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**Texas Department of State
Health Services**

Enhancing Texas IIS with AART Tool: Challenges and Key Improvements

Dr. Prageet Kaang

Texas IIS Interim Director

Immunization Section

Texas Department of State Health Services



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Agenda

- Introduction to Aggregate Analysis Reporting Tool (AART)
- Benefits of AART Tool
- Texas IIS Status on AART Tool
- Enhancements and Fixes
- Lessons Learned

Aggregate Analysis Reporting Tool

- The Aggregate Analysis Reporting Tool (AART) was developed by the American Immunization Registry Association to help evaluate and improve the performance of the Immunization Information Systems across the United States.
- It is an application that compiles and visualizes results and information from community-driven tests and measures related to the Immunization Information System Functional Standards.

Benefits of the AART Tool



Standardized Performance Evaluation: Supports objective and independent evaluation of IIS against national standards including HL7 messaging, transport, and data quality benchmarks.

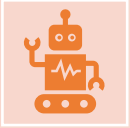


Actionable Data Reports: Provides comprehensive and actionable reports across key testing phases: Testing and Discovery, Assessment, and Validation.



Improved Data Quality & Interoperability: Enables jurisdictions to improve data exchange, improve data accuracy, and ensure more reliable and complete immunization information by aligning with national standards.

Benefits Continued



Customized Technical Assistance: Provides access to tailored guidance to understand Measurement and Improvement outcomes and strengthen system performance.



Benchmarking and Peer Insights: Provides the ability to compare assessment and validation results with other IIS programs and shared best practices.



Leadership Monitoring and Oversight: Built-in dashboards allow IIS managers to easily track validation progress and evaluate overall performance.



Controlled and Secure Access: IIS programs maintain control over their data, with options to securely grant access to authorized users.

Texas IIS and AART Tool



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AART Assessment Content Areas

**Transport
Assessment**

**Query and
Response
Assessment**

**Submission and
Acknowledgement
Assessment**

**Data Quality
Incoming/Outgoing
Assessment**

**Clinical Decision
Support
Assessment**

**Data at
Rest Assessment**

**Patient Matching-
HL7 Submission
Assessment**

**Patient Matching-
HL7 Query
Assessment**

AART Validated Content Areas

Transport

**Query and
Response**

**Submission and
Acknowledgement**

**Data Quality
Incoming/Outgoing**

**Clinical Decision
Support**


Transport

- This content area evaluates how closely systems align with established transport standards, including SOAP-based web services and the CDC Web Services Definition Language (WSDL).
- Texas IIS successfully completed full validation in 2018.

Validation

2025

✔ Complete Validated

 [Compare with my peers](#)

[Basic Validation](#) [Complete Validation](#)

Required for Complete Validation

Transport - Complete

Congratulations! Your IIS has passed all three measures and is now Validated at the Complete Level for Transport.

Your IIS meets the requirements for Complete Validation.


1	The IIS shall implement the Connectivity Test Operation	✔
2	The IIS shall implement the Submit Single Message Operation	✔
3	The IIS shall have the ability to throw a Security Fault	✔

Query and Response

- This content area describes the HL7 Query (QBP) message sent to an IIS and the Response (RSP) messages that the IIS sends back to the requesting system.
- Texas achieved complete validation in 2023.

2025

✔ Complete Validated

 [Compare with my peers](#)

Basic Validation **Complete Validation**

Required for Complete Validation

Query and Response Validation - Complete

Congratulations! Your IIS has passed all seven required measures and is now validated at the Complete Level for Query and Response.

Your IIS meets the requirements for Complete Validation.

1	The IIS processes a query requesting a patients immunization record.	✔
2	The IIS processes a query requesting a patients evaluated immunization record and forecast.	✔
3	The IIS responds to a query for a known patient (one-to-one match).	✔
4	The IIS responds to a query for a patient that is not in the IIS.	✔
6	The IIS responds to a query that has a significant error that cannot be accepted.	✔
7	The IIS responds to a query for a known patient and returns known Core Data Elements.	✔
8	The IIS responds to a query with an RSP within 5 seconds or less for 95% of the queries submitted.	✔

Submission and Acknowledgement

- This section addresses the exchange of submissions and acknowledgment messages with an Immunization Information System.
- A vaccine update (VXU) is an HL7 message that includes patient demographic and vaccination data submitted to an IIS by an electronic health record system (EHR).
- An ACK (acknowledgment) is an HL7 response message returned to the EHR, indicating the processing outcome of the VXU message.

Submission and Acknowledgement Basic

Basic Validation Complete Validation

Required for Basic Validation

Submission and Acknowledgment Validation - Basic

Congratulations! Your IIS has passed the seven basic measures and is now validated at the basic level for Submission and Acknowledgment. But don't stop here. We recommend that you look at the Complete level now.

Your IIS meets the requirements for Basic Validation.

- | | | |
|----|---|---|
| 1 | The IIS processes an administered vaccine for a patient. | ✓ |
| 2 | The IIS processes a historical vaccine for a patient. | ✓ |
| 3 | The IIS processes the submission of a full immunization record for a patient. | ✓ |
| 4 | The IIS processes an update to a previously submitted vaccination event. | ✓ |
| 5 | The IIS processes a delete to a previously submitted vaccination event. | ✓ |
| 6 | The IIS processes a submission where the patient does not give consent (i.e., patient data is protected) to share data. | ✓ |
| 15 | IIS supports NDC 11-digit with hyphens | ✓ |

Submission and Acknowledgement Complete Validation 2024

1	The IIS processes an administered vaccine for a patient.	✓
2	The IIS processes a historical vaccine for a patient.	✓
3	The IIS processes the submission of a full immunization record for a patient.	✓
4	The IIS processes an update to a previously submitted vaccination event.	✓
5	The IIS processes a delete to a previously submitted vaccination event.	✓
6	The IIS processes a submission where the patient does not give consent (i.e., patient data is protected) to share data.	✓
7	The IIS processes a refusal of a vaccination.	✓
8	The IIS processes an adverse event.	✓
9	The IIS processes an observation about a patient which results in a contraindication or immunity to a vaccine preventable disease.	✓
10	The IIS processes messages in accordance with the HL7 2.5.1, release 1.5 guide.	⚠
11	The IIS processes both complete and incomplete/partially administered doses.	✓
12	The IIS responds to a correctly formatted message with no errors.	✓
13	The IIS responds to a submission that has an error.	✓
14	The IIS responds to a submission with an ACK within 5 seconds or less for 95% of the records submitted.	✓
15	IIS supports NDC 11-digit with hyphens	✓
16	IIS supports alternative NDC formats	✗

Data Quality Incoming/Outgoing

- This content area evaluates the IIS's capability to identify data quality issues at the individual message level.
- The IIS will receive messages that intentionally include data quality errors (e.g., vaccination date before date of birth) and is expected to accurately detect these inconsistencies.
- The IIS will also be evaluated on its ability to preserve and return vaccination data from submissions to query without altering the meaning (e.g., correct mapping from NDC to CVX, accurate retrieval of key vaccination event details).

Data Quality Incoming/Outgoing in 2024

Your IIS does not meet the requirements for Basic Validation.

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 administrative sex	✓
5	The IIS detects data quality issues with patient address: state	✓
7	The IIS detects data quality issues with race	✓
8	The IIS detects data quality issues with ethnicity	✓
14	The IIS detects data quality issues with Patient ID and patient ID: type	✓
15	The IIS detects data quality issues with vaccination administration 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	✓
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	✗

Clinical Decision Support (CDS)



This content area focuses on tools that automatically identify the recommended immunizations needed when a patient presents for vaccination.



These recommendations are developed by the Advisory Committee on Immunization Practices (ACIP).



Measures assess an IIS's capability to return three CDS concepts via HL7 messages (Evaluation Status, Earliest Date, and Recommended Date) and the accuracy of those concepts based on patient age.

Clinical Decision Support (CDS)

Required for Basic Validation

Clinical Decision Support Validation - Basic

Your IIS Clinical Decision Support (CDS) report displays differences from ACIP recommendations. Implementers such as EHRs may display inaccurate forecasts due to your IIS not aligning with ACIP recommendations.

Your IIS does not meet the requirements for Basic Validation.


5	Supports Earliest Date	✓
6	Accuracy Peds Earliest Date	✗
7	Accuracy Adol Earliest Date	↕
8	Accuracy Adult Earliest Date	—
9	Supports Recommended Date	✓
10	Accuracy Peds Recommended Date	↕
11	Accuracy Adol Recommended Date	↕
12	Accuracy Adult Recommended Date	—


Issues and Enhancements in 2024 and 2025





Issue 1: Submission and Acknowledgement Basic Validation

- IIS supports alternative NDC forms.
- IIS rejected the test message with NDC 49281-860-78 for Poliovirus Vaccine Inactivated.
- IMR-111: Immunization rejected. 49281-860-78 is an invalid NDC or registry action required.

16.1 IIS supports unit-of-sale NDC 11-digit without hyphens 
The IIS did accept the message

16.2 IIS supports unit-of-use NDC 11-digit without hyphens 
The IIS did accept the message

16.3 IIS supports unit-of-sale NDC 10-digit with hyphens 
The IIS did accept the message






16.4 IIS supports unit-of-use NDC 10-digit with hyphens 
The IIS did not accept this message. This means the IIS does not meet the standard for this measure.

Issue 1: Resolution

- IIS staff identified that the NDC for Poliovirus Vaccine Inactivated was missing in ImmTrac2. The NDC was added in August 2025.
- IIS initiated a project to cross match the ImmTrac2 NDC listing against CDC's list. As part of the analysis, we identified 200+ missing NDCs in the system. While a majority of these are attributed to older flu vaccines, a portion of these were for current pediatric and adult vaccines which were added to the system recently.

Issue 2: Submission and Acknowledgement Complete Validation

- The IIS processes messages in accordance with the HL7 2.5.1, release 1.5 guide.
- Texas IIS deviates on all the five measures in Measure 10 because address is a required field.
- Deviation is acceptable as 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.**

10.1	Message will contain a minimally populated message with 1 administered dose	
	The IIS did accept the message but only if it custom changes were made to the message. This means the IIS deviates from the standard for this measure.	
10.2	Message will contain a minimally populated message with 1 historical dose	
	The IIS did accept the message but only if it custom changes were made to the message. This means the IIS deviates from the standard for this measure.	
10.3	Message will contain a minimally populated message with 1 refusal	
	The IIS did accept the message but only if it custom changes were made to the message. This means the IIS deviates from the standard for this measure.	
10.4	Message will contain a minimally populated message with one adverse event	
	The IIS did accept the message but only if it custom changes were made to the message. This means the IIS deviates from the standard for this measure.	
10.5	Message will contain a minimally populated message with 1 observation	
	The IIS did accept the message but only if it custom changes were made to the message. This means the IIS deviates from the standard for this measure.	

Issue 3: Data Quality Incoming/Ongoing

- The IIS returns critical information about a previously submitted vaccination event.
- **Test Case:** A query was sent for the patient and the RSP from the IIS was examined for the expired administration.
- **Expectation:** Texas IIS returns the expired administration including the expiration date which was submitted.
- **Outcome:** Texas IIS did not respond with the expected segment.

26.1.1	Message will contain an expired vaccination event The IIS did accept the message	✓
26.1.2	Query for patient expired vaccination event The IIS did not respond with the expected segment	✗
26.2.1	Message will contain a partially administered vaccination event The IIS did accept the message	✓
26.2.2	Query for patient partially administered vaccination event The IIS did respond with the expected segment	✓
26.3.1	Message will contain a combination vaccination event The IIS did accept the message	✓
26.3.2	Query for patient combination vaccination event The IIS did respond with the expected segment	✓

Issue 3: Issue

- Texas IIS was not storing the vaccine lot expiration date from the VXU if reported.
- The expiration date was not returned on Query by Parameter (QBP).
- The immunization was being rejected if the incoming immunization had a date of administration after the vaccine lot was expired.

Issue 3: Resolution

- Texas IIS implemented a solution to add a column in the immunization table in the ImmTrac2 database to capture the expiration date in RXA-16.
- IIS would return a warning error if the incoming immunization vaccine lot was expired instead of rejecting the vaccine.
- As a result of this implementation:
 - ImmTrac2 began capturing the expiration date from the VXU
 - Storing it in the newly added column in the database
 - Returning it in the QBP response

Data on Expiration Date

- This demonstrates meaningful progress towards improving vaccine traceability, inventory management, and data completeness across reporting providers.
- ~12 K immunizations where immunization date is after the lot expiration date.

Date Vaccine Reported	Imms Reported with Expiration Date
2021	29,809
2022	32,550
2023	76,134
2024 (Column Added)	6,282,506
2025	12,899,865
2026	3,302,633

Issue 4: Data Quality Incoming/Ongoing

- The IIS returns the consolidated immunization history following updates or deletes.
- **Case Description:** Two messages are sent. The second message is an update to the vaccination event in the first message.
- **Test Case Expectation:** The IIS responds with an ACK indicating it has accepted the message.
- **Test Case Outcome:** The IIS did not accept the message.

27.1.1	Two messages - first message vaccination event The IIS did accept the message	✓
27.1.2	Two messages - second message updates vaccination event The IIS did not accept the message	✗
27.1.3	Query for updated vaccination event - #1 The IIS did not respond with the expected segment	✗
27.1.4	Query for updated vaccination event - #2 The IIS did not respond without sending a specific segment	✗

Resolution: Issue 4

- The first VXU in the test case had a CVX code of 45, while the second submission which was sent as an update had a CVX code of 8. Both VXUs were historical.
- Texas IIS did not update the existing immunization after the update was submitted because of a logic restriction where the update requires the CVX/NDC or CPT code to be the same as the first submission.
- Fix was implemented to update the existing vaccine if the CVX codes:
 - Same administration date, same vaccine group, same administering notes
 - NOS dose replaced with a more specific code

AIRA TAB: Scenarios for Updates and Queries

- If any of the **identifying** vaccination record fields change, then the change must be submitted as a delete followed by an add. This ensures the IIS can properly reconcile the vaccination record.
- Identifying vaccination record fields:
 - RXA-3 (date of administration),
 - RXA-5 (CVX/admin code),
 - RXA-9 (administered/historical indicator),
 - RXA-11.4 (administered at location)
- A simple update is only appropriate when modifying non-identifying fields such as lot number, manufacturer, route, etc. The guidance is designed to give the best chance of avoiding duplicates, but IIS implementers can still decide how strictly to enforce it <https://repository.immregistries.org/resource/tab-resources/>.

Issue 5: Data Quality Incoming/Ongoing

- **Case Description:** A query is sent with the same name, date of birth, gender, and MRN used in the submission message.
- **Case Expectation:** The IIS returns the immunization history event information.
- **Case Outcome:** The IIS did not respond with the expected segment.
- Not a match, value in RXA-5.1
- '45' <> '08'

27.1.1	Two messages - first message vaccination event The IIS did accept the message	✓
27.1.2	Two messages - second message updates vaccination event The IIS did not accept the message	✗
27.1.3	Query for updated vaccination event - #1 The IIS did not respond with the expected segment	✗
27.1.4	Query for updated vaccination event - #2 The IIS did not respond without sending a specific segment	✗

Issue 6: Data Quality Incoming/Ongoing

- **Case Description:** A query is sent with the same name, date of birth, gender, and MRN used in the submission message.
- **Case Expectation:** The IIS does NOT return the original vaccination event information proving the record was consolidated and not duplicated.
- **Case Outcome:** The IIS did not respond with the expected segment.

27.1.1	Two messages - first message vaccination event The IIS did accept the message	✓
27.1.2	Two messages - second message updates vaccination event The IIS did not accept the message	✗
27.1.3	Query for updated vaccination event - #1 The IIS did not respond with the expected segment	✗
27.1.4	Query for updated vaccination event - #2 The IIS did not respond without sending a specific segment	✗

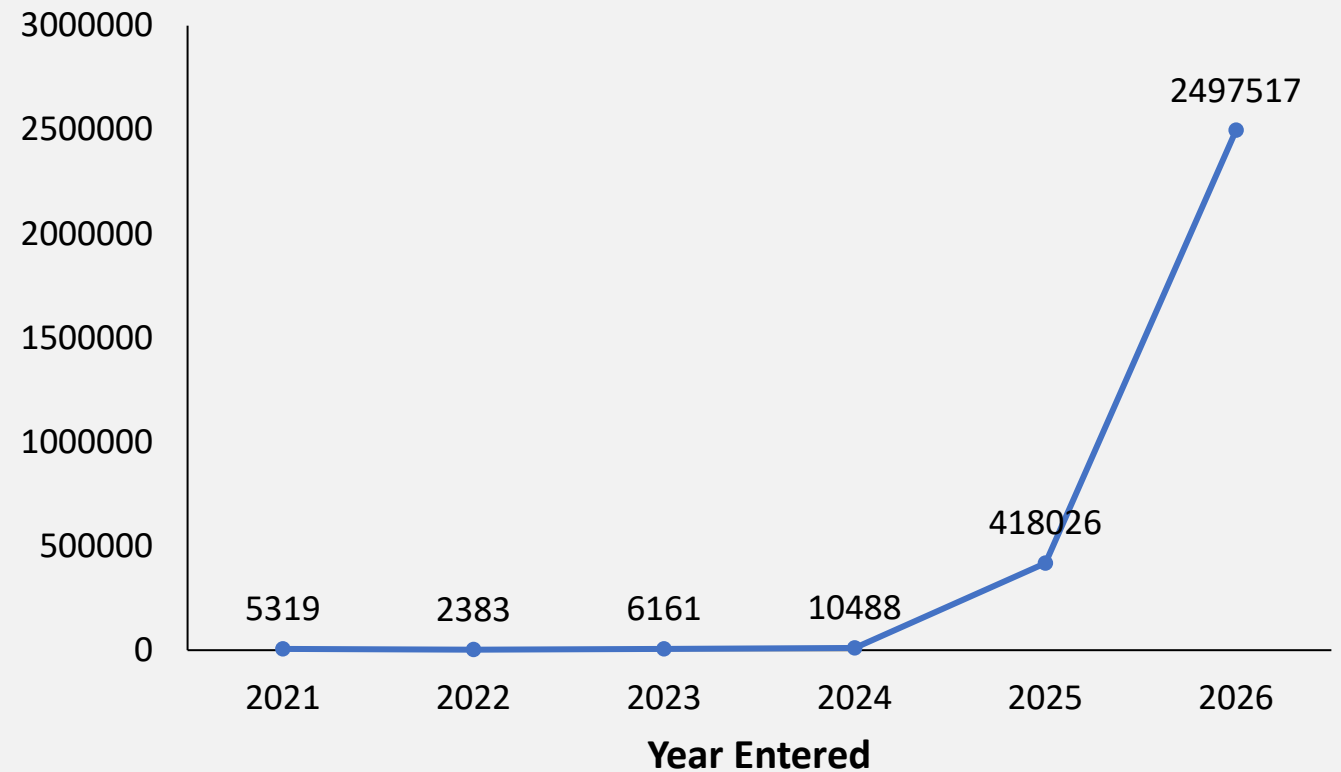
Resolution of Issue 5 and 6

- The resolution of issue 4 allowed the CVX code to change from 45 to 08 for the existing vaccine.
- As a result of the above fix:
 - On QBP, the system responded with the correct immunization history
 - On QBP, the correct vaccine CVX code was returned (08 instead of 45)


Data at Rest- Vaccine Funding Source Adoption

- In December 2025, Texas added the column to accept reporting of Vaccine Funding Source to achieve completeness on the field on the Data at Rest Assessment.
- Implemented backend validations to ensure compliance between vaccine eligibility codes and vaccine funding codes.

Immunizations by Year Entered



Complete Validations in 4/5 Content Areas


 Aggregate Analysis Reporting Tool


TX ImmTrac2 ▾

- Validation
- Assessment
- Testing & Discovery







My Peers

More AART Info

 Settings

 Logout

TX ImmTrac2 Validation Summary

 Transport Validation Complete Validation - 2025 Download Validation Certificate Your system passes 3 of 3 measures with all requirements	 Submission and Acknowledgment Validation Complete Validation with Minor Differences - 2025 Download Validation Certificate Your system passes 15 of 16 measures with minor differences from standard.	 Query and Response Validation Complete Validation - 2025 Download Validation Certificate Your system passes 7 of 7 measures with all requirements	 Data Quality Incoming/Ongoing Validation Complete Validation - 2025 Download Validation Certificate Your system passes 27 of 27 measures with all requirements
 Clinical Decision Support Validation Validation not met for 2025 Your system has major differences from the national standard.	DAR Assessment 38 of 45 2026 		

Lessons Learned

- AART Validation helped identify gaps that directly informed targeted system enhancements, resulting in measurable improvements to data quality, interoperability and IIS functionality.
- Incomplete Code sets can cause message rejections and data loss, or incorrect query responses highlighting the importance of proactive standard alignment.
- While national HL7 and AART standards provide a foundation, jurisdictions must sometimes deviate to support local business rules and policy.
- Close coordination between IIS staff, AIRA team was key to diagnosing issues quickly and implementing effective solutions.

Resources

- Aggregate Analysis and Reporting Tool: [AART](#)
- AART guides: <https://repository.immregistries.org/resource/aggregate-analysis-reporting-tool-aart-quick-guides/>
- Technical Advisory Bulletins (TAB) Resources: <https://repository.immregistries.org/resource/tab-resources/>
- CDC HL7 Implementation: Guide: <https://www.cdc.gov/iis/technical-guidance/hl7.html>
- CDC Code Sets: <https://www2a.cdc.gov/vaccines/iis/iisstandards/vaccines.asp?rpt=ndc>

Thank You

Texas Immunization Registry (ImmTrac2)

ImmTracMu@dshs.texas.gov



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