successfully reaching all immunization-related goals. IIS Functional Standards related to data quality are woven into the Essential Infrastructure Functional Standards and are reflected in multiple goals in this document. This underscores the importance of thinking about and applying data quality in all aspects of access and use of IIS data and functionality.*

[1] http://www.cdc.gov/vaccines/programs/iis/about.html
[2] http://www.cdc.gov/vaccines/programs/iis/technical-guidance/downloads/hl7guide-1-5-2014-11.pdf
[3] https://www.cdc.gov/vaccines/programs/iis/func-stds.html

Scope

In Scope

- The IIS's ability to detect data quality issues on a per message basis. The IIS will be presented with messages that contain intentional data quality errors (e.g., vaccination date before date of birth).
- The IIS's ability to retain (and return) vaccination events from submission to query without changing the meaning (e.g., NDC mapped to CVX, return key information about a vaccination event).

Out of Scope

- Data quality monitoring of multiple messages (e.g., percentage of records submitted with phone number)
- Patient or vaccine matching/deduplication algorithms
- Address hygiene/cleansing
- Storage of data

Measures

The measures – described in greater detail below – are broken into three categories (patient demographic, vaccination event, and additional aspects). The first two categories (patient demographic and vaccination event) expect the IIS to detect when poor quality data is submitted to the IIS. The third category (additional aspects) expects the IIS to be good stewards of the data which is submitted and ensure the data still represents what was initially submitted when returned from a query. Patient demographic and vaccination event data elements are a select subset of CDC endorsed core data elements[4]. The remainder of this document references the data elements as named and defined in the CDC endorsed data elements.

Patient Demographic Data Elements

1. The IIS detects data quality issues with patient name: first.
2. The IIS detects data quality issues with patient name: last.
3. The IIS detects data quality issues with patient date of birth.
4. The IIS detects data quality issues with patient gender.
5. The IIS detects data quality issues with patient address: state.
6. The IIS detects data quality issues with patient address: country.
7. The IIS detects data quality issues with race.
8. The IIS detects data quality issues with ethnicity.
9. The IIS detects data quality issues with patient multiple birth indicator and patient birth order.
10. The IIS detects data quality issues with patient telephone number and patient telephone number type.
11. The IIS detects data quality issues with responsible person name: first.
12. The IIS detects data quality issues with responsible person name: last.
13. The IIS detects data quality issues with responsible person relationship to patient.
14. The IIS detects data quality issues with Patient ID and patient ID: type.

Vaccination Event Data Elements

15. The IIS detects data quality issues with vaccination administration date.
16. The IIS detects data quality issues with dose level eligibility.

[4] https://www.cdc.gov/vaccines/programs/iis/core-data-elements/iis-func-stds.html

17. The IIS detects data quality issues with contraindications/precautions and contraindication/precaution observation date.
18. The IIS detects data quality issues with exemptions/refusals reasons and exemptions/refusals date.
19. The IIS detects data quality issues with vaccination event record type.
20. The IIS detects data quality issues with vaccine funding source.
21. The IIS detects data quality issues with vaccine product.
22. The IIS detects data quality issues with vaccine manufacturer name.
23. The IIS detects data quality issues with vaccine expiration date.
24. The IIS detects data quality issues with vaccine event ID.

Additional Aspects

25. The IIS has the ability to map between coding systems.
26. The IIS returns critical information about a previously submitted vaccination event.
27. The IIS returns the consolidated immunization history following updates or deletes.

Tests

The MACAW members developed high-level strategies for establishing detailed test cases for each measure. Test cases were developed with the following guiding principles in mind:

- **Isolate the test case to the measure:** Each test case should be isolated to the measure to ensure consistent measurement across all IIS.
- **Expectations for a test case should be few, not many:** Multiple expectations—either in number or variation—lead to inconsistencies in assessment across all IIS. For example, IIS "A" could fail for one reason while IIS "B" could fail for a different reason. When results are aggregated across all IIS, it becomes difficult to tease apart the variation and develop actionable improvement strategies.

Measure and Test Outcomes

Test Outcomes

Each test case has a defined test case expectation. The test cases and test case expectations are used during testing to determine how well an IIS aligns with the published national standards. Once each test case is executed against an IIS, the IIS is slotted into one of the following four categories:

Meets: The IIS meets the test case expectation without modification to the test case or test case expectation(s).

Deviates: The IIS can meet the test case expectation with modification to the test case or test case expectation(s) which supports the local business need, policy, or law.

Does Not Meet: The IIS cannot meet the test case expectation.

Not Measured: The IIS is unable to be measured as the IIS does not currently support the capability being tested.

Testing Method

AIRA will submit an HL7 message (VXU) which reflects the condition described in the test case. Each test case will be isolated to one data quality error. Following the VXU, a query (QBP) will be sent for the patient. The information returned by the IIS in both the acknowledgment (ACK) and response (RSP) will be used to determine if the IIS has met the expectation of the test case.

The IIS will meet the test case if either of the following are true:

- The HL7 ACK clearly identifies the data quality error.
- The HL7 RSP does not include the data quality error.

This approach has limitations and critical details which will be taken into consideration on specific test cases and/or in published aggregate reports.

- Some tests may not be able to leverage the ACK while others may not be able to leverage the RSP. These limitations will be denoted in the specific measures below.
- Analyzing the RSP will be used as a second method to determine success, but may also lead to an occasional false positive. This approach was preferred over not analyzing the RSP which could lead to a larger set of false negatives as well as only one possible way to pass a test.
- The IIS does not need to have perfect ACK or RSP conformance for this content area. HL7 conformance is measured in the Submission/Acknowledgment and Query/Response content areas. However, the IIS must populate key fields appropriately for them to be analyzed.
    - For example, ERR-2 is the error location where the error occurred in the VXU message. The IIS must populate this field properly. The testing program will not look in other ACK segments or fields in an attempt to derive or imply the data quality error was detected.
- The error severity found in ERR-4 (i.e., I, W, or E) will not be considered. Any severity is acceptable per local IIS business rules.

Measures 1 through 24

Measures 1 through 24 focus on data quality detections on a select set of CDC Endorsed Data Elements. These tests can be broken into three types of tests (is missing, is invalid, and is in conflict).

- **Missing data:** These tests intentionally omit a data element (e.g., first name) and submit the record to the IIS. The remainder of the message is populated with logical data and per the HL7 implementation guide.
- **Invalid data:** These tests intentionally submit an illogical value (e.g., phone number of “no phone”) and submit the record to the IIS. The remainder of the message is populated with logical data and per the HL7 implementation guide.
- **Conflicting data:** These tests intentionally submit HL7 messages per the HL7 Implementation guide, but the data within the message is illogical when compared against other data elements (e.g., immunization date before birth date). The remainder of the message is populated with logical data and per the HL7 implementation guide.

Each of the data element measures – unless noted – will submit the VXU message followed by the QBP. From this, the ACK and RSP will be analyzed to determine if the IIS detected the data quality issue. The following table describes the results of the test case based on what information is found in the ACK or the RSP.

IF THE TEST IS	AND	ACK	AND	RSP	THEN	TEST CASE OUTCOME
The IIS detects if data	→	detects error	→	→	→	Pass

element is missing	→	silent about error	→	Empty or noted default value	→	Pass
	→	silent about error	→	Patient or vaccination event not found	→	Fail
	→	silent about error	→	Non-default value found	→	Fail
The IIS detects if data element is invalid	→	detects error	→	→	→	Pass
	→	silent about error	→	Empty or noted default value	→	Pass
	→	silent about error	→	Patient or vaccination event not found	→	Fail
	→	silent about error	→	Non-default value found	→	Fail
The IIS detects if data element is in conflict	→	detects error	→	RSP not used in these tests	→	Pass
	→	silent about error	→	RSP not used in these tests	→	Fail

Measures 25 - 27

In contrast to Measures 1 – 24, Measures 25 – 27 focus on additional aspects of data quality and use the RSP exclusively to assess the test case. More details on these can be found within the specific measures.

Patient Demographic Data Element Measures

Measure 1:

The IIS detects data quality issues with patient name: first.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient name: first is missing.	The IIS returns an ACK with an error indicating the first name is missing or an RSP is returned without the patient's first name populated.	

Measure 2:

The IIS detects data quality issues with patient name: last.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient name: last is missing.	The IIS returns an ACK with an error indicating the last name is missing or an RSP is returned without the patient's last name populated.	

Measure 3:

The IIS detects data quality issues with patient date of birth.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient date of birth is missing.	The IIS returns an ACK with an error indicating the date of birth is missing or an RSP is returned without the patient's date of birth populated.	
The IIS detects the patient date of birth is invalid.	The IIS returns an ACK with an error indicating the date of birth is invalid or an RSP is returned without the patient's date of birth populated.	
The IIS detects the patient date of birth is in the future.	The IIS returns an ACK with an error indicating the date of birth is illogical.	The RSP is not used as a secondary means of measurement for this test.
The IIS detects the patient date of birth is after the vaccination administration date.	The IIS returns an ACK with an error indicating the date of birth (or the vaccination administration date) is illogical.	The RSP is not used as a secondary means of measurement for this test.

Measure 4:

The IIS detects data quality issues with patient gender.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient gender is missing.	The IIS returns an ACK with an error indicating the gender is missing or an RSP is returned either without a gender or a default value of "U" (for unknown).	
The IIS detects the patient gender is invalid.	The IIS returns an ACK with an error indicating the gender is invalid or an RSP is returned either without a gender or a default value of "U" (for unknown).	

Measure 5:

The IIS detects data quality issues with patient address: state.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient address: state is invalid.	The IIS returns an ACK with an error indicating the state is invalid or an RSP is returned without the state populated.	

Measure 6:

The IIS detects data quality issues with patient address: country.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient address: country is invalid.	The IIS returns an ACK with an error indicating the country is invalid or an RSP is returned either without a country or a default value of "US" or "USA" (for United States of America).	

Measure 7:

The IIS detects data quality issues with race.

Test Cases

Test Case	Test Case Expectation	Further Details

The IIS detects the race is invalid.	The IIS returns an ACK with an error indicating the race is invalid or an RSP is returned without the race populated.	

Measure 8:

The IIS detects data quality issues with ethnicity.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the ethnicity is invalid.	The IIS returns an ACK with an error indicating the ethnicity is invalid or an RSP is returned without the ethnicity populated.	

Measure 9:

The IIS detects data quality issues with patient multiple birth indicator and patient birth order.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient multiple birth indicator is invalid.	The IIS returns an ACK with an error indicating the multiple birth indicator is invalid or an RSP is returned without the multiple birth indicator populated.	
The IIS detects the patient birth order is invalid.	The IIS returns an ACK with an error indicating the birth order is invalid or an RSP is returned without the birth order populated.	
The IIS detects the patient multiple birth indicator and patient birth order conflict with each other.	The IIS returns an ACK with an error indicating a conflict exists in the submitted data or an RSP is returned without multiple birth indicator and birth order populated.	

Measure 10:

The IIS detects data quality issues with patient telephone number and patient telephone number type.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient telephone number is invalid.	The IIS returns an ACK with an error indicating the telephone number is invalid or an RSP is	

	returned without the telephone number populated.	
The IIS detects the patient telephone number type is invalid.	The IIS returns an ACK with an error indicating the telephone number type is invalid or an RSP is returned without the telephone number type populated.	

Measure 11:

The IIS detects data quality issues with responsible person name: first.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the responsible person name: first is missing.	The IIS returns an ACK with an error indicating the responsible person's first name is missing or an RSP is returned without the responsible person's first name populated.	In most IIS, the responsible person (NK1 segment) is not required, however, if the NK1 segment is submitted, then the responsible person first name becomes required. This test will submit a well formed NK1 segment without a responsible person first name.

Measure 12:

The IIS detects data quality issues with responsible person name: last.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the responsible person name: last is missing	The IIS returns an ACK with an error indicating the responsible person's last name is missing or an RSP is returned without the responsible person's last name populated.	In most IIS, the responsible person (NK1 segment) is not required, however, if the NK1 segment is submitted, then the responsible person last name becomes required. This test will submit a well formed NK1 segment without a responsible person last name.

Measure 13:

The IIS detects data quality issues with responsible person relationship to patient.

Test Cases

Test Case	Test Case Expectation	Further Details

The IIS detects the responsible person relationship to patient is missing.	The IIS returns an ACK with an error indicating the responsible person's relationship to patient is missing or an RSP is returned either without the responsible person's relationship to patient populated or set to a default value of "OTH" (for other).	In most IIS, the responsible person (NK1 segment) is not required, however, if the NK1 segment is submitted, then the responsible person relationship to patient becomes required. This test will submit a well formed NK1 segment without a responsible person relationship to patient.
The IIS detects the responsible person relationship to patient is invalid.	The IIS returns an ACK with an error indicating the responsible person's relationship to patient is invalid or an RSP is returned either without the responsible person's relationship to patient populated or set to a default value of "OTH" (for other).	

Measure 14:

The IIS detects data quality issues with patient ID and patient ID: type.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the patient ID is missing.	The IIS returns an ACK with an error indicating the patient ID is missing or an RSP is returned without the patient ID populated.	
The IIS detects the patient ID type is missing.	The IIS returns an ACK with an error indicating the patient ID type is missing or an RSP is returned either without the patient ID type populated or set to a default value of "U" (for unspecified identifier).	
The IIS detects the patient ID type is invalid.	The IIS returns an ACK with an error indicating the patient ID type is invalid or an RSP is returned either without the patient ID type populated or set to a default value of "U" (for unspecified identifier).	

Vaccination Event Data Element Measures

Measure 15:

The IIS detects data quality issues with vaccination administration date.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccination administration date is missing.	The IIS returns an ACK with an error indicating the vaccination administration date is missing or an RSP is returned without the vaccination administration date populated.	
The IIS detects the vaccination administration date is invalid.	The IIS returns an ACK with an error indicating the vaccination administration date is invalid or an RSP is returned without the vaccination administration date populated.	
The IIS detects the vaccination administration date is in the future.	The IIS returns an ACK with an error indicating the vaccination administration date is illogical.	The RSP is not used as a secondary means of measurement for this test.
The IIS detects the vaccination administration date is before the patient date of birth.	The IIS returns an ACK with an error indicating the vaccination administration date (or patient date of birth) is illogical.	The RSP is not used as a secondary means of measurement for this test.

Measure 16:

The IIS detects data quality issues with dose level eligibility.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the dose level eligibility is missing.	The IIS returns an ACK with an error indicating the dose level eligibility is missing or an RSP is returned without the dose level eligibility populated.	
The IIS detects the dose level eligibility is invalid.	The IIS returns an ACK with an error indicating the dose level eligibility is invalid or an RSP is returned without the dose level eligibility populated.	

Measure 17:

The IIS detects data quality issues with contraindications/precautions and contraindication/precaution observation date.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the contraindications/precautions code is invalid.	The IIS returns an ACK with an error indicating the contraindications/precautions is invalid or an RSP is returned without the contraindications/precautions populated.	
The IIS detects the contraindications/precautions observation date is invalid.	The IIS returns an ACK with an error indicating the contraindications/precautions is invalid or an RSP is returned without the contraindications/precautions populated.	
The IIS detects the contraindications/precautions observation date is in the future.	The IIS returns an ACK with an error indicating the contraindications/precautions observation date is illogical.	The RSP is not used as a secondary means of measurement for this test.
The IIS detects the contraindications/precautions observation date is before the patient date of birth.	The IIS returns an ACK with an error indicating the contraindications/precautions observation date is illogical.	The RSP is not used as a secondary means of measurement for this test.

Measure 18:

The IIS detects data quality issues with exemptions/refusals reasons and exemptions/refusals date.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the exemption/refusal reason code is invalid.	The IIS returns an ACK with an error indicating the exemption/refusal reason code is invalid or an RSP is returned without the exemption/refusal reason code populated.	
The IIS detects the exemption/refusal date is invalid.	The IIS returns an ACK with an error indicating the exemption/refusal date is invalid or an RSP is returned without the exemption/refusal date populated.	
The IIS detects the exemption/refusal date is in the future.	The IIS returns an ACK with an error indicating the exemption/refusal date is illogical.	The RSP is not used as a secondary means of measurement for this test.

The IIS detects the exemption/refusal date is before the patient date of birth.	The IIS returns an ACK with an error indicating the exemption/refusal date is illogical.	The RSP is not used as a secondary means of measurement for this test.

Measure 19:

The IIS detects data quality issues with vaccination event record type.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccination event record type is missing.	The IIS returns an ACK with an error indicating the vaccination event record type is missing or an RSP is returned either without the vaccination event record type populated or with a default value of “01” (for historical).	
The IIS detects the vaccination event record type is invalid.	The IIS returns an ACK with an error indicating the vaccination event record type is missing or an RSP is returned either without the vaccination event record type populated or with a default value of “01” (for historical).	

Measure 20:

The IIS detects data quality issues with vaccine funding source.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccine funding source is invalid	The IIS returns an ACK with an error indicating the funding source is invalid or an RSP is returned without the funding source populated.	

Measure 21:

The IIS detects data quality issues with vaccine product.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccine product is missing.	The IIS returns an ACK with an error indicating the vaccine product is missing or an RSP is	

	returned without the vaccine product populated.	
The IIS detects the CVX code is invalid.	The IIS returns an ACK with an error indicating the vaccine product is invalid or an RSP is returned without the vaccine product populated.	
The IIS detects the NDC is invalid.	The IIS returns an ACK with an error indicating the vaccine product is invalid or an RSP is returned without the vaccine product populated.	
The IIS detects the NDC and CVX conflict with each other.	The IIS returns an ACK with an error indicating the NDC and CVX conflict with each other.	The RSP is not used as a secondary means of measurement for this test.

Measure 22:

The IIS detects data quality issues with vaccine manufacturer name.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccine manufacturer name is missing.	The IIS returns an ACK with an error indicating the vaccine manufacturer is missing or an RSP is returned either without the vaccine manufacturer populated or with a default value of “UNK” (for Unknown).	
The IIS detects the vaccine manufacturer name is invalid.	The IIS returns an ACK with an error indicating the vaccine manufacturer is invalid or an RSP is returned either without the vaccine manufacturer populated or with a default value of “UNK” (for Unknown).	

Measure 23:

The IIS detects data quality issues with vaccine expiration date.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccine expiration date is invalid.	The IIS returns an ACK with an error indicating the vaccine expiration date is invalid or an RSP is returned without the	

	vaccine expiration date populated.	

Measure 24:

The IIS detects data quality issues with vaccine event ID.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS detects the vaccine event ID is missing.	The IIS returns an ACK with an error indicating the vaccine event ID is missing or an RSP is returned with the vaccination event.	The field where this is messaged in HL7 is overloaded and can contain either the vaccination event ID or the IIS vaccination event ID. Therefore, this test can't expect an empty response.

Additional Aspects

Measure 25:

The IIS has the ability to map between coding systems.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS will be sent a vaccination event using NDC (and CVX if required by the IIS). Next a query will be submitted for the patient and the RSP from the IIS will be examined to ensure the NDC was mapped to the proper CVX.	The IIS maps the NDC to the proper CVX per the CDC NDC to CVX mapping tables.	This will test an IIS's ability to map, it will not test all NDC to CVX mappings. This will be tested by sending 5 different NDC codes. The IIS must properly map at least one of those to demonstrate the IIS has the ability to map. Full testing of all NDCs is performed in the Testing and Discovery stage of measurement.

Measure 26:

The IIS returns critical information about a previously submitted vaccination event.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS will be sent a vaccination event which represent an expired administration. Next a query will be submitted for the patient and the RSP will be examined.	The IIS returns the expired administration including the expiration date which was submitted.	This is not to imply expiration should only be returned in this situation, but it is critically important to return when it was expired as it shows the dose was ineffective.

The IIS will be sent a vaccination event which represent a partially administered (or sub-potent) vaccination event. Next a query will be submitted for the patient and the RSP will be examined.	The IIS returns the partially administered vaccination event and represents it properly in HL7 (i.e., RXA-20 = PA).	
The IIS will be sent a vaccination event which was a combination vaccine (e.g., Pediarix). Next a query will be submitted for the patient and the RSP will be examined.	The IIS returns one vaccination event (i.e., one RXA) representing the combination vaccine which was initially submitted. That is, the IIS does not break this vaccination event into multiple parts and return the unspecified formulation of each component as its own vaccination event.	

Measure 27:

The IIS returns the consolidated immunization history following an update.

Test Cases

Test Case	Test Case Expectation	Further Details
The IIS will be sent two messages. The second message will be an update of vaccination event information in the first message. Finally, a query will be submitted and the RSP will be examined.	The IIS returns the updated vaccination event information.	This test is not to test vaccine matching/deduplication algorithms. It is to test that updates are applied when a match is very obvious.

Appendix A: Community Resources

The following community resources were referenced during the development of this content area.

MIROW Guides

2008: Data Quality Assurance in IIS – Incoming Data

- https://repository.immregistries.org/resource/data-quality-assurance-in-immunization-information-systems-incoming-data-1/

2013: Data Quality Assurance in IIS – Incoming Data, Selected Aspects

- https://repository.immregistries.org/resource/data-quality-assurance-in-immunization-information-systems-selected-aspects/

2017: Consolidating Demographic Records and Vaccination Event Records

- https://repository.immregistries.org/resource/consolidating-demographic-records-and-vaccination-event-records/

Assessment Steering Committee

2017: IIS Data Quality Practices – Monitoring and Evaluation Data Submissions

- https://repository.immregistries.org/resource/iis-data-quality-practices-monitoring-and-evaluating-data-submissions/

2017: Data Validation Guide – For the IIS Onboarding Process

- https://repository.immregistries.org/resource/data-validation-guide-for-the-iis-onboarding-process/

Standards and Interoperability Steering Committee

2014: HL7 2.5.1 Implementation Guide for Immunization Messaging Release 1.5

- https://repository.immregistries.org/resource/hl7-version-2-5-1-implementation-guide-for-immunization-messaging-release-1-5/

2015: HL7 Version 2.5.1 Implementation Guide for Immunization Messaging Release 1.5 – Addendum

- https://repository.immregistries.org/resource/hl7-version-2-5-1-implementation-guide-for-immunization-messaging-release-1-5-addendum/

2015: Guidance for HL7 Acknowledgement Messages to Support Interoperability

- https://repository.immregistries.org/resource/guidance-for-hl7-acknowledgement-messages-to-support-interoperability/

2017: IIS Functional Guide, Volume 1 – Query and Response

- https://repository.immregistries.org/resource/iis-functional-guide/

2019: IIS Functional Guide, Volume 2 – CDC Endorsed Data Elements

- https://repository.immregistries.org/resource/iis-functional-guide/