HL7 TOOLS

NEWBORN SCREENING HEALTH IT GUIDE AND TOOLKIT

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Introduction

This document is intended to provide guidance and additional information on the activities and tools referenced in Chapter 2 of the Building Blocks Guide. This work may be broken into the following tasks:

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Message Definition

Successful data exchange requires messaging partners agree upon a message specification than unambiguously defines what data is supported and how it should be formatted. The HL7 Laboratory Results Interface (LRI) and Laboratory Orders Interface (LOI) define requirements for electronic ordering and resulting of laboratory tests using the HL7 2.5.1 base standard.   Profiling or constraint is required to tailor the message to the NDBS use case and then further, to program specific needs.

LOI and LRI are structured into groups of requirements called "profile components." Implementers may define their profile to a certain extent by their selection of these components.
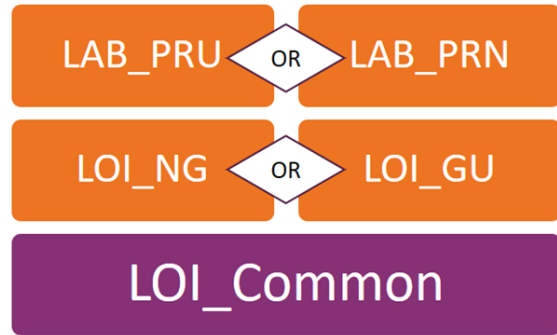
Profile Components

LOI and LRI utilize profile components to group related requirements that define a certain aspect of a profile. This organization allows a single specification like LOI or LRI to accommodate many different use cases. It may be helpful to think of profile components as reusable building blocks that range in specificity from broad requirements that apply to all laboratory orders to more precise requirements applying only to a specific use case, such as newborn screening.

In some instances, implementers will need to choose between two profile components offering alternate approaches to address a single issue. Below are the profile components currently required for a valid LOI and LRI profile:

Component	Description
Common Component (REQUIRED)	Serves as the core for both LOI and LRI; specifies the minimum constraints on the base specification and may be further constrained by additional components.
Selection of either: *GU (Globally Unique)* *<OR>* *NG (Non-globally Unique)*	Specifies whether or not a globally unique identifier is required for specific names and identifiers in the message. The GU Component requires that the assigning authority for sending and receiving facilities and applications, as well as patient, specimen, and other identifiers be populated with an ISO Compliant OID. The NG_Component allows for other assigning authorities in addition to ISO, which may include CLIA, CLIP, or a locally defined entity identifier.
For Orders, selection of either: *PRU (Unique Placer Order Number)* *<OR>* *PRN (Non-Unique Placer Order Number)*	PRU or PRN Components specify whether or not a placer order number is unique. The LAB_PRU Component indicates that the order number is unique on its own – no additional information is needed to identify the order. The LAB_PRN Component indicates that the order number is not unique and must be paired with the universal service identifier (the requested test) to identify the order. LAB_PRN would apply in scenarios where multiple tests or screenings are scheduled under the same order number.
For Results, selection of either: *FRU (Unique Filler Order Number)* *<OR>* *FRN (Non-Unique Filler Order Number)*	FRU or FRN Components specify whether or not a filler order number is unique. The LAB_FRU Component indicates that the filler number is unique on its own – no additional information is needed to identify the order. The LAB_FRN Component indicates that the filler number is not unique and must be paired with the universal service identifier (the requested test) to identify the order. LAB_FRN would apply in scenarios where multiple tests or screenings are performed under the same filler number.

A valid order profile MUST include the LOI Common Component, either GU or NG, and either PRU or PRN:

LAB_PRU	OR	LAB_PRN
LOI_NG	OR	LOI_GU
LOI_Common		

Similarly, a valid result profile MUST include the LRI Common Component, either GU or NG, and either FRU or FRN:

LAB_FRU	OR	LAB_FRN
LRI_NG	OR	LRI_GU
LRI_Common		
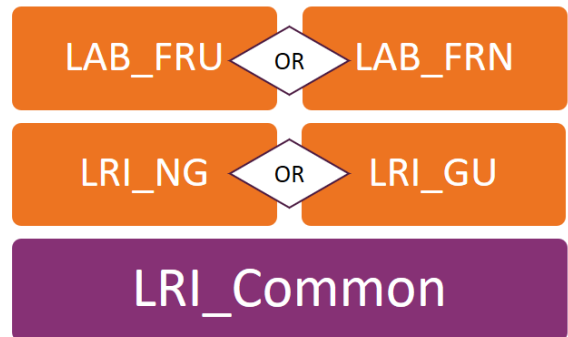
Senders and receivers of NDBS orders and results would include a fourth "add-on" component for the NDBS profile, which specifies the constraints needed for newborn dried blood spot screening.

In this NDBS result example, selected profile components are in purple:

- The LRI_NDBS profile component has been selected.
- Unique filler numbers are not required and therefore LAB_FRN has been selected.
- ISO compliant OIDs are not required and therefore the LRI_NG component has been selected.
- The base LRI_Common profile component is required for all result messages

LRI_NDBS		
LAB_FRU	OR	LAB_FRN
LRI_NG	OR	LRI_GU
LRI_Common		
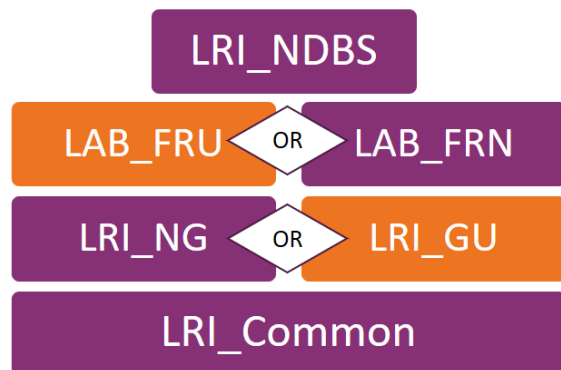
Conformance to these profile components is declared in the Message Profile Identifier (MSH-21), which may be populated in one of two ways:

Option 1: Specify each component separately as repeats in MSH-21:

LRI_Common_Component^^2.16.840.1.113883.9.16^ISO~
LRI_NG_Component^^2.16.840.1.113883.9.13^ISO~
LAB_FRN_Component^^2.16.840.1.113883.9.84^ISO~
LRI_NDBS_Component ^^2.16.840.1.113883.9.195.3.6^ISO

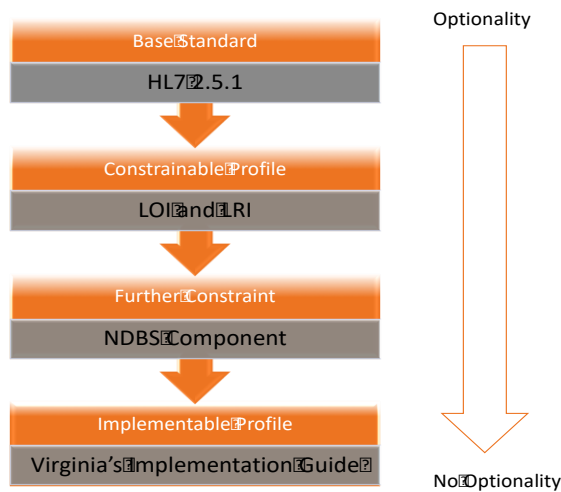**Option 2:** Use the pre-coordinated profile identifier for the LRI_NG_FRN profile:
LRI_NG_FRN_Profile^^2.16.840.1.113883.9.195.3.4^ISO~
LRI_NDBS_Component ^^2.16.840.1.113883.9.195.3.6^ISO

By selecting these components, the laboratory has taken the first step in creating a constrained profile which will be usable for their data exchange needs. For more information on message profile components and identifiers please refer to the Profiles and Profile Components section of the LOI or LRI HL7 guides.

Static Definition

HL7 messages are structured in a hierarchal fashion that increases in granularity from segment groups to segments and down to fields, components, and subcomponents. Attributes define data elements at each of these structural levels and changes to these attributes are what we generally mean when we refer to "constraint." In fact, the process by which the program may constrain a message profile into a program specific implementation guide is the same process by which the LOI and LRI message profiles were constrained to create the LAB_NDBS component.

Optionality

| Base Standard |
| HL7 2.5.1 |

| Constrainable Profile |
| LOI and LRI |

| Further Constraint |
| NDBS Component |

| Implementable Profile |
| Virginia's Implementation Guide |

No Optionality

The remaining changes incorporated the program specific implementation guide should be limited to addressing any discrepancies identified during the gap analysis between the NBS program requirements and the message profile.

Implementers should beware of:

- Instances where the profile is open; optionality exists.
- Instances where the profile is discrepant with the program's data requirements.

In these instances, the implementer should add additional clarification or, via the mechanisms described below, tighten the data element attributes to meet the laboratory's needs.

LOI and LRI segment tables define each field using attributes, such as:

- Usage- This is the set of rules used to define when an element appears in a message. For a full description of usage see HL7 guides.
- Cardinality – This identifies the minimum number of repetitions for a particular element. Some elements will need to be repeated any number of times or can only appear in the message once. For a full description of cardinality see HL7 guides.
- Data type – The data type of a component defines the formatting and other rules that apply to it. There are many data types and for a full listing see the HL7 guide. Examples of data types include CE- coded element, TM – time, and NM-Numeric.

As its name suggests, 'constraint' of these attributes serves to make requirements stricter.

The overarching rule when creating a constrained profile is that changes may only serve to "tighten" or to make requirements stricter or more specific.

This rule ensures that requirements of the underlying base profile are preserved. For example, constraint of the usage attribute means that you have narrowed the circumstances under which you would expect a data element to be populated. Further information on constraint rules and profiling may be found in Chapter 2B of the HL7 2.7.1 standard as well as the HL7 Message Profiling Specification.

Usage

Constraint of the usage attribute, for example, would allow a change from RE (required but may be empty) to required (must always be populated).

A required element, however, may not be changed to RE or O (optional). To be fully conformant, data elements required in the base may not be made not supported (X). The table below provides allowable changes to usage.

CURRENT USAGE	MAY BE CHANGED TO:
X	Must Stay X
R	Must Stay R
RE	R
C	R
CE	RE, R
O	X, R, RE, C, CE

Cardinality

Constraint may also be applied to the cardinality attribute, which defines how many times a data element may appear. To tighten the cardinality attribute, the minimum number of repeats must be higher and the maximum must be lower. An example for a stricter maximum would be a change in cardinality for a required data element from [1..*] to [1..1]. This specifies that a data element that previously could repeat an unlimited number of times can now appear once and only once. Changes to the cardinality minimum, for example, may accompany a change of usage. For example, a usage change from RE to R would require a change in cardinality from [0..1] to [1..1].

Datatype

Datatype 'flavors' allow for constraint of the base data type definition to meet specific requirements for use in multiple fields across different profiles. For example, flavors of the Date/Time (DTM) data type allow for varying levels of precision from year to month, minute, second, and so on.

Conformance Statements

When constraint of one or more attributes will not adequately describe requirements for the program, the implementer may choose to add conformance statements. They can convey constraint for more complex requirements or business rules. Keep in mind that additional detail,

which does not impose a constraint, may always be conveyed in the data element description as an annotation or comment.

Tool: Implementation Workbook

As described in the sections above, selection of profile components and further constraint of the static definition narrows the message to meet the needs of sender and receiver. The result is an implementable profile, that leaves no ambiguity with regard to what data may be exchanged and how it should be conveyed. The following tools have been created to aid in this task:

- LOI Implementation Workbook
- LRI Implementation Workbook

At a minimum, these workbooks present the segment and datatype definitions from the LOI and LRI published PDFs in flexible excel format. Each workbook contains three tabs:

Tab	Description
Syntax	Provides the structure of each message. Specifies which segments may be included and how many times they may appear.
Message Specification	Provides the structure of each segment. Specifies which fields may be included and how the data should be formatted.
Data Types	Provides the definition for all datatypes associated with fields with a usage of R, RE, or C.

The Syntax and Message Specification tabs include additional columns that feature constrained values for Usage, Cardinality, and Datatype for specific profiles. The following excerpt from the 'Syntax' tab demonstrates how the usage and cardinality for several segments varies depending upon the profile component. The LOI abstract message syntax is constrained by the NDBS component:

Segment	Name	Usage	Cardinality	Description	NDBS Usage
MSH	Message Header	R	[1..1]	The message header (MSH) segment contains information	R
[{SFT}]	Software Segment	Varies		LOI_NDBS_Component usage: X All others usage: O	X
[{NTE}]	Notes and Comments for Header	Varies		LOI_NDBS_Component usage: X All others usage: O	X
[	*PATIENT Begin*	R	[1..1]		R
PID	Patient Identification	R	[1..1]	The patient identification (PID) segment is used to provide	R
[PD1]	Additional Demographics	Varies		LOI_NDBS_Component usage: X All others usage: O	X
[{NTE}]	Notes and Comments for PID	Varies		LOI_NDBS_Component usage: X All others usage: O	X
[{NK1}]	Next of Kin/Associated Parties	Varies	[0..5]	Sender usage: 'RE' Receiver usage: 'O'	Varies
[	*VISIT Begin*	Varies	Varies	Financial Information Profile usage: 'R' Financial	O
PV1	Patient Visit	R	[1..1]	HL7 requires that PV1 (Patient Visit) segment be present if	R
[PV2]	Patient Visit – Additional Information	O			O
]	*VISIT End*				
[{	*INSURANCE Begin*	Varies	Varies	Financial Information Profile usage: C(R/O)	O
IN1	Insurance	R	[1..1]		R
[IN2]	Insurance – Additional Information	O			O
[IN3]	Insurance – Additional Information –	O			O
}]	*INSURANCE End*				

Similarly, the LOI_GU and LOI_NG columns on the 'Message Specification' tab display values constrained by the respective profile. For example, the datatype for PID-3 is specified as CX_01 for the GU profile component and CX_02 for the NG profile component. Each of these sets of columns also incorporates requirements of the NDBS component. For example, XPN_03 is required for PID-5.

Segment	Sequence	Element Name	Description/Comments	LOI DT	LOI Usage	LOI Cardinality	LOI_GU_NDBS DT	LOI_GU_NDBS Usage	LOI_GU_NDBS Cardinality	LOI_NG_NDBS DT	LOI_NG_NDBS Usage	LOI_NG_NDBS Cardinality
PID												
PID	1	Set ID – PID	Constrained to the literal value '1'.	SI	R	[1..1]	SI	R	[1..1]	SI	R	[1..1]
PID	2	Patient ID	Excluded for this Implementation Guide, see Section 1.3.1.		X			X			X	
PID	3	Patient Identifier List	GU data type: CX_01 NG data type: CX_02	Varies	R	[1..*]	CX_01	R	[1..*]	CX_02	R	[1..*]
PID	4	Alternate Patient ID – PID	Excluded for this Implementation Guide, see Section 1.3.1.		X			X			X	
PID	5	Patient Name	LOI_NDBS_Component datatype: XPN_03, comment: It is required that the name on the blood spot card matches the name sent in the HL7 message. In the special case that an infant has not yet received a first or middle name at time of screening, we recommend submitters use the literal "BabyBoy" or "BabyGirl" for the first name. For unknown last name just use 'Doe'. All other Profiles datatype XPN_01	Varies	R	[1..1]	XPN_03	R	[1..1]	XPN_03	R	[1..1]
PID	6	Mother's Maiden Name	PH Component Usage: 'RE' All other profiles Usage: 'O'	XPN_01	Varies	[0..1]	XPN_01	O	[0..1]	XPN_01	O	[0..1]
PID	7	Date/Time of Birth	LAB_NB_Component data type: TS_02 or TS_03 LOI_NDBS_Component data type: TS_06 or TS_07 LOI_NDBS_Component comment: For the purpose of NDBS, the newborn's birth date/time shall be fully specified to the minute, if known, in PID-7 (Date of Birth).	Varies	R	[1..1]	TS_06 or TS_07	R	[1..1]	TS_06 or TS_07	R	[1..1]

Display of all three (Base LOI, LOI_GU, and LOI_NG) and incorporation of the NDBS component may help implementer's more quickly identify and compare differences in profile requirements. Once a profile component has been selected, implementer's can choose to hide or remove those that do not apply. Columns are also available for programs to further define their own requirements during gap analysis.

The Datatypes tab lists all the data types as specified by LOI or LRI.

SEQ		Component Name	DT	Usage	Value Set	Comments
CWE_01		CODED WITH EXCEPTIONS; CODE REQUIRED (CWE_01)				
CWE_01	1	Identifier	ST	R		
CWE_01	2	Text	ST	RE		It is strongly
CWE_01	3	Name of Coding System	ID	R	HL70396_US	
CWE_01	4	Alternate Identifier	ST	RE		The alternate identifier
CWE_01	5	Alternate Text	ST	RE		It is strongly
CWE_01	6	Name of Alternate Coding System	ID	C(R/X)	HL70396_US	Condition Predicate: If
CWE_01	7	Coding System Version ID	ST	C(RE/O)		Condition Predicate: If
CWE_01	8	Alternate Coding System Version ID		O		
CWE_01	9	Original Text	ST	RE		Original Text is used to
CWE_01	10	Second Alternate Identifier		O		
CWE_01	11	Second Alternate Text		O		
CWE_01	12	Second Name of Alternate Coding System		O		

Action Item

Task: Message Definition

Tools: Implementation Workbook

Using the LOI or LRI Implementation Workbook, Implementers will familiarize themselves with the Syntax, Message Specification, and Datatypes tabs. Take note of any openness in usage, cardinality, and data types that may need closed in the static definition of each profile component columns on the message specification tab. Implementers will be comparing the program's needs to these profiles during the next task, Gap Analysis.

Gap Analysis

Selection of the appropriate laboratory profile components results in a constrained profile. However, the requirements of this profile probably will not yet meet the specific needs of the NBS program. For orders, the laboratory may collect only a subset of the data elements supported by the HL7 Orders Profile. Similarly, it may report only some of the data elements associated with the results. Further definition or constraint of this profile is needed to create an implementation profile that is specific to the laboratory's NBS program. To identify which data elements will need to be defined further, the team must determine which segments and fields the laboratory will use to send and receive NBS orders and results. This will require a gap analysis.

At a minimum:

- For laboratory orders, the gap analysis will likely include a comparison between the collection card and the LOI NDBS profile.
- For laboratory results, the gap analysis will compare results reports (usually paper) and the LRI profile.

The gap analysis should result in documentation that clearly captures which data elements will be collected for both orders and results and where there are discrepancies with the LOI or LRI profiles to which your messages will adhere. In order to perform a full gap analysis on the HL7 message each data element need to be evaluated.

Questions to consider include:

- Can every data element be mapped? Does the profile specify a location for each data element that the laboratory needs to send or receive?
- Do the possible responses for a data element match the specified vocabulary for each field? Does the laboratory include selections that are not specified in the profile?
- Does the usage match? Which segments/fields are required by the profile? Are these data elements currently collected by the lab?
- Does the format or datatype of the data element match? For example, does the granularity of the date collected by the laboratory (days, hours, minutes) match the specified datatype flavor? Further, does the datatype specified in the orders and results profiles match?
- Does the cardinality match? Does the profile allow for more or fewer repeats of a data element than the laboratory collects?
- Is the data element included in both the order and result message? If so, does the profile require that the laboratory send the data element in the results message (applies to R or RE data elements)?

This gap analysis may reveal discrepancies in between the laboratory's data requirements and the data supported in the HL7 standard. Each discrepancy should be evaluated and resolved by changes in data practice or further modification of the profile.

Tool: Implementation Workbook

Selection of profile components and further constraint of the static definition results in an implementable guide that fully specifies requirements for data exchange between sender and receiver. The LOI and LRI Implementation Workbooks display constrained values for each profile and provides implementer's the opportunity to document their own program specific requirements.

The following example uses the PID segment to demonstrate how the NDBS component constrains the LOI specification and how it may be further constrained in the implementation guide. The Base LOI profile includes some optionality: datatype and usage 'varies' for specific fields. The constrained LOI_GU_NDBS profile further restricts some fields, while leaving others open. The Implementation Profile removes any remaining optionality by requiring Mother's Maiden Name and specifying granularity of time of birth to the second (TS_06).

				Base LOI			LOI_GU_NDBS			Virginia		
Segment	Sequence	Element Name	Description/Comments	LOI DT	LOI Usage	LOI Cardinality	LOI_GU_NDBS DT	LOI_GU_NDBS Usage	LOI_GU_NDBS Cardinality	Virginia DT	Virginia Usage	Virginia Cardinality
PID												
PID	1	Set ID – PID	Constrained to the literal value '1'.	SI	R	[1..1]	SI	R	[1..1]	SI	R	[1..1]
PID	2	Patient ID	Excluded for this Implementation Guide, see Section 1.3.1.		X			X			X	
PID	3	Patient Identifier List	GU data type: CX_01 NG data type: CX_02	Varies	R	[1..*]	CX_01	R	[1..*]	CX_01	R	[1..*]
PID	4	Alternate Patient ID – PID	Excluded for this Implementation Guide, see Section 1.3.1.		X			X			X	
PID	5	Patient Name	LOI_NDBS_Component datatype: XPN_03, comment: It is required that the name on the blood spot card matches the name sent in the HL7 message. In the special case that an infant has not yet received a first or middle name at time of screening, we recommend submitters use the literal "BabyBoy" or "BabyGirl" for the first name. For unknown last name just use 'Doe'. All other Profiles datatype XPN_01	Varies	R	[1..1]	XPN_03	R	[1..1]	XPN_03	R	[1..1]
PID	6	Mother's Maiden Name	PH Component Usage: 'RE' All other profiles Usage: 'O'	XPN_01	Varies	[0..1]	XPN_01	O	[0..1]	XPN_01	R	[1..1]
PID	7	Date/Time of Birth	LAB_NB_Component data type: TS_02 or TS_03 LOI_NDBS_Component data type: TS_06 or TS_07 LOI_NDBS_Component comment: For the purpose of NDBS, the newborn's birth date/time shall be fully specified to the minute, if known, in PID-7 (Date of Birth).	Varies	R	[1..1]	TS_06 or TS_07	R	[1..1]	TS_06	R	[1..1]

<u>Action Item</u>

Task: Gap Analysis

Tools: Implementation Workbook

Using the LOI or LRI Implementation Workbook, Implementers will begin filling in the last columns on the message specification tab with the specific program's data element usage, cardinality, and data type requirements. Take note of any constraints that can be made between the profile components and your specific program's needs. If any discrepancies exist, decide how to proceed. Once all ambiguity has been addressed, these columns will ultimately represent your program specific implementable profile.

Mapping

'Mapping' is frequently referenced when working on HL7 implementations. The term generally describes the matching of local concepts to their counterpart within a standard. Mapping can refer to the task of matching fields or the responses or answers contained within those fields.

A simple example of the first would be the mapping of a local field for Patient Race to the corresponding field, PID-10, in the message. An example of the second would the mapping of the local values for Race (Asian, African American, Caucasian…) to the standard codes specified by the associated value set of PID-10 (HL70005_USL).

The LOI and LRI Implementation Workbooks can assist with mapping at the field level.

Tool: Implementation Workbook

The task of mapping local fields to the standard extends beyond the determination of present or absent. Additional information is often recorded to help with location and retrieval of the local field during the technical development of the message. The Implementation workbook provides space for implementers to document this information.

Using the previous example for Race, implementers can indicate that 'yes' this field is collected within their application. They can further specify that it's local name or display name is 'Race' and its column within the Database is captioned 'PATIENTRACE'.

Additional columns are available to document:

• the local database name, if more than one is referenced

• the local extract field name, if data will be extracted from the database prior to message generation

• Translation/Logic Notes, if data will need to be manipulated in some manor prior to being sent in the message

• Questions/Comments/Follow-up for outstanding items that will require follow-up

• Local Value Set or Collection of Values, to document specific responses for each field.

Segment	Sequence	Element Name	Data Element Collected	Local Data Element Name	Local Database Name
PID					
PID	1	Set ID – PID	Yes	Generated by Rhapsody	
PID	3	Patient Identifier List	Yes	Medical Record Number	VA_MEDICAL_ID
PID	5	Patient Name	Yes	Baby's Name (Last, First)	LAST_NAME/FIRST_NAME
PID	6	Mother's Maiden Name	Yes	Mother's Name (Maiden)	VA_MOTHER_MAIDEN_NAME
PID	7	Date/Time of Birth	Yes	Birth Date/ Birth Time	BIRTH_DATE/BIRTH_TIME
PID	8	Administrative Sex	Yes	Sex	SEX
PID	10	Race	Yes	Race	PATIENTRACE
PID	11	Patient Address	Yes		
PID	22	Ethnic Group	Yes		
PID	24	Multiple Birth Indicator	Yes		
PID	25	Birth Order	Yes		
PID	29	Patient Death Date and Time	No		
PID	30	Patient Death Indicator	No		

Tool: Local Mapping Template

The responses or answers to each of the fields above, may also be mapped using the local mapping template. This comprehensive spreadsheet includes the concepts associated with coded data elements specified within the LOI and LRI profiles. In the example below, Race is sent in PID-10 as a CWE datatype. The codes, names, and associated code system are available for each concept within the HL70005_USL value set. The Message Value column also previews the concept as it's displayed within the message. For example, race would be sent as a CWE triplet (ex. 2028-9^Asian^HL70005), while Sex (IS datatype) includes the concept code only (ex. F for Female).

Columns are available for local codes and descriptions. This spreadsheet allows for the associated standard values (either as the 'message value' or the component parts: code, name, code system) to be loaded into the application (LIMS, Rhapsody, HIS) where it will be maintained. Note: Concepts 'excluded' from the value set by the associated profile are not included.

Data Element	Datatype	Element Name	Answer List	Concept Code	Concept Name	Code System	Message Value	Local Code	Local Description
PID-8	IS	Administrative Sex	HL70001_USL	A	Ambiguous	HL70001	A	A	Ambiguous
PID-8	IS	Administrative Sex	HL70001_USL	F	Female	HL70001	F	F	Female
PID-8	IS	Administrative Sex	HL70001_USL	M	Male	HL70001	M	M	Male
PID-8	IS	Administrative Sex	HL70001_USL	N	Not Applicable	HL70001	N		
PID-8	IS	Administrative Sex	HL70001_USL	O	Other	HL70001	O		
PID-8	IS	Administrative Sex	HL70001_USL	U	Unknown	HL70001	U		
PID-10	CWE	Race	HL70005_USL	1002-5	American	HL70005	1002-5^American Indian or Alaska Native^HL70005	1	BLk
PID-10	CWE	Race	HL70005_USL	2028-9	Asian	HL70005	2028-9^Asian^HL70005	2	WHT
PID-10	CWE	Race	HL70005_USL	2054-5	Black or African	HL70005	2054-5^Black or African American^HL70005	3	ASIAN
PID-10	CWE	Race	HL70005_USL	2076-8	Native	HL70005	2076-8^Native Hawaiian or Other Pacific Islander^HL70005	4	AMER, INDIAN
PID-10	CWE	Race	HL70005_USL	2106-3	White	HL70005	2106-3^White^HL70005	5	MIXED/OTHER

Action Item

Task: Mapping

Tools: Implementation Workbook

Once the implementable profile has been defined, Implementers will use the LOI or LRI Implementation Workbook to continue to fill in the last remaining columns on the message specification tab with the local values, descriptions, and field locations from the database that contain these data elements. Use the columns provided to take note of any data elements that will need to be translated into a standard code system. Implementers should keep in mind that they only need to document on the relevant data elements that have been defined in the implementable profile.

Tools: Local Mapping Template

Implementers will use the Local Mapping template to document all local values that were identified to be translated using a standard code system. Only the coded data elements that are relevant to the implementable profile will need translated.

Message Validation

Validation of the raw HL7 message is essential to a successful implementation. This task, however, can be one of the most time and labor-intensive steps. Commercial products are available to parse and view messages; however, they do not allow for the content validation required for specific test scenarios.

Tool: Validation Template

The validation template is an excel spreadsheet that parses HL7 messages and compares the content of each field with the expected value of the data element.

Segment	Location	Element Name	Local Value	expected value	message value	compare
MSH	MSH	MSH	MSH	MSH	MSH	MSH
MSH	2	Encoding Characters	^~\&	^~\&	^~\&	Match
MSH	3	Sending Application	SendingApplicationName^2.	SendingApplicationName^2.16.840.1.114222.XXX^ISO	SendingApplicationName^2.16.840.1.114222.XXX^ISO	Match
MSH	4	Sending Facility	SendingFacilityName^2.16.8	SendingFacilityName^2.16.840.1.114222.XXX^ISO	SendingFacilityName^2.16.840.1.114222.XXX^ISO	Match
MSH	5	Receiving Application	VA StarLIMSv10	VA StarLIMSv10 Prod^2.16.840.1.114222.4.3.3.2.2.4^ISO	VA StarLIMSv10 Prod^2.16.840.1.114222.4.3.3.2.2.4^ISO	Match
MSH	6	Receiving Facility	VA PHL	VA PHL Richmond^2.16.840.1.114222.4.1.9977^ISO	VA PHL Richmond^2.16.840.1.114222.4.1.9977^ISO	Match
MSH	7	Date/Time Of Message	2/22/2017 6:54:38 PM	20170222185438-0500	20170222185438-0500	Match
MSH	8	Security	OML^O21^OML_O21	OML^O21^OML_O21	Null	
MSH	9	Message Type	OML^O21^OML_O21	OML^O21^OML_O21	OML^O21^OML_O21	Match
MSH	10	Message Control ID	MessageControlID	MessageControlID	MessageControlID	Match
MSH	11	Processing ID	P	P	P	Match
MSH	12	Version ID	Release 2.5.1	2.5.1	2.5.1	Match
MSH	15	Accept Acknowledgment Type	Always	AL	Null	
MSH	16	Application Acknowledgment Type	Always	AL	Null	
PID	PID	PID	PID	PID	PID	PID
PID	1	Set ID – PID	1	1	1	Match
PID	3	Patient Identifier List	987654321	987654321^^^HospitalSystem&2.16.840.1.114222.XXX&I	987654321^^^HospitalSystem&2.16.840.1.114222.XXX&I	Match
PID	5	Patient Name	ONE^TESTCASE	ONE^TESTCASE	ONE^TESTCASE	Match
PID	6	Mother's Maiden Name	MOMMAIDENONE	MOMMAIDENONE	MOMMAIDENONE	Match
PID	7	Date/Time of Birth	2/21/2017 1:52	201702210152-0500	201702210152-0500	Match
PID	8	Administrative Sex	Female	F	F	Match
PID	10	Race	White	2106-3^White^HL70005	2106-3^White^HL70005	Match
PID	13	Phone Number – Home	804-569-3861	^^^^^804^5693861	^^^^^804^5693861	Match
PID	22	Ethnic Group	Not Hispanic or Latino	N^Not Hispanic or Latino^HL70189	N^Not Hispanic or Latino^HL70189	Match
PID	30	Patient Death Indicator	No	N	Null	
NK1	NK1	NK1	NK1	NK1	NK1	NK1
NK1	1	Set ID - NK1	1	1	1	Match
NK1	2	Name	ONE^MOMFIRST	ONE^MOMFIRST	ONE^MOMFIRST	Match
NK1	3	Relationship	Mother	MTH^Mother^HL70063	MTH^Mother^HL70063	Match
NK1	7	Contact Role	Next-of-Kin	N^Next-of-Kin^HL70131	Null	
NK1	16	Date/Time of Birth	4/16/1986	19860416-0500	19860416-0400	

Valid responses for coded elements may be selected from a drop down. The expected value is populated accordingly:

Segment	Location	Element Name	Local Value	expected value	message value	compare
PID	22	Ethnic Group	Not Hispanic or Latino	Not Hispanic or Latino^HL70189	N^Not Hispanic or Latino^HL70189	Match
PID	23	Birth Place	Select from drop down		Null	Match
PID	24	Multiple Birth Indicator			Null	Match
PID	25	Birth Order			Null	Match
PID	26	Citizenship			Null	Match

Segment	Location	Element Name	Local Value	expected value	message value	compare
PID	22	Ethnic Group	Not Hispanic or Latino	Not Hispanic or Latino^HL70189	N^Not Hispanic or Latino^HL70189	Match
PID	23	Birth Place	Hispanic or Latino		Null	Match
			Not Hispanic or Latino			
PID	24	Multiple Birth Indicator	Unknown		Null	Match

Expected values are compared with the message value and identified as a 'match' in the Compare column:

| Segment	Location	Element Name	Local Value	expected value	message value	compare
PID	22	Ethnic Group	Hispanic or Latino	H^Hispanic or Latino^HL70189	N^Not Hispanic or Latino^HL70189	
PID	23	Birth Place			Null	Match
PID	24	Multiple Birth Indicator			Null	Match

OBX segments may be checked for a variety of fields, allowing for validation of the test and result values (OBX-3 and OBX-5) as well as the datatype (OBX-2), Observation Sub-ID (OBX-4) and others:

| Segment	Location	Element Name	Local Value	expected value	message value	compare
		Feeding types				
OBX	67704-7	Observation Identifier		67704-7^Feeding types^LN	67704-7^Feeding types^LN	Match
OBX	67704-7	Observation Value	Breast milk	LA16914-6^Breast milk^LN	LA16914-6^Breast milk^LN	Match
OBX	67704-7	Value Type		CWE	CWE	Match
OBX	67704-7	Observation Sub-ID			Null	Match
OBX	67704-7	Observation Result Status		O	O	Match
OBX	67704-7	Date/Time of the Analysis	201707111536-0500	201707111536-0500	201707111536-0500	Match
OBX	67704-7	Observation Type	^1^16	^1^16	^1^16	Match

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Instructions

<u>To enter a new message:</u>

1. Ensure that the 'Message_Input' tab is clear. If a message already exists, highlight any rows that will need to be cleared, right click and select 'Clear Contents'.
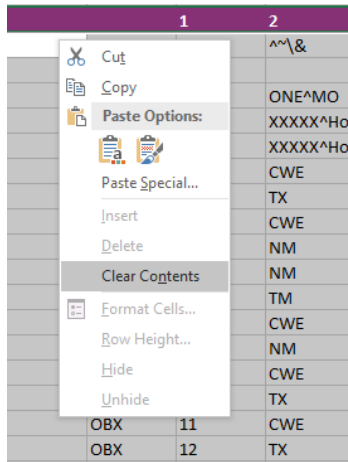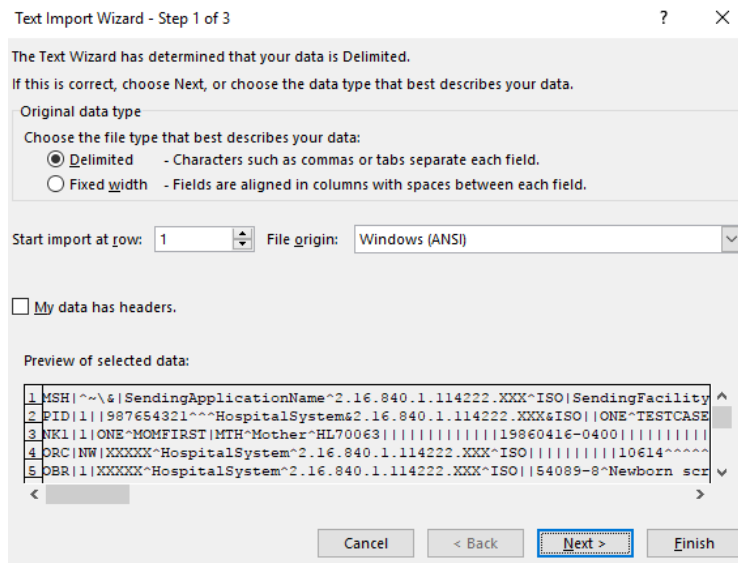

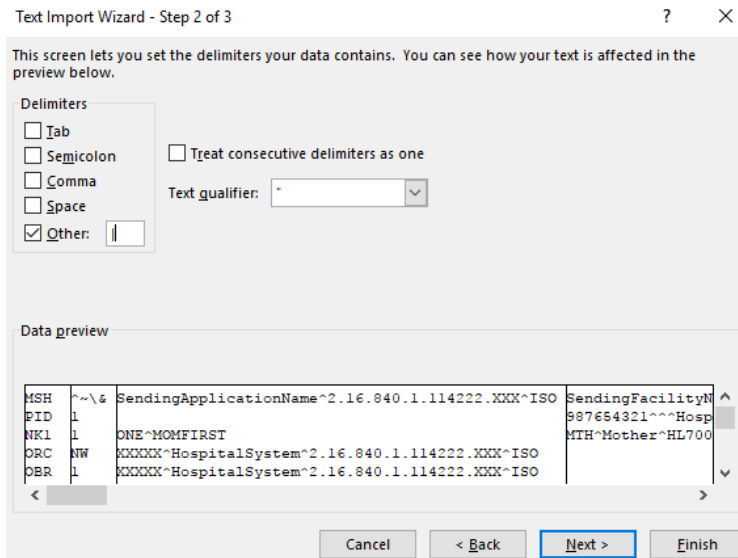2. Copy the message, place your cursor on (not in) B2, and paste.
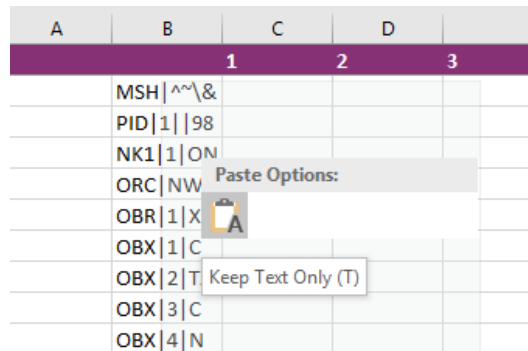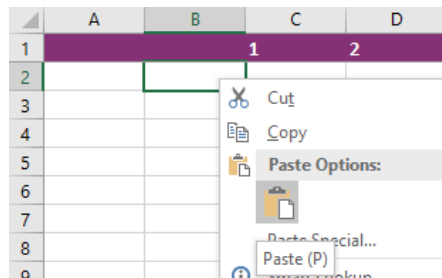
3. Use the Text Import Wizard to parse using the pipe (|) delimiter:
   a. Find the 'Use Text Import Wizard' from the paste options offered at the end of the pasted range:
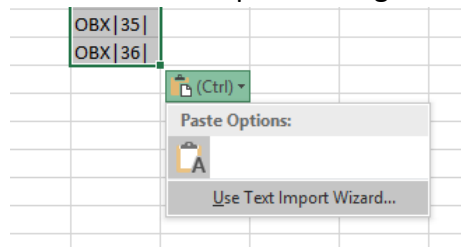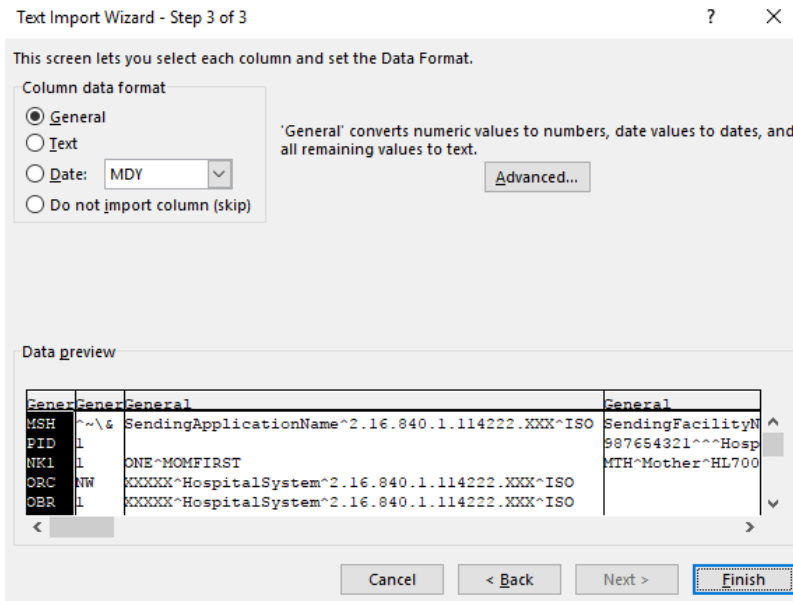

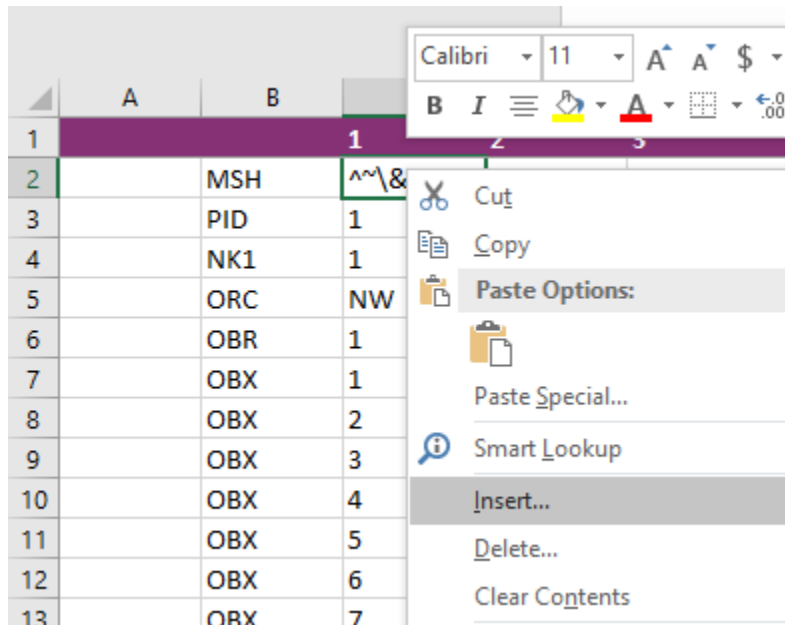   b. Chose the 'Delimited' file type

   c. Select 'Other' Delimiter and enter a pipe '|' (Shift+\)

d. Select 'Finish'

e. To accommodate for the field separator in MSH-1, place your cursor on C2, right click and insert

f. Shift cells right

▲	A	B	C	D	
1			**1**	**2**	**3**
2		MSH	^~\&	SendingA	Sending
3		PID	1		9876543
4		NK1	1	ONE^MO	MTH^M(
5		ORC			
6		OBR			
7		OBX			7721-3'
8		OBX			7716-3'
9		OBX			9566-6'
10		OBX			339-4^F
11		OBX			8229-6'
12		OBX			3806-2'
13		OBX			7722-1'
14		OBX	8	NM	57714-8'
15		OBX	9	CWE	57713-0'

Insert ? ✕

Insert
◉ Shift cells right
○ Shift cells down
○ Entire row
○ Entire column

OK   Cancel

▲	A	B	C	D	
1			**1**	**2**	**3**
2		MSH		^~\&	SendingApplicationNam
3		PID	1		987654321^^^HospitalSy
4		NK1	1	ONE^MO	MTH^Mother^HL70063
5		ORC	NW	XXXXX^Ho	
6		OBR	1	XXXXX^Ho	
7		OBX	1	CWE	57721-3^Reason for lab t
8		OBX	2	TX	57716-3^State printed or
9		OBX	3	CWE	79566-6^Collection meth
10		OBX	4	NM	8339-4^Birth weight Mea
11		OBX	5	NM	58229-6^Body weight Me
12		OBX	6	TM	73806-2^Newborn age in

Action Item

Task: Validation

Tools: LOI and LRI validation spreadsheet

Create a raw HL7 message that follows a specific test case and the static definition of your implementable profile. Submit the raw message into the validation spreadsheet using the instructions above. Validate the test case content and structure of the message within the validation template. Implementers will be tracking all validation issues that arise during the next task.

Feedback

Message validation often results in an iterative process to address problems or required changes. A feedback template can aid in organizing outstanding issues and tracking their resolution. Templates may be used alone or as preparation before logging items in an issue tracking software.

Tool: Feedback Template

Comment	Validation Status	Error Message	Suggested Fix	Resolution
Test Case #1				
Test Case #2				