Consolidating Demographic Records and Vaccination Event Records

MIROW: Helping IIS Keep Pace with Evolving Health Initiatives and Technology

In 2005, the American Immunization Registry Association (AIRA) formed the Modeling of Immunization Registry Operations Workgroup (MIROW) to identify areas for improvement in IIS operations and develop best practice recommendations. MIROW regularly assembles workgroups of subject matter experts from the immunization information system (IIS) community to examine, discuss, and develop consensus-based best practices for IIS operations.

The guide presents best practice recommendations for a fundamental function of the immunization information system (IIS)—consolidating information from various sources. Best practice recommendations support IIS Functional Standards (2013–2017) and IIS Functional Standard 1.3 (2018–2022), which states: "The IIS contains a complete consolidated demographic record and vaccination history for every child, adolescent and adult participating in the IIS and currently residing in the jurisdiction." The guide provides recommendations for both demographic records and vaccination event records and is a step toward the alignment of consolidating practices across IIS.

Relevance of consolidating records

Consolidating information about the patient or vaccination event from different sources, as well as information from multiple reports by the same source, leads to a more accurate and complete reflection of reality in the IIS. Likewise, consolidation of records helps maintain data quality within the IIS and allows for accurate evaluation of population- and vaccination-based assessments of a specified area. Immunization provider organizations rely heavily on these consolidated records for clinical decision support when providing services to their patients. This guide offers best practice recommendations to support IIS staff to implement and sustain the consolidating records functionality.

Overview of consolidating records process

The consolidating records process begins when two records are identified as matched records during deduplication. Matched records are two records that represent the same patient or the same vaccination event. Information from the two matched records should be combined into one consolidated record. Once two records are matched, the best values for each data element will be selected to form a consolidated record.

Foundational principles for consolidating records include:

- The essence of consolidation is to select the best value for each data element from all available data sources. An IIS achieves this by comparing values from separate records for a single data element and selecting the better of the values. Via this process, an IIS distills and retains the best information in the consolidated record.

- The act of consolidation will create a new record or update an existing record.

- The functionality of consolidation relies on the accessibility within the IIS of certain original information submitted to an IIS by immunization providers and other data sources. Those data are vital for ongoing consolidation and for fixing incorrectly merged records.

The guidelines provide recommendations using:

• A step-by-step description of the consolidating records process

• 13 principles (high-level business rules that help to capture institutional knowledge and to guide the development of more specific business rules)

• 69 business rules (representing specific requirements and decision-making logic for IIS processes and operations)

• 3 decision tables

• 20 operational scenarios

In addition, the recommendations provide implementation considerations that discuss education about the record consolidation processes, methods of updating records, IIS resources, provider profiles, data quality, data validation, vaccination action code concepts, data type definitions in HL7 compared to definitions in the guide, and the administered/historical indicator.

Replacement of a portion of the MIROW 2006 Vaccine Deduplication Guidelines

The guide acts as a replacement for Chapter 5: Resolution Phase and Appendix B in the *MIROW 2006 Vaccine Deduplication Guidelines*. The 2006 guidelines recommended that IIS create two records for each vaccination event: a "best record" for clinical purposes and a consolidated record for both clinical and public health purposes. Due to changes in the health care landscape and technical advancements in the past 10 years, the current perspective is that providers should use an electronic health record (EHR) to maintain a clinical record for a patient. An IIS should take advantage of its role as the repository of records from many data sources to create the most robust and comprehensive record possible via consolidation. The guide recommends the use of a single consolidated demographic record and a single consolidated vaccination event record for all IIS functions, including clinical decision support, query response, reminder/recall, Vaccines for Children program activities, coverage assessment reports, and for viewing via direct user interface (UI). Consolidation can also provide a more complete record for patient use (i.e., consumer access).

Key outcomes and recommendations

The guidelines discuss key concepts and terms for consolidating records, including:

CATEGORIES OF RECORDS

There are three categories of records discussed in the guide:

• Demographic record: A group of related data elements that represent information about a patient.

• Vaccination event record: A group of related data elements that represent information about a vaccination event.

• Patient record: A combination of a demographic record for a patient and vaccination event record(s) for that patient. Each patient record contains one demographic record and zero, one, or more vaccination event records.

DATA ELEMENT, VALUE, DATA GROUP, AND DATA SOURCE

A data element is the general term for a component of a record. A value is the specific information submitted for that data element. Certain data elements are grouped together and treated as a unit (i.e., data group) in which the value for each data element must come from the same data source. Data sources may include vital statistics, birthing hospitals, immunization providers, billing records, claims (e.g., Medicaid), schools, and health plans. Since trust in a specific data source varies between jurisdictions, each IIS should use its knowledge of local considerations to set business rules that reflect the confidence level in various data sources.

BASIC CONSOLIDATION OPTIONS

Consolidation of two existing records in an IIS results in either a new record or an update of an existing record.

- When an incoming record is matched to an existing record (demographic or vaccination event records) the existing record is updated with the value(s) from the incoming record that is determined to be "better."

- When two existing records (demographic or vaccination event records) in the IIS are determined to be matching records, consolidation can be accomplished in two different ways that are both equally acceptable.

  — The IIS creates a new record with a new IIS ID (i.e., IIS patient ID or IIS vaccination event ID) and stores a history of both IIS IDs for the two matched records in the new consolidated record.

  — The IIS selects either of the existing records to be updated with information from the other record and stores the IIS ID for the other existing record in history.

UNMERGING AND TRACEABILITY

Occasionally two records will be erroneously matched and consolidated when the records truly represent different patients or vaccination events. When it is determined that two records were incorrectly consolidated, the IIS should be able to unmerge a consolidated record. To facilitate unmerging, the "best" practice is for an IIS to store all incoming records; however, it is a "good" practice for an IIS to be able to access sufficient information about the data source for each data element to facilitate unmerging.
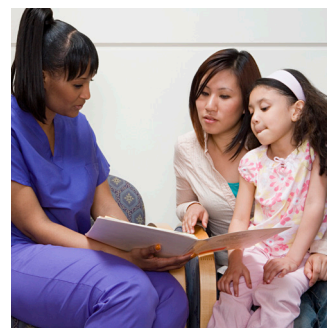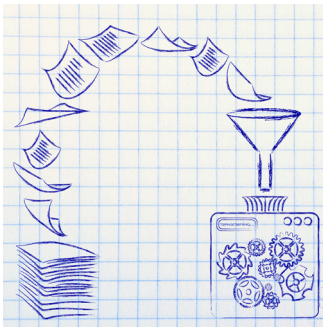
Consolidating Records Processes

The consolidating records process compares two matched records, one data element at a time, to determine the best value for each data element for inclusion in a consolidated record. One of the records is used as a base record to update with information from another record.
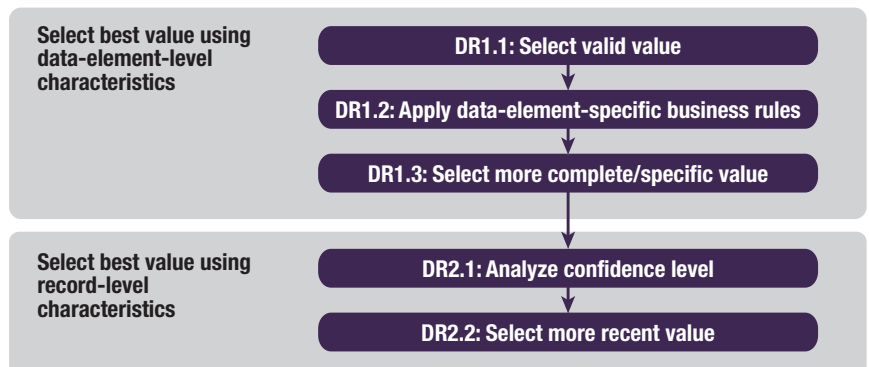
DEMOGRAPHIC RECORD PROCESS

The consolidating records process starts when the same data element (e.g., first name) from two records is selected for comparison.

- First, data-element-level business rules are applied.
  - The best value for a data element is selected based on whether the values being compared are valid, invalid, or empty, as well as whether the values are the same or different and required or not required.
  - Next, data-element-specific rules are applied to choose the best value. One such rule is that records from vital statistics are a definitive data source for the values of some data elements.
  - If the best value is not selected with data-element-level business rules, the more complete/specific value is selected for consolidation.
- Second, if a best value cannot be identified using data-element-level business rules, record-level characteristics (i.e., confidence level and recency) are used to identify the appropriate value.
- Finally, if the best value still has not been identified, the IIS should use locally developed policies to determine how to select a value.

Once a value has been selected for use in the consolidated demographic record, the process ends for that data element. This process is repeated for each data element being consolidated.

The following diagram presents the simplified process of consolidating data elements for a demographic record.

Select best value using data-element-level characteristics	**DR1.1: Select valid value**
	↓
	DR1.2: Apply data-element-specific business rules
	↓
	DR1.3: Select more complete/specific value

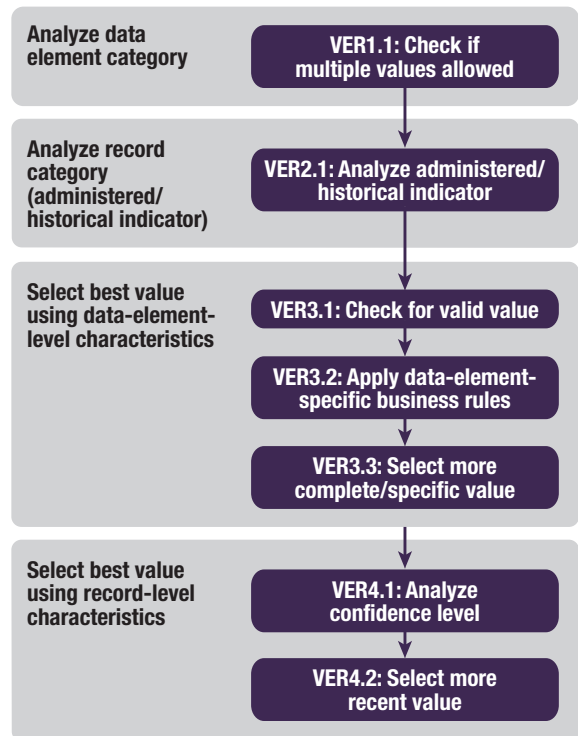| Select best value using record-level characteristics	**DR2.1: Analyze confidence level**
	↓
	DR2.2: Select more recent value

VACCINATION EVENT RECORD PROCESS

The consolidating records process starts when the same data element (e.g., vaccine lot number) from two records is selected for comparison. Once a value has been selected for use in the consolidated vaccination event record, the process ends for that data element. This process is repeated for each vaccination event data element being consolidated.

- First, data-element-level business rules are applied.
  - If multiple values are allowed for the data element, then all unique values are selected for the consolidated vaccination event record.
  - Next, the process analyzes the vaccination event records based on the values of the administered/historical indicator. If the administered/historical indicator for one of the records is administered and for another record is historical, then the value of the data element from the administered record is selected.
  - During the next step, the best value for a data element is selected based on whether the data elements being compared are valid, invalid, or empty, as well as whether the values are the same or different and required or not required.
  - The final steps in the data-element-level business rules select the more complete/specific value of the data element for consolidation.

- Second, if a best value cannot be identified using data-element-level business rules, record-level characteristics (i.e., confidence level and recency) are used to identify the appropriate value.

- Finally, if the best value still has not been identified, the IIS should use locally developed policies to determine how to select a value.

The following diagram presents the simplified process of consolidating data elements for a vaccination event record.

Analyze data element category	**VER1.1: Check if multiple values allowed**
Analyze record category (administered/ historical indicator)	**VER2.1: Analyze administered/ historical indicator**
Select best value using data-element-level characteristics	**VER3.1: Check for valid value**
	VER3.2: Apply data-element-specific business rules
	VER3.3: Select more complete/specific value
Select best value using record-level characteristics	**VER4.1: Analyze confidence level**
	VER4.2: Select more recent value

Principles

A principle (P) is a high-level business rule. It provides a high-level direction that helps capture institutional knowledge and guides the development of more specific business rules that represent specific requirements and decision-making logic for IIS processes and operations. The following are some of the identified principles.

P#	DESCRIPTION
P01	The IIS should create a single consolidated demographic record for each patient and a single consolidated vaccination event record for each vaccination event.
P02	A consolidated record should be used for all IIS functions.
P03	Original information should be accessible by an IIS.
P04	Consolidation should result in either a new record or an updated base record.
P05	The best value for each data element from all available data sources should be selected for a consolidated record.
P08	A confidence ranking for data sources should be established and used by the IIS.

Business Rules

In contrast to principles, business rules (BR) represent specific requirements and decision-making logic for IIS processes and operations. The following are summaries of some key business rules.

BR#	DESCRIPTION
Demographic records	
BR201, BR202, BR203, BR204	The IIS should make accessible information needed to make consolidation decisions.
BR501	Valid values should be used over invalid values.
BR601	Vital statistics is a definitive source for certain demographic data elements.
BR702	If a data element allows for multiple values, then both values should be selected for the consolidated record.
BR801, BR802	The most complete/specific data element should be selected.
BR901, BR902, BR903	If the best value cannot be selected based on data-element-level business rules, then record-level characteristics (i.e., confidence level and recency) should be used to select the best value for each data element.
Vaccination event records	
BR5101	The IIS should make accessible information needed to make consolidation decisions.
BR5102	The IIS should ensure that the administered/historical indicator contains a valid value.
BR5301, BR5302	If a data element allows for multiple values, then both values should be selected for the consolidated record.
BR5401	If one of the vaccination event records is an administered record and one is a historical record, the value from the administered record should be chosen for a consolidated record.
BR5501	A valid value for a data element or data group should be used over an invalid value.
BR5601, BR5602	The most complete/specific data element should be selected.
BR5701, BR5702, BR5703	If the best value cannot be selected based on data-element-level business rules, then record-level characteristics (i.e., confidence level and recency) are used to select the best value for each data element.

Operational Scenarios

Operational scenarios can help the reader test and explore the best practice recommendations through real situations. The following represent a few key scenarios outlined in the full best practice guidelines.

SCENARIO	DESCRIPTION
Demographic records	
S103, S104, S106	Patient first name: valid and invalid values, recency of submission
S108, S109	Patient last name: vital statistics compared to provider submission
S105, S110	Address: same type, vital statistics compared to provider submission
S111	Patient date of birth: vital statistics compared to provider submission
Vaccination event records	
S1103	Multiple values permitted
S1104	Administered compared to historical vaccination event record
S1106	Two historical vaccination event records: valid and invalid values
S1108, S1109	Delete code

Implementation Considerations

The guide presents key implementation considerations that are important to understand prior to implementing the consolidating records process.

Overarching concepts include:

- Importance of provider education about the impact of consolidating records on IIS functions and the value of consolidating records.

- Applicability of business rules to all methods of updating records (i.e., UI and electronic submissions).

- Dedication of sufficient IIS resources and staff time to the consolidating records process.

Data quality issues that impact consolidating records include:

- Reliable information about data source type and provider profiles allows for a more specific input in determining confidence level for a record.

- Regular data validation on incoming and existing data supports high data quality and can be mutually symbiotic with the consolidating records process. The consolidating records process should not result in overwriting validated data.

Health Level Seven (HL7) messaging issues that impact consolidating records include:

- An action code in an HL7 message allows the submitter to indicate the desired action to be taken on individual vaccination events. All IIS should have the capability to accept action codes. However, standards for use of action codes are limited. An IIS should apply additional validation rules before automatically assuming these codes are correct.

- The vaccination event consolidating records process relies heavily on the use of the administered/historical indicator. The field is often empty or the IIS may know that the value is incorrect. As a good practice, an IIS should consistently determine the value of the administered/historical indicator based on local considerations.

- Address information is complex because it can have six or more data elements (e.g., street, other designation such as PO Box, city, state, zip code, country, and county of residence) to make up just one address. In addition, different types of addresses can be submitted via an HL7 message for one patient. When comparing data elements from different records, it is important that the IIS compare the same data elements of the same address type.

Learn more about consolidating records

This mini guide provides an overview of the in-depth, technical information related to these best practices found in the full best practice guide. To download, visit the AIRA website at: http://www.immregistries.org/resources/aira-mirow.

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