

North Dakota Immunization Information System (NDIIS)
Data Exchange Messaging Guide

Release 1.0

November 16, 2010

This guide provides a high level description of the electronic data exchange bi-directional messaging process used in the North Dakota Immunization System (NDIIS). The system is based on the CDC/AIRA HL7 Version 2.5.1 Implementation Guide: Immunization Messaging, Release 1.0. This target audience for this guide is management and other non-technical personnel. The information is contained in appendix A and B in this document.

Appendix A. This appendix contains Chapters 1 and 2 from the CDC/AIRA Version 2.5.1 Implementation Guide. Chapter 1 contains an introduction to electronic messaging. Chapter 2 contains descriptions of the data exchange process.

Appendix B. This appendix contains a matrix that defines data usage for required and conditional data fields in the HL7 messages.

A separate NDIIS HL7 Transfer Specification document has been created based on the CDC/AIRA Guide. This specification document provides the technical information needed to interface with the NDIIS messaging system, including user-defined data.

APPENDIX A.

Introduction to electronic messaging and the data exchange process.

1. Introduction

Immunization Information Systems (IIS) are centralized population based repositories of immunization related information. They receive and share data on individual clients/patients with a number of other systems, including Electronic Health Record systems (EHR-S). Health Level Seven (HL7) is a nationally recognized standard for electronic data exchange between systems housing health care data. The HL7 standard is a key factor that supports this two-way exchange of information because it defines a syntax or grammar for formulating the messages that carry this information. It further describes a standard vocabulary that is used in these messages. It does not depend on specific software, that is, it is platform independent.

This document represents the collaborative effort of the American Immunization Registry Association (AIRA) and the Centers for Disease Control and Prevention (CDC) to improve inter-system communication of immunization records. This implementation guide will replace the existing *Implementation Guide for Immunization Data Transaction Using Version 2.3.1 of the HL7 Standard Protocol*, and will be based on HL7 Version 2.5.1, as published by the HL7 organization (www.hl7.org). The existing 2.3.1 Guide has a number of successful implementations that exchange messages with other IIS and EHR-S. The experience of these implementations has identified a number of areas of the existing Guide that would benefit from an update of the Guide.

As HL7 has developed and published new versions of the standard, it has sought to maximize the ability of implementations, based on newer versions to be able to accept messages from earlier versions. Based on this, we anticipate that faithful implementations of this Guide will be able to accept most immunization messages based on the 2.3.1 Guide. Note that variations in current 2.3.1 interfaces increase the risk that faithful 2.5.1 implementations will encounter problems with 2.3.1 messages. The benefits from moving to 2.5.1 should encourage migration to this standard.

Implementations that are supporting Version 2.3.1 messages should continue to follow the specifications of 2.3.1 messages described in the Implementation Guide Version 2.2, June 2006.

Intended Audience

This Guide has two audiences. The first is the system managers that must understand this process at a high level. The second is the technical group from IIS and EHR-S that must implement these guidelines. For them we strive for an unambiguous specification for creating and interpreting messages. Our goal is for this Guide to be a bridge between the two.

It is important to note that HL7 specifies the interface between 2 systems. It does not specify how any given system is implemented to accomplish the goals of messaging.

Scope

This Guide is intended to facilitate the exchange of immunization records between different systems¹. This includes

- sending and receiving immunization histories for individuals
- sending and receiving demographic information about the individuals
- requesting immunization histories for individuals
- responding to requests for immunization histories by returning immunization histories
- acknowledging receipt of immunization histories and requests for immunization histories
- reporting errors in the messaging process
- sending observations about an immunization event (this may include funding, reactions, forecasts and evaluations).

The Guide is not intended to specify other issues such as

- business rules, which are not implicit in HL7, applied when creating a message
- business rules, which are not implicit in HL7, applied when processing a received message
- the standard transport layer
- search process used when responding to a query
- business rules used to deduplicate clients or events
- management of vaccine inventory
- maintenance of Master Person Index.²

Local implementations are responsible for the important issues described above. One way to insure success is to publish a local profile or implementation guide that outlines the local business rules and processes. These guides may further constrain this Guide, but may not contradict it. This Guide will identify some of the key issues that should be addressed in local profiles.

The Guide is meant to support and integrate with standards harmonization efforts. These efforts include the Health Information Standards Panel (HITSP), HITSP has selected a number of items which support interoperability between health systems. Among these is selection of preferred vocabulary. This Guide will adopt these standard vocabularies as they apply. Another effort, which promotes standards harmonization, is

¹ The exchange partners could be IIS, EHR-S. or other health data systems.

² Note that requesting an immunization history may require interaction with an MPI or other identity source. Those using these services should consult with profiles or implementation guides that support this. Integrating the Healthcare Enterprise (IHE) has profiles that support MPI maintenance and identity resolution.

an organization called Integrating the Healthcare Enterprise (IHE)³. They produce profiles, which define how to accomplish various goals with common components.

This Guide makes the following assumptions:

- Infrastructure is in place to allow accurate and secure information exchange between information systems.⁴
- Providers access immunization information through either an EHR-S or immunization information system (IIS).
- Privacy and security has been implemented at an appropriate level.
- Legal and governance issues regarding data access authorizations, data ownership and data use are outside the scope of this document.
- The immunization record and demographic record for each patient contains sufficient information for the sending system to construct the immunization and demographic message properly.
- External business rules are assumed to be documented locally.

It is important to be able to accept complete immunization histories from different sources and have a method for integrating them. This implies that a system should not assume that any record sent is “new”. If the system makes this assumption and receives a complete history that has overlapping immunization records, there is a risk for duplicate records.

There is “best practice” guidance on handling this from the American Immunization Registry Association (AIRA) in the Modeling Immunization Registry Operations Workgroup (MIROW) documents available the AIRA website. (immregistries.org)

Organization and Flow

The first two chapters are meant to lay out what can be done and why. The chapters that follow them describe and specify how. They start at the most granular level and proceed to the message level. Several appendices support implementers with value sets and examples of use.

Boxed notes are used to call attention to areas where there are changes from the version 2.3.1 Implementation Guide or areas where readers should pay special attention.

³ IHE is an industry-supported group, which creates implementable specifications, based on existing standards, to support accomplishment of selected use cases.

⁴ This infrastructure is not specified in this document, but is a critical element to successful messaging. Trading partners must select a methodology and should specify how it is used.

Chapter 1-Introduction

This chapter describes the scope of the Guide and gives supporting background. It includes a description of the diagrams that will be used to illustrate business processes and transactions.

Chapter 2-Actors, Goals and Messaging Transactions

Chapter 2 describes the business motivations that this Guide will support. It will describe the entities (actors) that will rely on the messages. It will lay out the transactions that will support the goals of these actors (use cases). Finally, it will describe the broader context that this messaging occurs in. There are supporting business processes outside of the actual messaging that are keys to success.

Chapter 3-Messaging infrastructure

Chapter 3 focuses on the underlying rules and concepts that are the basis for HL7 messaging. It will illustrate the components of messages, the grammatical rules for specifying the components and subcomponents.

Chapter 4_Data-type Definitions

This chapter will describe and specify all data types anticipated for use by the messages supported by this Guide. Where there are subcomponents to a data type, it will specify any rules related to use. The values used in messages are specified in appendix A. Data types are the building block for segments, described in the next chapter.

Chapter 5-Message Segments

Chapter 5 gives specifications for message segments. Segments are units of the message that carry specific types of information. For instance PID carries patient identifying information. The segments included in this chapter are those that are needed by the messages specified in Chapter 6.

Chapter 6- Message Details for Immunization

Chapter 6 specifies how to use the building blocks of data types and segments to meet the business needs to convey immunization records. It will include specification for requesting an immunization history and acknowledging message receipt or errors.

Chapter 7- Query Profile for Requesting an Immunization History.

HL7 has a template for specifying a query. This chapter uses that template to give the specifications for a query requesting an Immunization History. It is built on the previous 4 chapters. Two child profiles, which support response to the query, are also found in this chapter.

Appendix A-Code Tables

This appendix lists expected values for all coded data elements used in this Guide.

Appendix B- Message examples

This appendix will show detailed examples of how to implement the messages specified in the body of the Implementation Guide.

Introduction to Diagrams and Models

This document makes use of models or diagrams to illustrate the transactions and their components. These include Use Case model, Sequence Diagram and Activity Diagram. These are based on the Unified Modeling Language (UML). The illustrations below are examples only. Detailed models will be found in the appropriate sections later in the document.

Actor and Use Case Diagrams and Tables

Actors are information systems or components of information systems that produce, manage, or act on categories of information required by operational activities in the enterprise. In our context, **use cases** are tasks or goals that actors use to communicate the required information through standards-based messages. The diagrams and tables of actors and transactions in subsequent sections indicate which transactions each actor performs.

The use cases shown on the diagrams are identified by their name. Supporting text will define the goal of a use case. The actors associated with each use case will be included and show their relationship. The diagram below shows 2 actors that use the Send Immunization History Use Case. In this use case we see that both IIS and EHR-S use the *Send Immunization History* use case. It does not imply that the IIS sends an immunization history to an EHR-S.

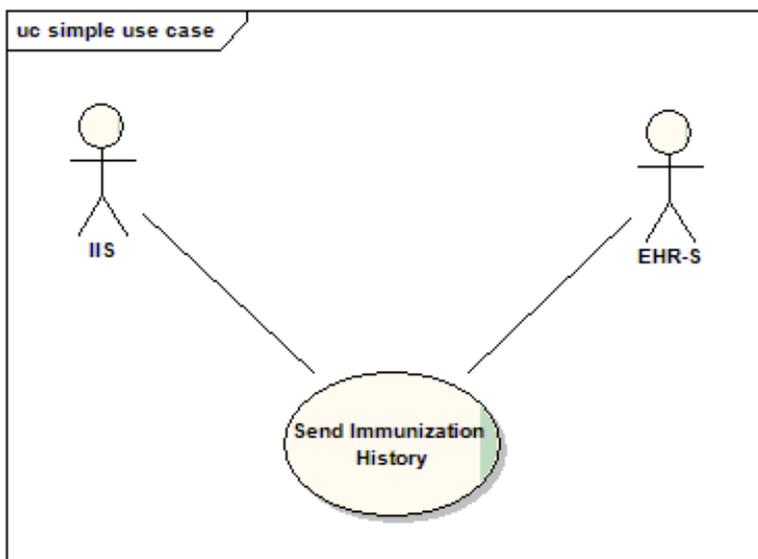


Figure 1-1 Simple Use Case Diagram

Sequence Diagrams

The descriptions of the use cases that follow include sequence diagrams that illustrate how the use case is accomplished as a sequence of transactions between relevant actors.

These diagrams are intended to provide an overview so the transactions can be seen in the context of the participating institution's workflows. These diagrams are not intended to present the only possible scenario, just those required to accomplish the goals of communicating between information systems.

In some cases the sequence of transactions may be flexible. Where this is the case there will generally be a note pointing out the possibility of variations. Transactions are shown as arrows oriented according to the flow of the primary information handled by the transaction. In the diagram below we see that one system (it could be IIS or EHR-S) sends an immunization record to another system. The message sent is a VXU (Unsolicited Update of Immunization Record). The receiver processes the message and sends an acknowledgment of the receipt. The processing is not part of the messaging and may vary from application to application. The acknowledgement could be as simple as "I got it, all is OK" or "The message has errors and I can't accept it"

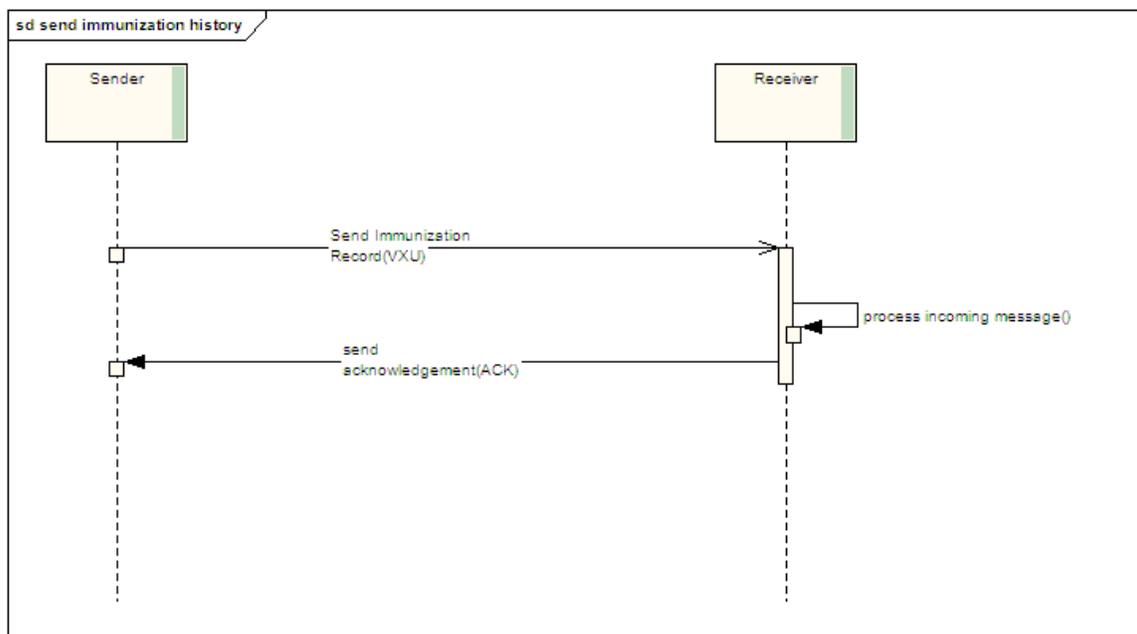


Figure 1-2-Simple Sequence Diagram

Activity Diagrams

Activity diagrams are another way of showing what is happening within systems and between systems. They are most useful for showing the decision logic used. The diagram includes “swim-lanes”, which separate the tasks of cooperating systems. The purpose of the following diagram is to illustrate the components of an activity diagram, not to design a system.

In this case, the sending system sends a VXU. The receiving system parses the message and decides what to do with it. We assume that parsing was successful to simplify this diagram. There are a number of decisions that are made and each leads to an action or actions. The diamonds represent decision points. In the first decision point, the system branches follows different paths, depending on the results of the client search. If no matches are found, it follows its local process for integrating a new record into the data base. If a lower confidence match is found (for instance, more than one client matches the incoming record) it follows local business rules for the situation. If a high confidence match is found, it follows local business rules for merging the incoming data into an existing client record. All actions then move to acknowledge the results of the activity.

The actual activity of a real system may be very different from this.

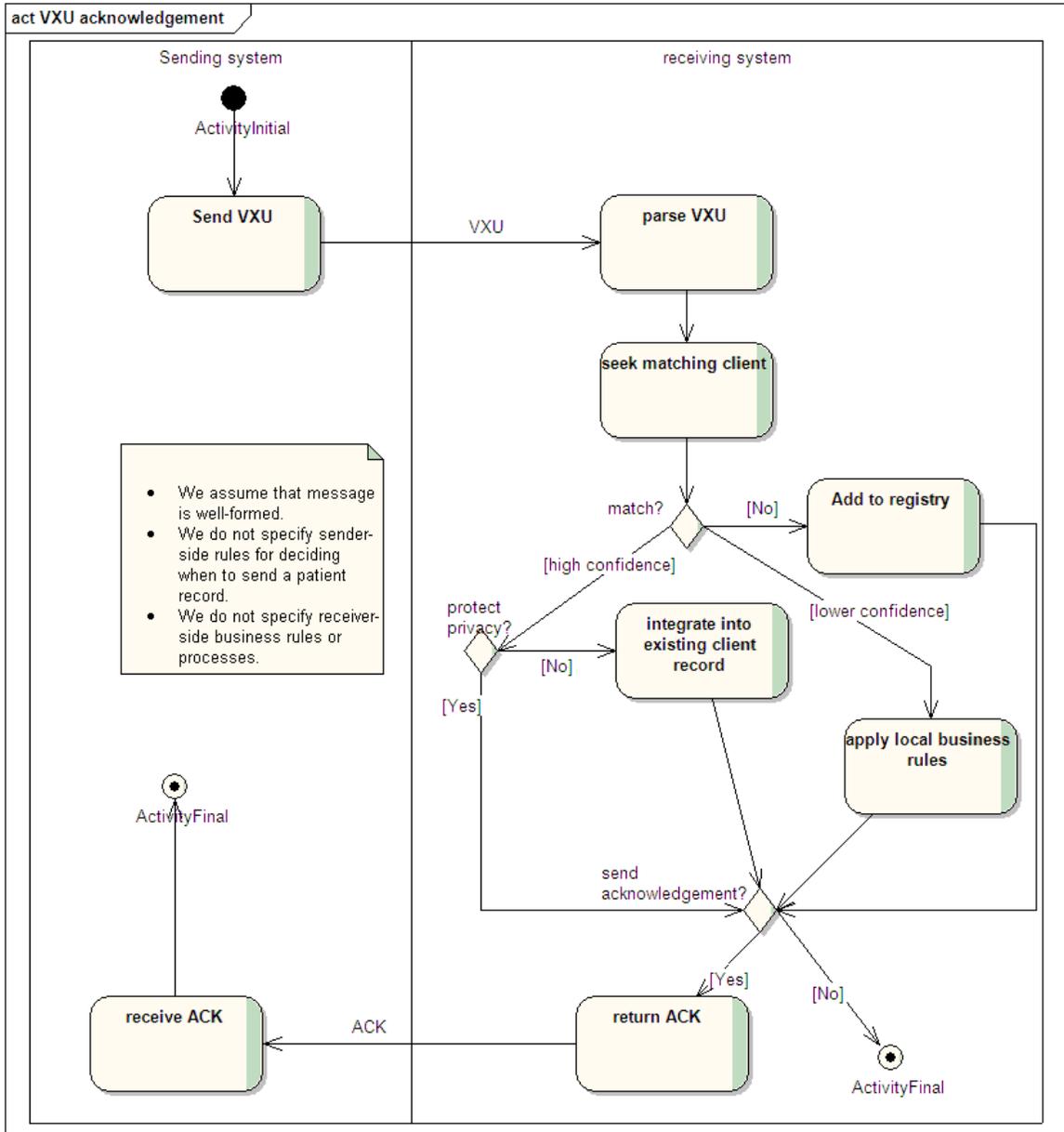


Figure 1-3 Simple Activity Diagram

Note that the focus of this guide is on the format and grammar of the messages between systems. The activities shown within a system are intended to put the message in context and to highlight the local responsibilities for successful messaging.

2. Actors, Goals, and Messaging Transactions

This chapter will describe the actors (entities) that may be involved in sending or receiving immunization-related messages. It will list and describe the use cases (goals) that they have that can be met by the messages. It will illustrate the messaging interface in context. Finally, it will associate specific HL7 messages with these goals.

Note that there are a number of supporting processes that are not included within the messaging specifications. They are vital to success, but do not belong in this Implementation Guide, but rather in local business rules documentation.

Actors and Goals

There are a number of primary actors involved in data exchange. These include

- Immunization Information System (IIS)
- Electronic Health Record Systems (EHR-S) and other systems⁵
- An actor with a supporting role may be a Master Person Index (MPI)⁶.

We will focus on the first 2 actors but will illustrate how the MPI actor may be integrated. These actors can be suppliers of information/data and consumers/requesters of data. We will consider the initiator of a messaging conversation the sender and the target of this first message the receiver. Obviously, a sender may receive messages. For instance, a sender initiates a request for an immunization history for a client. The receiver responds with a message that is received by the initiating sender. For clarity, the initiator will keep the label of sender.

Note that we do not assume that the sender or receiver is a specific data source (IIS or EHR). One IIS may query another IIS or an EHR-S. Similarly, an EHR-S may send an immunization history to another EHR-S.

Other actors have an interest in the functions of an IIS and messaging. These include:

- Clients/patients
- Users
- Policy makers
- Researchers
- Public Health agencies

⁵ The diagrams often show an IIS and an EHRs/other system. The other system may be an IIS.

⁶ A Master Person Index is used by some health data systems to cross-reference a person's identifiers across these systems. If system A needs the person's id from system B, then it may retrieve it from the MPI. The PIX query asks for one system's personal identifier, based on another system's identifier.

- Clinicians
- Billing systems

These actors will not be directly addressed in this Guide. They interact with the primary actors to accomplish their needs.

Table 2-1 Actors and Goals for Messaging

Actor	Responsibility	Messaging Goals
Immunization Information System (IIS)	<p>Provide access to a complete, consolidated immunization record for each person in its catchment area</p> <p>Supply individual immunization records to authorized users and systems</p> <p>Support aggregate reporting and analysis</p> <p>Evaluate immunization history and make recommendations for next doses</p> <p>Store medical conditions that affect what vaccines are recommended</p>	<p>Receive immunization histories and updates</p> <p>Receive demographic updates</p> <p>Receive requests for individual records</p> <p>Receive observations about a person</p> <p>Send observations about a person</p> <p>Send immunization records to other systems</p> <p>Send demographic data</p> <p>Request immunization record</p> <p>Request person id</p> <p>Acknowledge receipt of message</p> <p>Report processing errors from receipt of message</p>
Electronic Health Record system (EHR-S)	<p>House a person’s electronic health record</p> <p>Make a person’s record available to authorized persons</p>	<p>Receive immunization histories and updates</p> <p>Receive demographic updates</p> <p>Receive requests for individual</p>

Actor	Responsibility	Messaging Goals
	Provide decision support for clinical decisions.	records Send immunization records to IIS Send demographic data Receive observations about a person Send observations about a person Request Immunization record Request person id Acknowledge receipt of message Report processing errors from receipt of message Request evaluation on an immunization history and recommendations for next dose on a given Schedule, such as ACIP
Master Person Index or other identity broker.	Maintain a list of patients and identifiers for a set of persons Supply identifiers for other system's use Be a central demographic supplier for participating systems Provide cross-reference for identifiers for participating systems.	Send id for an individual for use in a record request or record update Receive request for person id. Return complete demographic data for an individual from central demographic store

The table lists a number of messaging needs that relate to IIS and their trading partners. These are all candidates for HL7 messaging. Some are not currently implemented, but

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give us the landscape that should be considered. Note that the messaging for maintaining of an MPI is out of scope for this Implementation Guide.

Another way to organize these tasks or goals is to decompose the goals of the entities (actors) into the various roles they may play. These roles include:

- Immunization history supplier
- Immunization history consumer
- Demographic information supplier
- Demographic information consumer
- Identity resolution broker

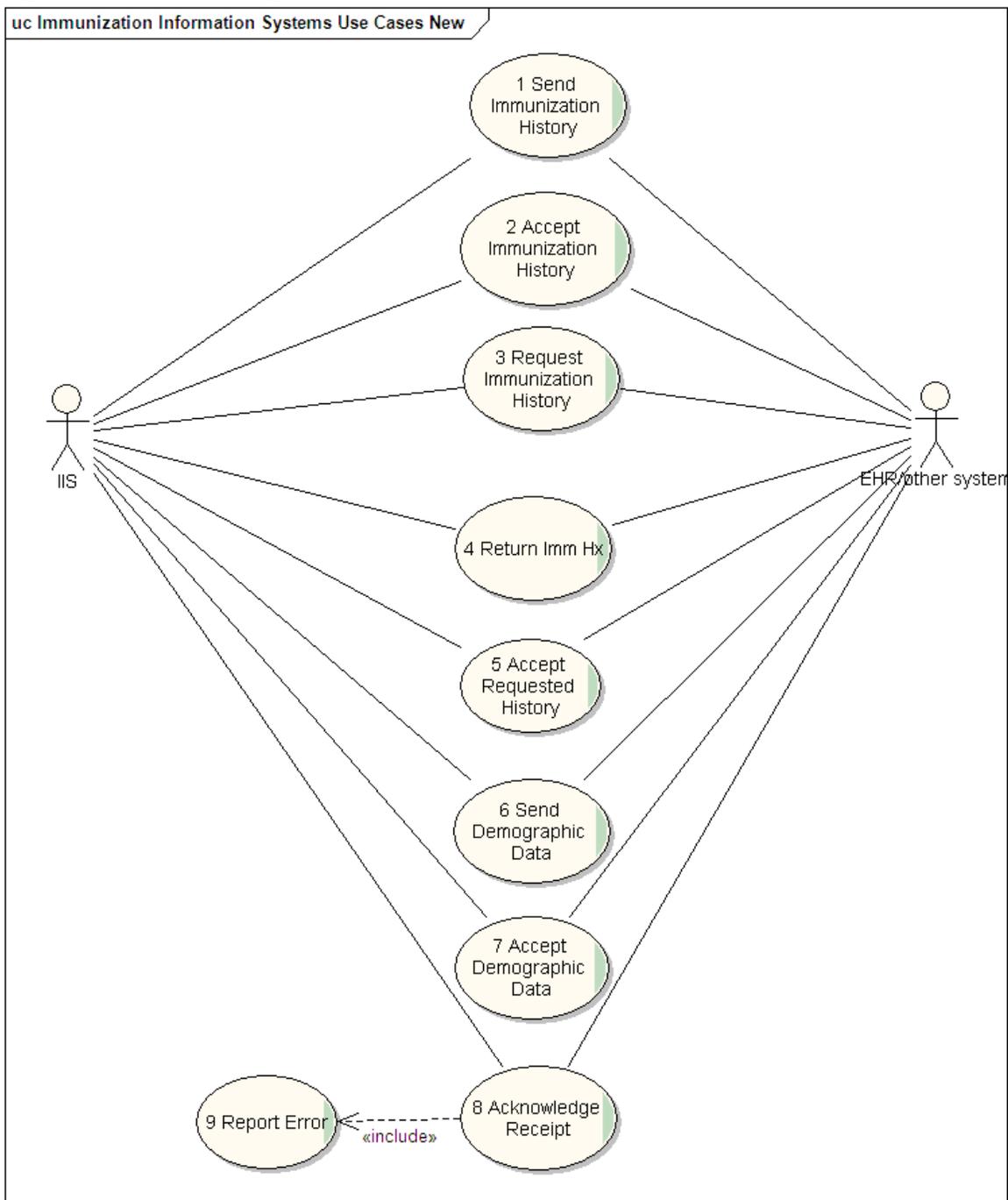
Each of the actors above may have the capacity and interest to support some constellation of these roles. This approach is useful for system design and implementation and encourages a services approach to development. Since the goal of this chapter is to provide a non-technical view to help system managers understand how messaging can meet their needs, we will focus on the business entities and their goals.

High-Level View of Use Cases

We can map these actors and messaging goals to use cases. The following diagram maps the messaging goals of the various players to use cases. These use cases will be defined below. Note that some of these use cases are logically related. For instance, *Request Immunization History* is paired with *Return Immunization History*. *Send Immunization History* needs the receiver to *Receive Immunization History*. These use cases are not intended to be the basis of a software design process.

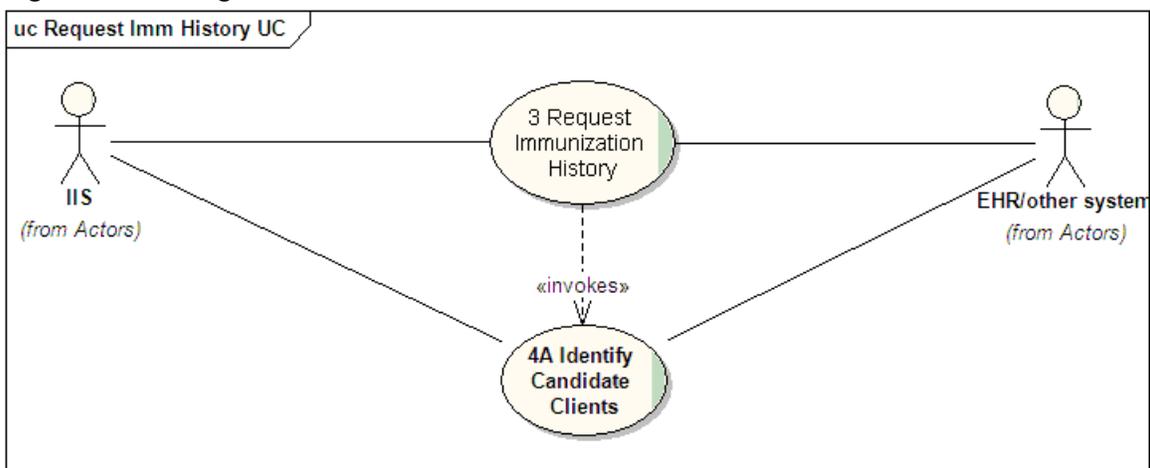
Several paths may accomplish the request for immunization history. Systems will return an immunization history when they are confident that the person requested has been identified. One path separates identity resolution from the request for immunization history. Another includes implicit identity resolution. For details, see use case 3, 4A and 4 below.

Figure 2-1 Use Case Diagram



The following diagram illustrates a more detailed view of the request immunization history and return immunization history. It breaks the *Find Candidate Clients* use case out. Note that a system may request identity resolution (find client) prior to requesting an immunization history. Alternatively, a system may request an immunization history. This can trigger an implicit request to find a client.

Figure 2-2 Finding a Client



The following lists the HL7 Messages shown below in the Use Cases:

- ACK-Acknowledgement message
- ADT-Admit, Discharge and Transfer message
- QBP-Query by parameter
- RSP-Respond to QBP
- VXU-Unsolicited vaccine history

The following are profiled queries supported by IHE for identity resolution:

- PDQ-A specific type of QBP that facilitates identify resolution based on demographic information
- PIX- A specific type of QBP that accomplishes id cross reference

Use Case Descriptions

Use Case 1—Send Immunization History

Goal: To send an immunization history for an individual client from one system to another. In addition to EHR-S and IIS, other systems such as vital records systems or billing systems could use this message to send immunization histories.

HL7 version 2.5.1 Message Type: VXU

Precondition: A user or other actor requests that the sending system send an immunization history.

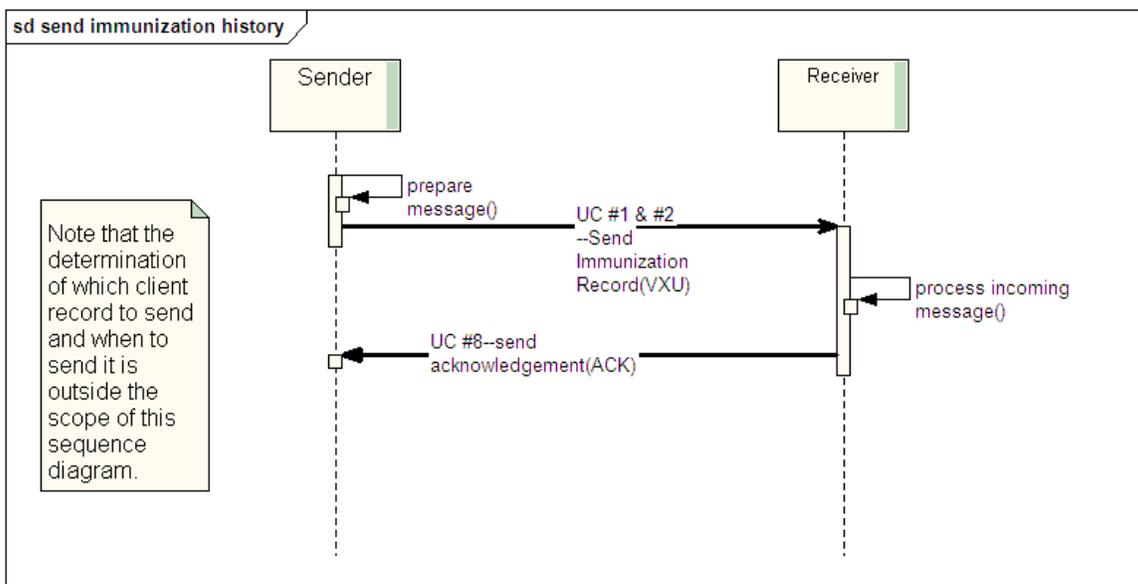


Figure 2-3-Use Cases 1 and 2: Send and Receive Immunization History

This sequence diagram illustrates the message flow. The sender sends an immunization record (Use Case 1). The receiver accepts the message (Use Case 2) and processes it. The receiver may send an acknowledgment message. (See Use Case 9) The transactions that are of interest are indicated by bold arrows.

Use Case 2—Receive Immunization History

Goal: To receive an unsolicited immunization history. It may be an update or a new record. This use case does not have responsibility for the processing of the message. The receiving system may review and accept the immunization history if it chooses, but this outside the scope of this use case.

HL7 version 2.5.1 Message Type: VXU

Precondition: A VXU is received by the receiving system.

Use Case 3—Request Immunization History

Goal: To request an immunization history from another system.

Precondition: A user or other actor requests that the sending system send a request for an immunization history using demographic information and/or other identifiers.

The old VXQ query included implicit identity resolution. If a high confidence candidate was identified, based on demographics and other identifiers, an immunization history was returned in a VXR. If lower confidence candidates were found, a list of candidates was returned for further selection in a VXX. The selection from the VXX informed the re-query with a new VXQ. The approach outlined in this Guide allows this process to be followed using different messages.

Another approach that is common in the informatics world is to separate the identity resolution from the request for content (immunization history in this case). Here the requester sends a query seeking a candidate, based on demographics and other identifiers. The requester selects from the candidates returned and then sends the request for content based on that selection. The identity may be sought from a separate Master Person Index or from the content provider. One industry standard, which supports this approach, is the PDQ query profile by Integrating the Healthcare Enterprise (IHE). The approach outlined in this Guide allows this process to be followed.

A third situation occurs when the requester already knows an identifier meaningful to the responding system. This may occur when the sending system has already sent a record for the person of interest that includes the sender's identifier. Alternatively, it may occur if the requester knows the unique identifier used by the responding system. The approach outlined in this Guide allows this process to be followed.

Since identity resolution is required either implicitly or explicitly, a use case is described for finding a client/candidate (Use Case 4A). That use case contains the alternate flows for the different paths.

Note that more detailed information about the flow of events and options is available in Appendix B.

HL7 version 2.5.1 Message Type: QBP using Request Immunization History query profile.

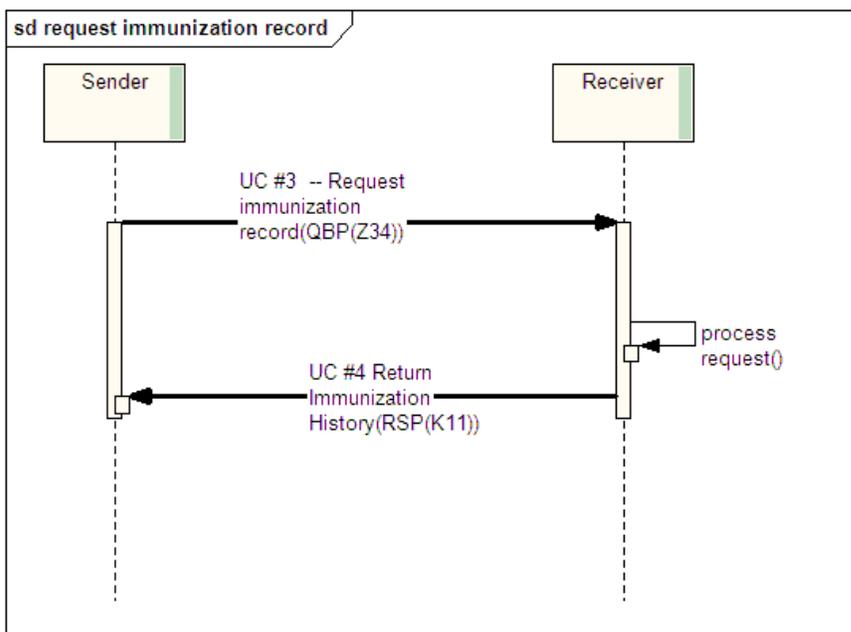


Figure 2-4-Use Cases 3, 4 and 5: Request Immunization History, Respond to Request and Accept Requested History

Note that the sending system process may include confirming that the record returned is the one being sought. This process is not specified here.

Use Case 4—Return Immunization History

Goal: To return an immunization history. It does not include the processes used to find candidate clients for return.

There are 4 possible results:

1. One client matches exactly⁷ the criteria sent
2. One or more clients match the criteria sent (inexact match)⁸
3. No clients match the criteria sent
4. There were errors or other problems

Note that systems must deal with the situation where a Client has indicated that his/her records must be protected. (Only the owning provider may view) This should be clearly documented.

See Figure 6.

Standard Reference HL7 version 2.5.1 Message Type: RSP

Precondition: A receiving system receives a request for an immunization history.

HL7 version 2.5.1 Message Type:

QBP using Request Immunization History query profile

Use Case 4A—Find Candidate Clients

Goal: To find one or more candidate clients from another system and select one to be used when requesting an immunization history.

Precondition:

There are two potential preconditions.

1. A user or other actor requests that the sending system send a request for one or more candidate clients using demographic information and/or other identifiers. (This is well specified in the IHE PDQ profile)
2. A receiving system receives a request for immunization history using a request for immunization history query.

⁷ The definition of “exact” is a local business rule and should be documented locally.

⁸ If more than one client has a high-confidence match with the query parameters, this is an inexact match.

If exactly one high confidence match is found then an immunization history is returned. If this query does not find one high confidence candidate, but rather finds one or more lower confidence candidates then a list of candidates are returned. If more than one high confident match is found, then this is treated as a lower confidence match.

Note that the diagrams below are intended to put the messages in context and do not accurately reflect the architecture that would support the activities.

Request Identity Resolution Prior to Requesting an Immunization History

The following diagram illustrates the process and messages where a system uses a PDQ query to request identifiers and demographics for a client. The result of this process is then used to populate a Request for Immunization History query. Messages have bolded arrows. Other processes are not bolded. It should be noted that the immunization history supplier may also act as the id supplier, but this is not required. This particular Use Case focuses on the interactions between the requester and the id supplier. The other transactions illustrate how this fits into the rest of the process. We assume that the identifier used in the QBP^Q11 is unique within the immunization history supplier.

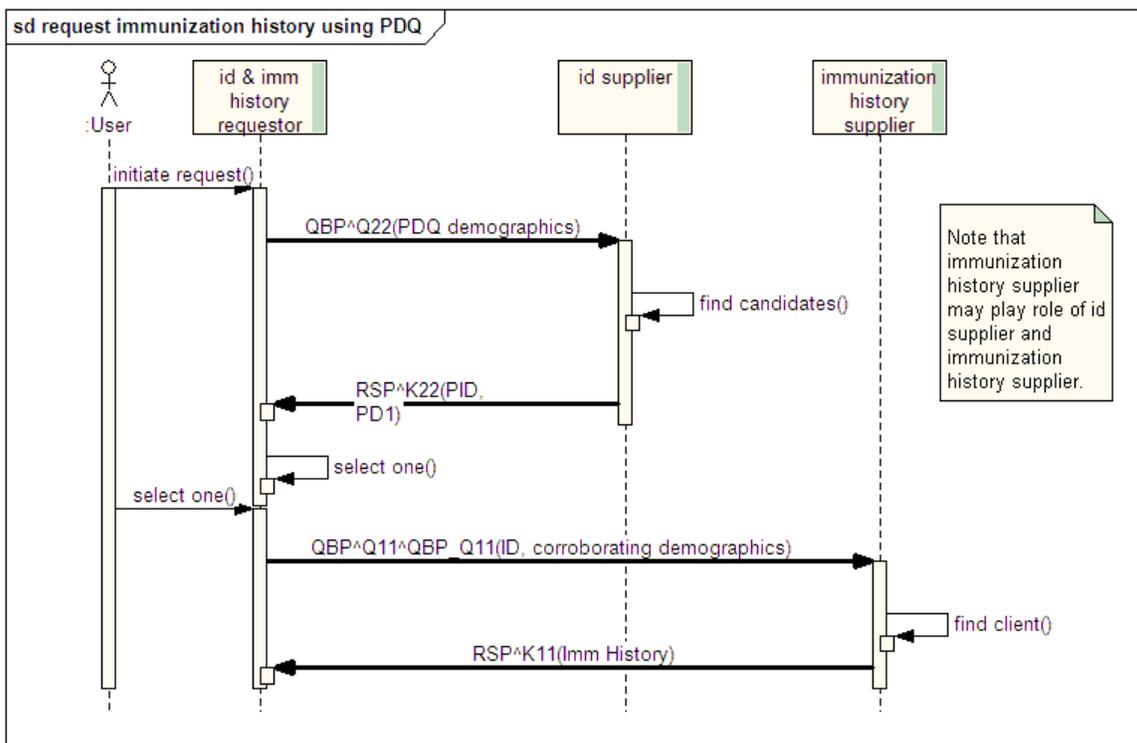


Figure 2-5--Using PDQ to Resolve Identity Prior to Request for Immunization History

Requesting an Immunization History Using Implicit Identity Resolution

The following 2 diagrams illustrate how a system, which uses a Request for Immunization History, relies on implicit identity resolution.

The first drawing illustrates the case when one high confidence candidate is found. The outcome of the find client process is a call for the system to send the immunization history back to the requesting system. Messages are bolded.

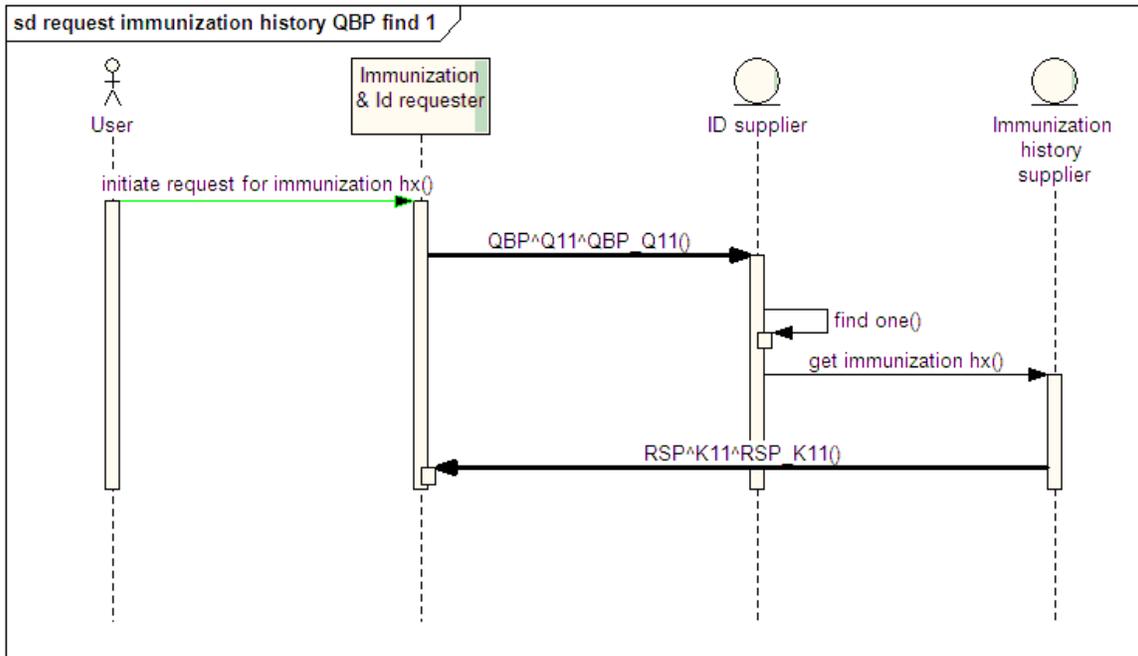


Figure 2-6--Implicit Identity Resolution in Response to a Request for Immunization History When One High-confidence Match Is Found

When the find client process finds lower confidence candidates, then the system returns a list of candidate clients. The user reviews these and selects the one of interest. The selection is used to populate a second Request for Immunization History query. The identity resolution process points to the correct client and an immunization history is returned. The user may choose to refine the search criteria and submit a new query, if he/she believes that a match should have been found.

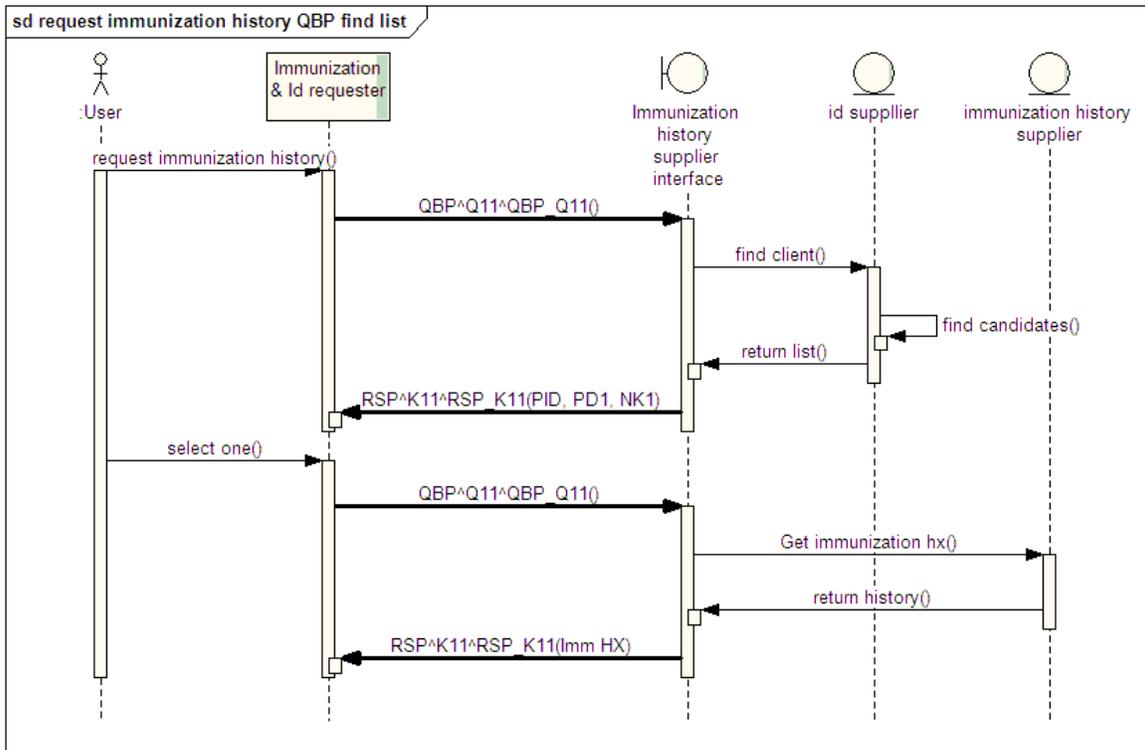


Figure 2-7--Implicit Identity Resolution in Response to a Request for Immunization History When Lower Confidence Candidates Are Found

HL7 version 2.5.1 Message Type:

QBP using Request Immunization History query profile

Or

QBP using PDQ (IHE)

Use Case 5--Accept requested history:

Scope:

The goal of this use case is to accept an immunization history in response to a query for an immunization history from another system.

Standard Reference HL7 version 2.5 Message Type:RSP

Preconditions:A sending system receives a requested immunization history.

Sequence Diagram:

See sequence diagrams for use case 3 above.

Use Case 6—Send Demographic Data

Goal: To send demographic data about a person. It may be an update or a new record. This use case does not have responsibility for the processing of the message. The message will include an indication of the expected/requested acknowledgement.

Standard Reference HL7 version 2.5 Message Type:

The standard messages that may be used for carrying demographic data are VXU and ADT.

Precondition: A user or other actor requests that the sending system send demographic data.

Sequence Diagram:

See Figure 7.

Use Case 7—Accept Demographic Data

Goal: To accept demographic data about a person. It may be an update or a new record. This use case does not have responsibility for the processing of the message. The message will include an indication of the expected/requested acknowledgement.

Standard Reference HL7 version 2.5 Message Type:

The standard messages that may be used for carrying demographic data are VXU, ADT.

Precondition: The receiving system receives demographic data.

Sequence Diagram:

See Figure 7.

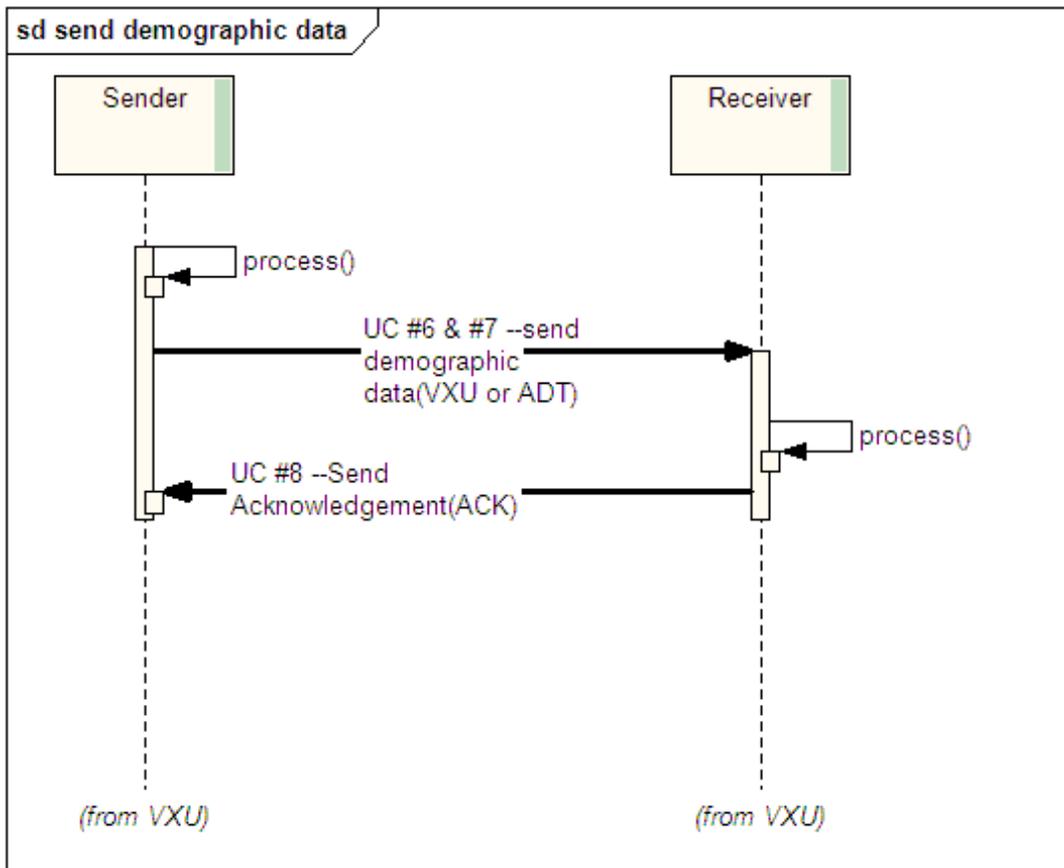


Figure 2-8--Send Demographic Data Via VXU or ADT

Use Case 8--Acknowledge Receipt

Scope:

The goal of this use case is to acknowledge receipt of a message. This can be an immunization history, request for immunization history, demographic update, observation report or request for personal id. It may indicate success or failure. It may include error messages. One example occurs when a query is well-formed, but finds no candidates. In this case the acknowledgement reports this fact.

Standard Reference HL7 version 2.5 Message Type:ACK, RSP

Precondition: A system has processed a message and determined the success of receipt.

Sequence Diagram:

See sequence diagrams for use cases above.

Use Case 9—Report Error

Scope:

The goal of this use case is to send error messages related to messages.

Standard Reference HL7 version 2.5 Message Type: ACK, RSP

Precondition: A system has processed a message and found errors.

Sequence Diagram:

See sequence diagrams for use cases above.

Messaging in the Context of the Business Process

While this document focuses on the format and content of messages from one system to another, it is useful to understand where this fits into the bigger picture of interoperable communication.

The following diagram illustrates the most common message exchange in the IIS context, the VXU (unsolicited immunization record). When the sending system wishes to send a VXU to a receiving system, it must do several steps in preparation:

- Create message⁹
 - Assemble data on person of interest
 - Build the VXU message with this data
- Send the message
 - Connect to the receiving system. The partners must agree on how this is done.
 - The sending system now sends the message over the connection and the receiving system catches the message.

The receiver accomplishes the following steps:

- Process the received message
 - Determine that the message is in the appropriate format.
 - Parse the message into a format that it uses.
 - Evaluate the message components to determine that these are correctly formatted and specified.
- Send an acknowledgement to the sender, indicating the message has been successfully processed.

⁹ Identifying which client's record to send is an important consideration, but outside the scope of this document.

- Integrate the received record into the existing data base.¹⁰
 - Deduplicate on client to be sure that each client only has one record.
 - Deduplicate the events (immunizations, for instance).
 - Insert or update data.

Obviously, the interaction may be more complex than this¹¹. The connection may be rejected or fail. The message may be poorly formed or may not contain required information. Part of the message may contain errors, but these errors are not sufficient to reject the entire message.

The business rules for both the sender and the receiver should be clearly specified so that each side understands how the message will be handled.

When illustrating the processes involved in each message below, we will not elaborate on the processes that occur outside the actual message exchange.

¹⁰ Local business rules determine how this occurs and should be documented clearly.

¹¹ See Appendix B for illustrations of the processing rules expected when handling HL7 messages.

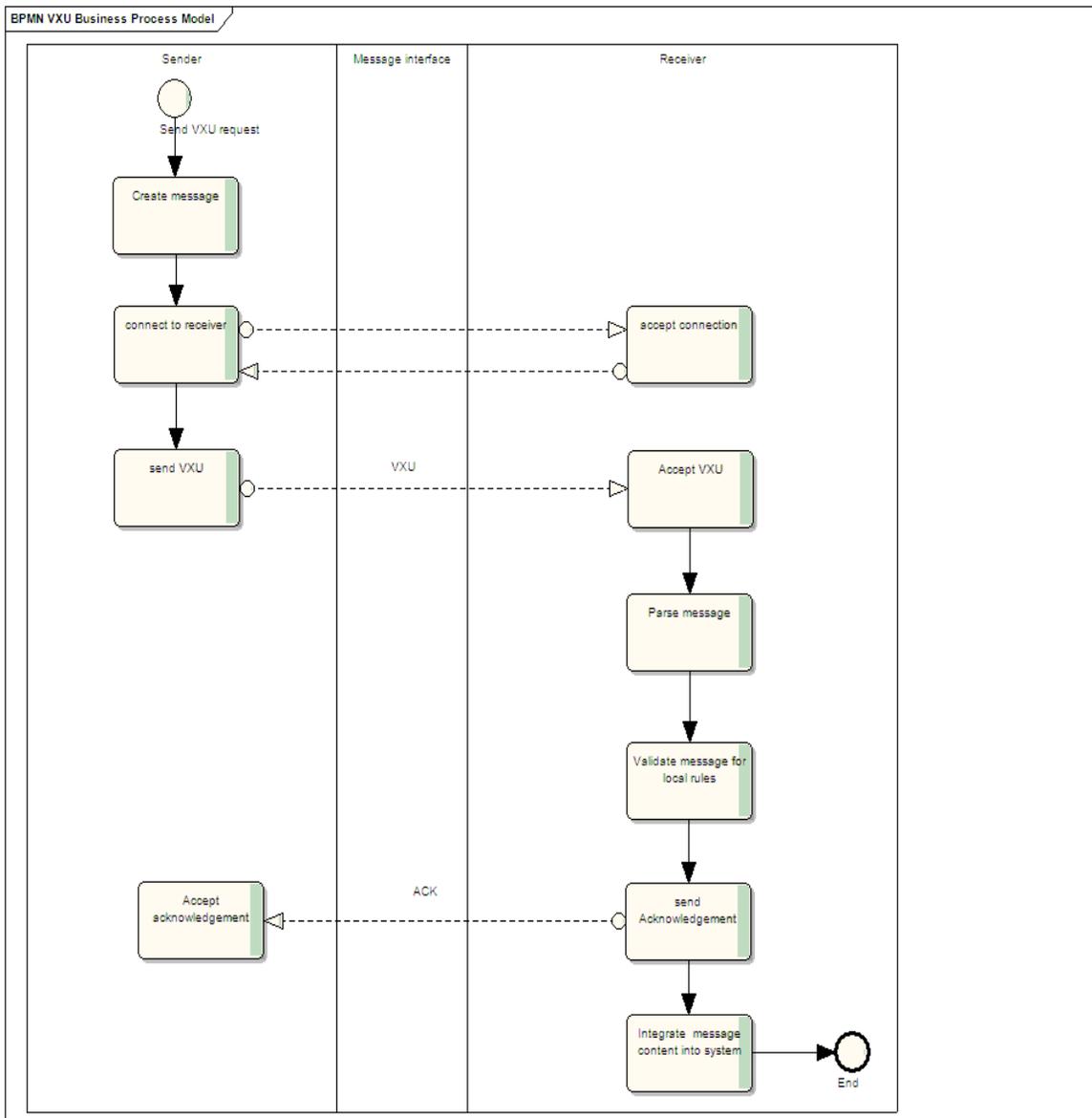


Figure 2-9--VXU Process Model

Note: It is vital that each implementation clearly document the business rules and special handling in a local Implementation Guide or Profile. Local implementers may place further constraints on the specifications found in this Guide. Optional fields or required fields that are allowed to be empty in this Guide may be made required. Repeating fields may be constrained to fewer repetitions.

Appendix B gives detailed example messages and has illustration of the business processes surrounding other message transactions.

APPENDIX B.

Data Usage.

Message	Name	Provider Send/Receive	Usage
QBP	Query by Parameter	Send	Required
VXU	Unsolicited Vaccination Record Update	Send	Required
RSP	Response to QBP message	Receive	Required
ACK	General Acknowledgment	Receive	Required
ADT			
Segment	Name	Definition	Usage
ERR	ERROR SEGMENT	The error segment reports information about errors in processing the message.	Required for conformant system.
EVN	EVENT TYPE SEGMENT	The EVN segment is used to communicate necessary trigger event information to receiving applications.	Required for conformant system.
MSA	MESSAGE ACKNOWLEDGEMENT SEGMENT	Contains information used to identify the receiver's acknowledgement response to an identified prior message.	Required for conformant system.
MSH	MESSAGE HEADER SEGMENT	The MSH segment defines the intent, source, destination, and some specifics of the syntax of a message.	Required for conformant system.
NK1	NEXT OF KIN SEGMENT	The NK1 segment contains information about the patient's next of kin or other related parties. Any associated parties may be identified.	Required for conformant system.
NTE	NOTE SEGMENT	The NTE segment is used for sending notes and comments. It is used in relation to OBX in the VXU and RSP.	Required for conformant system.
OBX	OBSERVATION RESULT SEGMENT	The observation result segment observations about the object of its parent segment. In the VXU/RSP it is associated with the RXA or immunization record. The basic format is a question and an answer.	Required for conformant system.

ORC	ORDER REQUEST SEGMENT	The Common Order segment (ORC) is used to transmit fields that are common to all orders (all types of services that are requested). While not all immunizations recorded in an immunization message are able to be associated with an order, each RXA must be associated with one ORC, based on HL7 2.5.1 standard.	Required for conformant system.
PD1	PATIENT DEMOGRAPHIC SEGMENT	The patient additional demographic segment contains demographic information that is likely to change about the patient. In immunization messages, this is information about the need to protect the client's information, how they should be part of reminder efforts and their current status in the IIS.	Required for conformant system.
PID	PATIENT IDENTIFIER SEGMENT	This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change. Used by all applications as the primary means of communicating patient identification information.	Required for conformant system.
PV1	PATIENT VISIT SEGMENT	This segment contains information related to a specific visit.	Required for conformant system.
QAK	QUERY ACKNOWLEDGEMENT SEGMENT	The QAK segment contains information sent with responses to a query.	Required for conformant system.
QPD	QUERY PARAMETER DEFINITION	Query parameter definition.	Required for conformant system.
RCP	RESPONSE CONTROL PARAMETER SEGMENT	Response control parameter segment.	Required for conformant system.
RXA	PHARMACY/TREATMENT ADMINISTRATION SEGMENT	Pharmacy/Treatment Administration Segment.	Required for conformant system.

RXR	PHARMACY/TREATMENT ROUTE SEGMENT	Pharmacy/Treatment Route Segment.	Required for conformant system.
Field	Name	Usage	Comment
ERR-2	Error Location	Required, may be empty	CDC Required.
ERR-3	HL7 Error Code	Required, may be empty	CDC Required.
ERR-4	Severity	Required, may be empty	CDC Required.
EVN-2	Recorded Date/Time	Required	CDC Required.
MSA-1	Acknowledgment Code	Required	CDC Required.
MSA-2	Message Control ID	Required	CDC Required.
MSH-1	Field Separator	Required	CDC Required.
MSH-2	Encoding Characters	Required	CDC Required.
MSH-3	Sending Application	Required, may be empty	CDC Required.
MSH-4	Sending Facility	Required, may be empty	CDC Required.
MSH-5	Receiving Application	Required, may be empty	CDC Required.
MSH-6	Receiving Facility	Required, may be empty	CDC Required.
MSH-7	Date/Time of Message	Required	CDC Required.
MSH-8	Security	Required	NDIIS required.
MSH-9	Message Type	Required	CDC Required.
MSH-10	Message Control Id	Required	CDC Required.
MSH-11	Processing ID	Required	CDC Required.
MSH-12	Version ID	Required	CDC Required.
MSH-15	Accept Acknowledgment Type	Required, may be empty	CDC Required.
MSH-16	Application Acknowledgment Type	Required, may be empty	CDC Required.
NK1-1	Set ID - NK1	Required	CDC Required.
NK1-2	Name	Required	CDC Required.
NK1-3	Relationship	Required	CDC Required.
NK1-4	Address	Required, may be empty	CDC Required.

NK1-5	Phone Number	Required, may be empty	CDC Required.
NTE-3	Comment	Required	CDC Required.
OBX-1	Set ID = OBX	Required	CDC Required.
OBX-2	Value Type	Required	CDC Required.
OBX-3	Observation Identifier	Required	CDC Required.
OBX-4	Observation Sub-ID	Required, may be empty	CDC Required.
OBX-5	Observation Value	Required	CDC Required.
OBX-6	Units	Required, may be empty	CDC Required.
OBX-11	Observation Result Status	Required	CDC Required.
OBX-14	Date/Time of the Observation	Required	CDC Required.
ORC-1	Order Control	Required	CDC Required.
ORC-2	Placer Order Number	Required, may be empty	CDC Required.
ORC-3	Filler Order Number	Required	CDC Required.
ORC-10	Entered By	Required, may be empty	CDC Required.
ORC-12	Ordering Provider	Required, may be empty	CDC Required.
PD1-11	Publicity Code	Required, may be empty	CDC Required.
PD1-12	Protection Indicator	Required, may be empty	CDC Required.
PD1-13	Protection Indicator Effective Date	Conditional, must be populated if PD1-12 is populated.	CDC Required.
PD1-16	Immunization Registry Status	Required, may be empty	CDC Required.
PD1-17	Immunization Registry Status Effective Date	Conditional, must be populated if PD1-16 is populated.	CDC Required.
PD1-18	Publicity Code Effective Date	Conditional, must be populated if PD1-11 is populated.	CDC Required.
PID-1	Set ID - PID	Required, may be empty	CDC Required.
PID-3	Patient Identifier List	Required	CDC Required.
PID-5	Patient Name	Required	CDC Required.
PID-6	Mother's Maiden Name	Required, may be empty	CDC Required.
PID-7	Date/Time of Birth	Required	CDC Required.

PID-8	Administrative Sex	Required	NDIIS Required
PID-10	Race	Required	NDIIS Required
PID-11	Patient Address	Required	NDIIS Required
PID-13	Phone Number - Home	Required	NDIIS Required
PID-22	Ethnic Group	Required	NDIIS Required
PID-24	Multiple Birth Indicator	Required, may be empty	CDC Required.
PID-25	Birth Order	Conditional, must be populated if PID-24 is populated.	CDC Required.
PID-29	Patient Death Date and Time	Required, may be empty	CDC Required.
PID-30	Patient Death Indicator	Conditional, must be populated if PID-29 is populated.	CDC Required.
PV1-2	Patient Class	Required	CDC Required.
PV1-20	Financial Class	Required	CDC Required.
QAK-1	Query Tag	Required	CDC Required.
QPD-1	Message Query Name	Required	CDC Required.
QPD-2	Query Tag	Required	CDC Required.
QPD-3	User Parameters (in successive fields).	Required	CDC Required.
RXA-1	Sub-ID Counter	Required	CDC Required.
RXA-2	Administration Sub-ID Counter	Required	CDC Required.
RXA-3	Date/Time Start of Administration	Required	CDC Required.
RXA-4	Date/Time End of Administration	Required, may be empty	CDC Required.
RXA-5	Administered Code	Required	CDC Required.
RXA-6	Administered Amount	Required	CDC Required.
RXA-7	Administered Units	Conditional, must be populated if RXA-6 is populated with any value except for 999.	CDC Required.
RXA-9	Administration Notes	Required, may be empty	CDC Required.

RXA-10	Administering Provider	Required, may be empty	CDC Required.
RXA-11	Administered-at Location	Required	NDIIS Required
RXA-15	Substance Lot Number	Required, may be empty	CDC Required.
RXA-16	Substance Expiration Date	Conditional, must be populated if RXA-15 is populated.	CDC Required.
RXA-20	Completion Status	Required, may be empty	CDC Required.
RXA-21	Action Code - RXA	Required, may be empty	CDC Required.
			CDC Required.
RXR-1	Route	Required	CDC Required.
RXR-2	Administration Site	Required, may be empty	CDC Required.

USER DEFINED FIELDS

The following user defined fields will be populated with data supplied by the NDIIS Technical Staff.

MSH-3	Sending Application	Required, may be empty	CDC Required.
MSH-4	Sending Facility	Required, may be empty	CDC Required.
MSH-5	Receiving Application	Required, may be empty	CDC Required.
MSH-6	Receiving Facility	Required, may be empty	CDC Required.
MSH-8	Security	Required	NDIIS required.