



**Newborn Dried Blood Spot (NDBS) Screening  
Implementation Guide for Laboratory Orders  
U.S. Realm**

**OML^O21  
HL7 Version 2.5.1**

**Version 1.0.1  
Final Version**

**October 12, 2011**

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## Summary of Revisions

Version	Date	
1.0	May 31, 2011	Final version approved by the workgroup
1.0.1	October 12, 2011	<p>Technical corrections to accommodate new LOINC codes:</p> <ul style="list-style-type: none"> <li>• Corrected data type to ST string (from ID) for Unique Bar Code of Current Sample (LOINC code 57723-9) and Unique Bar Code of Initial Sample (57711-4).</li> <li>• Added new LOINC codes and coded answer lists for Feeding Types (67704-7), Infant NICU factors that affect newborn screening interpretation (57713-0, previously called “Clinical events”) and Maternal factors that affect newborn screening interpretation (67706-2).</li> <li>• Corrected value data type to DTM for 62317-3 Date of Last Blood Product Transfusion.</li> </ul>

# 1. Introduction

## 1.1. Background

Newborn Dried Blood Spot (NDBS) Screening is used to screen newborns routinely for certain genetic, metabolic, hormonal, and functional disorders. While these disorders are rare, diagnosing them allows for early treatment to improve a baby's health and to prevent possible disabilities, and in some cases, death.

As with many aspects of healthcare, the organization and delivery of newborn care is information-intensive and can be facilitated by automating information management, usually in the form of electronic health records (EHR) or health information systems.

Currently, the majority of birthing centers / hospitals must complete a manual requisition for the laboratory specimen separate from the hospital's internal clinical information system, batch specimens together, and mail them to the newborn screening laboratory for testing. While the NDBS specimens would still have to be mailed, enabling the order process to occur via electronic data exchange between the birthing center/hospital and a public health laboratory would improve the accuracy and completeness of NDBS orders, provide an opportunity to improve laboratory quality assurance, and potentially expedite the entire process.

Health Level Seven (HL7)<sup>1</sup> is an internationally recognized standard for electronic exchange of healthcare data. HL7 defines a standard syntax, or grammar, for formulating the messages that carry the healthcare information being exchanged healthcare information systems.

In 2010, Public Health Informatics Institute (PHII), through a grant funded by the Health Resources and Services Administration (HRSA), convened a workgroup to develop a message implementation guide for NDBS laboratory orders. The workgroup members included representatives from public health laboratories, hospitals, public health agencies, an EHR vendor, and the U.S. National Library of Medicine.

This document, the *Newborn Dried Blood Spot (NDBS) Screening Implementation Guide for Laboratory Orders*, is the collaborative effort of that workgroup and is based on HL7 Version 2.5.1, as published by the HL7 organization ([www.hl7.org](http://www.hl7.org)). The *Newborn Dried Blood Spot (NDBS) Screening Implementation Guide for Laboratory Orders*, referred to in this document as *the Guide*, is intended to provide an electronic message template for the NDBS community to use for sending standardized NDBS laboratory orders.

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<sup>1</sup> <http://www.hl7.org/>

## 1.2. Purpose

The purpose of this Guide is to define an HL7 message for transmitting NDBS Laboratory Orders. It provides a recommended approach for using an HL7 Version 2.5.1 OML^O21 message to send an NDBS laboratory test order from the placer, such as the physician or birth hospital, to the laboratory fulfilling the order. In the HL7 standard, the OML event O21 message is used for laboratory order messages.

### HL7 Standard version 2.5.1

HL7 Standard version 2.5.1 was selected for the message specification in order to align with other adopted standards in places that call for the implementation of version 2.5.1, and to support the increasing number of systems that are adopting or have adopted HL7 version 2.5.1 as a result of those standards. It is recognized that HL7 version 2.3.1 is still used by many electronic health systems in the healthcare community. Thus, the OML^O21 message type has been specified without the use of the Specimen (SPM) segment, in order for those systems using HL7 version 2.3.1 to be able to create messages for laboratory orders without complex database changes. The workgroup determined that this is the most effective way of bridging the gap between the two versions and to provide the best opportunity for adoption across a broader range of partners. Since the business practices modeled in this document pertain specifically to the United States, this implementation guide is considered a U.S. realm document in HL7.

### Vocabulary Standards

This Guide provides recommendations on specific vocabulary standards for Newborn Dried Blood Spot Screening laboratory test orders. Standard vocabularies are important to enable a broader implementation of electronic data exchange. Without it, each facility or data exchange partner would be required to exchange master files that provide references for their specific vocabulary usage. Using vocabulary standards, each partner maps its own local vocabularies to a standard code, enabling partners to understand the data being transmitted.

In this Guide, the vocabulary and code sets that are used include: HL7, Logical Observation Identifiers Names and Codes® (LOINC)<sup>2</sup>, Systematized Nomenclature of Medicine – Clinical Terms (SNOMED CT)<sup>3</sup>, which are referenced within the LOINC code answer sets, and Unified Code for Units of Measure (UCUM)<sup>4</sup>.

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<sup>2</sup> <http://loinc.org/>

<sup>3</sup> <http://www.ihtsdo.org/>

<sup>4</sup> <http://www.unitsofmeasure.org/>

## Strong Identifiers

The workgroup recognized that there is a challenge in and need for having strong identifiers that are retained and used across systems to uniquely identify key information objects, such as patients, orders, specimen cards, providers, and facilities. Strong identifiers are identifiers that remain unique outside of the context in which they are created. The challenge includes not only which identifiers to use, but also the process in which identifiers are assigned and retained.

Addressing and recommending best practices for a process to assign and retain identifiers is outside the scope of this document. However, this implementation guide provides recommendations on the types of identifiers to capture, which HL7 field those identifiers are mapped to, and the specific identifiers that may be used. In the HL7 standard, the use of an assigning authority in conjunction with an identifier provides a strong identifier that is unique across systems.

## 1.3. Document Scope

- This Guide represents a constraint on the full HL7 version 2.5.1 standard as it pertains to transmission of NDBS laboratory orders along with recommended standard vocabularies. This is done in order to simplify implementation. This Guide does not replace the overall v2.5.1 standard.
- The scope of this Guide is to describe the specifications and how specifications may be used for sending electronic lab orders in the *current state* of business process flow in Newborn Dried Blood Spot Screening. Future state or business process redesign is outside the scope of this document.
- This Guide primarily supports the interaction between hospitals and healthcare providers that conduct NDBS screening and place a laboratory order, and the laboratories that fulfill the order. Other use cases, such as newborn hearing screening that may be related to newborn screening in general, as well as other processes within newborn dried blood spot screening, such as sending laboratory results or follow-up of abnormal results, are outside of the scope of this document.
- This Guide provides a general set of specifications for NDBS laboratory orders. It does not identify, eliminate, or override variations in state or local jurisdiction requirements for data collection, reporting, or protection of privacy and security of patient data. Variations in local laws and practices may result in additional data requirements for NDBS screening.

- This Guide provides specifications for NDBS screening conducted within the United States. NDBS screening practices and specifications of electronic messages exchanged for newborn screening conducted internationally outside of the United States are outside the scope of this document. However, NDBS programs outside of the U.S. could adapt this Guide.

## 1.4. Intended Audience

The audience of this Guide includes:

- EHR technology vendors who can utilize this Guide during development, planning, and implementation.
- IT Systems developers who are implementing electronic messages for data exchange
- Hospitals and healthcare providers for newborns, who are responsible for collecting specimens and submitting laboratory orders
- Laboratories accepting NDBS specimens
- Public Health Agencies and stakeholders who seek to better understand the current and potential future of EHR technology to improve health

This Guide is not intended as a comprehensive tutorial for HL7. Instead, it focuses on a specific constraint on the full HL7 version 2.5.1 standard as it pertains to transmission of NDBS laboratory orders, including a subset of recommended standard vocabularies.

## 1.5. Future Efforts

As the HL7 Standard evolves, future efforts will include the updating of this Guide for NDBS laboratory orders to encompass future versions of HL7.

In addition, PHII previously released a messaging implementation guide for NDBS laboratory test results<sup>5</sup> that specifies HL7 version 2.3.1 message type ORU^R01. To align with this NDBS laboratory orders implementation guide, the test results guide will be updated to use HL7 version 2.5.1 message type ORU^R01, using the same message type, but updated to HL7 version 2.5.1. This effort will begin December 2010/January 2011.

Other possible future efforts include:

- A redesign or process improvement analysis of the NDBS Screening business process in an effort to improve current practices.

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<sup>5</sup> Public Health Informatics Institute, "Implementation Guide for Reporting Test Results of Newborn Dried Blood Spot (NDBS) Screening to Birth Facility and Other Interested Parties", Decatur, GA, June 2009.

- Additional implementation guides for use cases that support Newborn Screening in general or other aspects of NDBS screening.

## 1.6. Assumptions

- Electronic health record systems and laboratory systems are in place that allow for the electronic messaging of laboratory orders.
- The data specified and agreed upon for data exchange is available. The order, paper or electronic, contains sufficient information for the placer to construct the lab order message properly.
- Exchange partners agree to the standards, methodologies, and consent, privacy and security requirements for data exchange.
- Privacy and security provisions have been implemented as set forth by federal, state, and local jurisdictions.
- Each OML^O21 message contains laboratory order information for a *single* Newborn Dried Blood Spot card (the specimen).

## 1.7. Contacts

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## 2. NDBS Screening Business Process

This Guide supports the business process of ordering laboratory tests for Newborn Dried Blood Spot Screening. This section describes that business process in detail.

### 2.1. Business Process Matrix for Newborn Screening

The **business process** supported in this Guide is the *ordering of laboratory tests for Newborn Dried Blood Spot Screening*. This process is only a portion of the entire Newborn Screening process.

The Business Process Matrix details the components that characterize a business process, including the goal, objective, business rules, triggers, task set, inputs, outputs and measurable outcomes.

The business process of ordering NDBS laboratory tests supports the main **goal** of preventing complications from detectable heritable disorders. The **objective** of the business process is to ensure that all infants are screened 24 hours after birth, as possible.

The following table provides the definitions of the components and how they are used to define the business process<sup>6</sup>:

Figure 2-1: Definition of Business Process Matrix components

Component	Definition
Goal	The major health goal that the business process supports. The goal is the end state to be achieved by the work of the health agency and its data sharing partners and is defined in terms of the benefits provided to the community/population or individual.
Objective	A concrete statement describing what the business process seeks to achieve. The objective is specific to the process such that one can evaluate the process or reengineer the process and quantify performance measures.
Business Rules	A set of criteria that defines or constrains some aspect of the business process. Business rules are intended to assert business structure or to control or influence the behavior of the business.

<sup>6</sup> Public Health Informatics Institute, "Taking Care of Business: A Collaboration to Define Local Health Department Business Processes", Decatur, GA, 2006.

Component	Definition
Task Set	The set of activities that are carried out in a business process.
Input	Information received by the business process from external sources. Inputs are not generated within the process.
Output	Information transferred out from a process. The information may have been the resulting transformation of an input, or it may have been information created within the business process.
Measurable Outcome	The resulting transaction of a business process that indicates the objective has been met. Often, measures can be associated with the outcome (e.g., how much, how often, etc.).

The following matrix defines the components of the business process of *ordering NDBS laboratory tests*.

Figure 2-2: Business Process Matrix for ordering NDBS laboratory tests

**BUSINESS PROCESS MATRIX: ORDERING NDBS LABORATORY TESTS**

OBJECTIVES	BUSINESS RULES	TRIGGER	TASK SET	INPUT	OUTPUTS	MEASURABLE OUTCOMES
Ensure all infants are screened 24 hours after birth, as possible, and as indicated in other cases.	<ul style="list-style-type: none"> <li>• State policies, laws, rules and regulations</li> <li>• State and federal advisory recommendations</li> <li>• Professional recommendations and guidelines</li> <li>• Hospital/State protocol</li> </ul>	<p>Child is born in the US at a hospital or birthing center</p> <p>Neonatal transfer into a hospital</p>	<ul style="list-style-type: none"> <li>• Birth/Identify Newborn</li> <li>• Physician Order</li> <li>• Opt Out</li> <li>• Document Dissent</li> <li>• Send Electronic Refusal Order</li> <li>• Complete Screening Form</li> <li>• Obtain Specimen</li> <li>• Send Electronic Order</li> <li>• Send Specimen to Screening Lab</li> <li>• Document the specimen(s) sent</li> <li>• Receive Order Acknowledgement</li> <li>• Receive Specimen Acknowledgment</li> </ul>	<ul style="list-style-type: none"> <li>• Blank Collection Kit (filter paper) sent from state lab to birth center</li> <li>• Demographic information</li> <li>• Opt Out form</li> </ul>	<ul style="list-style-type: none"> <li>• Screening order to state lab</li> </ul>	<ul style="list-style-type: none"> <li>• Proportion of newborns screened</li> <li>• Proportion of unsatisfactory samples</li> <li>• Proportion of all test results reported per state specific rule</li> <li>• Proportion of out of range (abnormal) results</li> <li>• Percent of screening completed in a stated time based on best practices</li> <li>• Proportion lost to follow up</li> <li>• Interval between birth and diagnosis</li> <li>• QA and QI metrics</li> </ul>

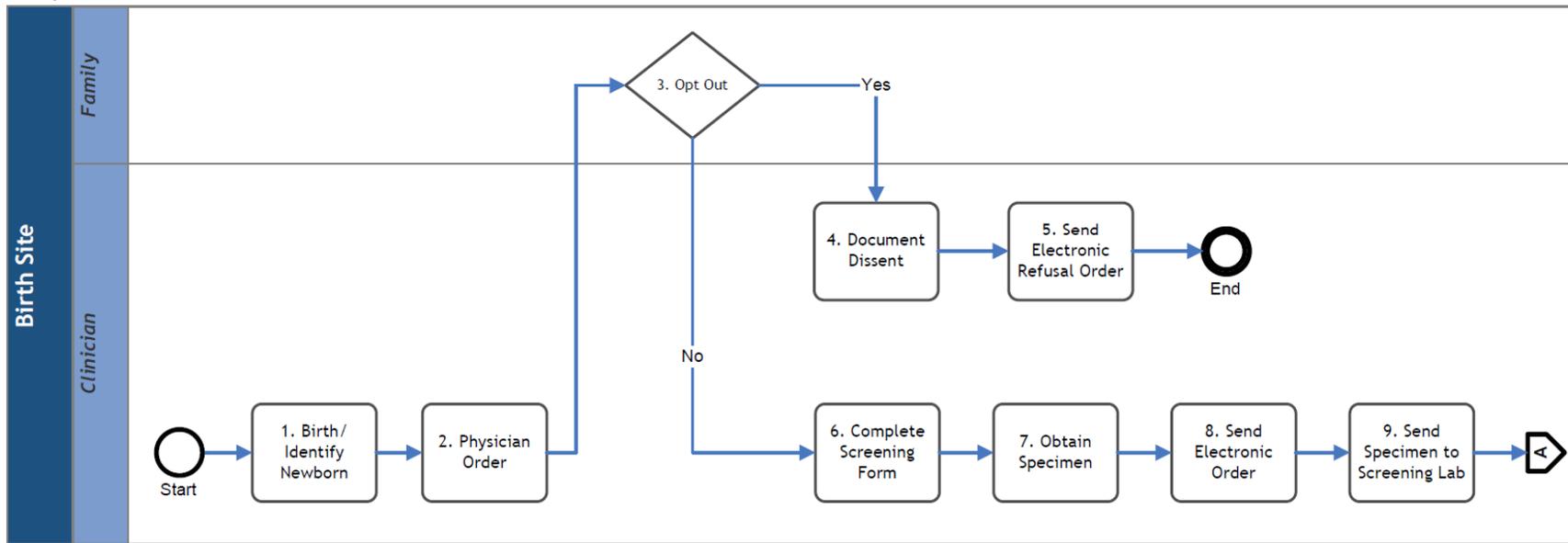
## 2.2. Laboratory Test Order for NDBS First Screening

This section depicts the task flow diagram for placing an initial laboratory order for NDBS screening. A task flow diagram graphically represents how activities within the business process proceed from the trigger point to the output. Below the task flow diagram is the activity detail and narrative that corresponds to each task.

Figure 2-3: Task flow diagram for laboratory orders for NDBS first screening

### Newborn First Screening Order

1 of 2



## Newborn First Screening Order

2 of 2

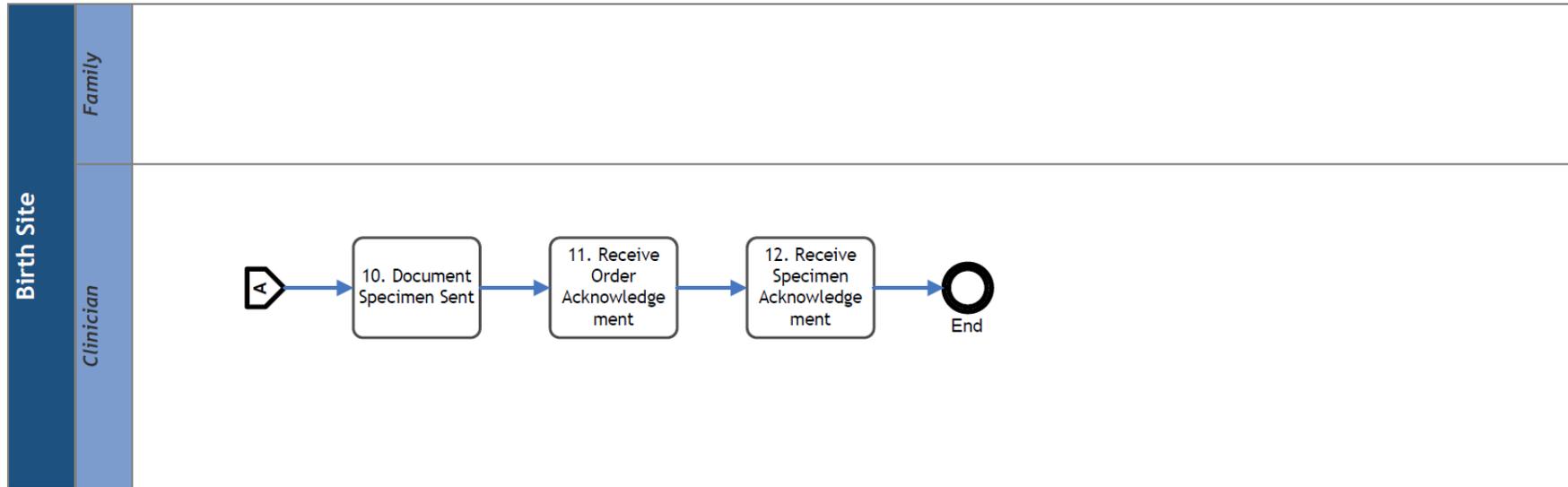


Figure 2-4: Activity details and narrative for laboratory orders for NDBS first screening

<b>Activity Details / Narrative</b>	<p><b><u>General Process Notes</u></b>  <b>Objective:</b> Ensure all infants are screened 24 hours after birth, as possible, and as indicated in other cases.</p> <p><b>1. Birth/Identify Newborn</b></p> <ul style="list-style-type: none"> <li>The newborn is identified for screening.</li> <li>Demographic information is gathered.</li> </ul> <p><b>2. Physician Order</b></p> <ul style="list-style-type: none"> <li>The NDBS order is documented via a system, log, or other procedure.</li> </ul> <p><b>3. Opt Out</b></p> <ul style="list-style-type: none"> <li>If allowed, the family may choose to deny the test.</li> </ul> <p><b>4. Document Dissent</b></p> <ul style="list-style-type: none"> <li>Documentation created to record the family's denial of the test. Family may also refuse to sign dissent form.</li> <li>Additional education may be provided to the family concerning newborn screening.</li> </ul> <p><b>5. Send Electronic Refusal Order</b></p> <ul style="list-style-type: none"> <li>If the family chooses to opt out, an electronic order of refusal is sent to the screening laboratory.</li> </ul> <p><b>6. Complete Screening Form</b></p> <ul style="list-style-type: none"> <li>Information is transferred to the screening form.</li> </ul> <p><b>7. Obtain Specimen</b></p> <ul style="list-style-type: none"> <li>The specimen is collected from the newborn.</li> </ul> <p><b>8. Send Electronic Order</b></p> <ul style="list-style-type: none"> <li>An electronic order is sent to the screening laboratory.</li> </ul> <p><b>9. Send Specimen to Screening Lab</b></p> <ul style="list-style-type: none"> <li>Specimens are sent to the screening lab via courier or other means (USPS, UPS, FedEx, etc.)</li> <li>Specimens may be sent directly from the nursery or from the laboratory.</li> </ul> <p><b>10. Document Specimen Sent</b></p> <ul style="list-style-type: none"> <li>Outgoing specimen log updated</li> </ul> <p><b>11. Receive Order Acknowledgement</b></p> <ul style="list-style-type: none"> <li>Receive order acknowledgement electronically</li> </ul> <p><b>12. Receive Specimen Acknowledgement</b></p> <ul style="list-style-type: none"> <li>Receive specimen acknowledgment electronically</li> </ul>
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## 2.3. Laboratory Test Order for NDBS Repeat Screening

The following task flow diagram and accompanying activity detail describes the activities related to a repeat NDBS Screening laboratory test order that may be submitted. A repeat test may be requested by the laboratory.

Figure 2-5: Task flow diagram for laboratory orders for NDBS repeat screening

### Newborn Repeat Screening Order

1 of 1

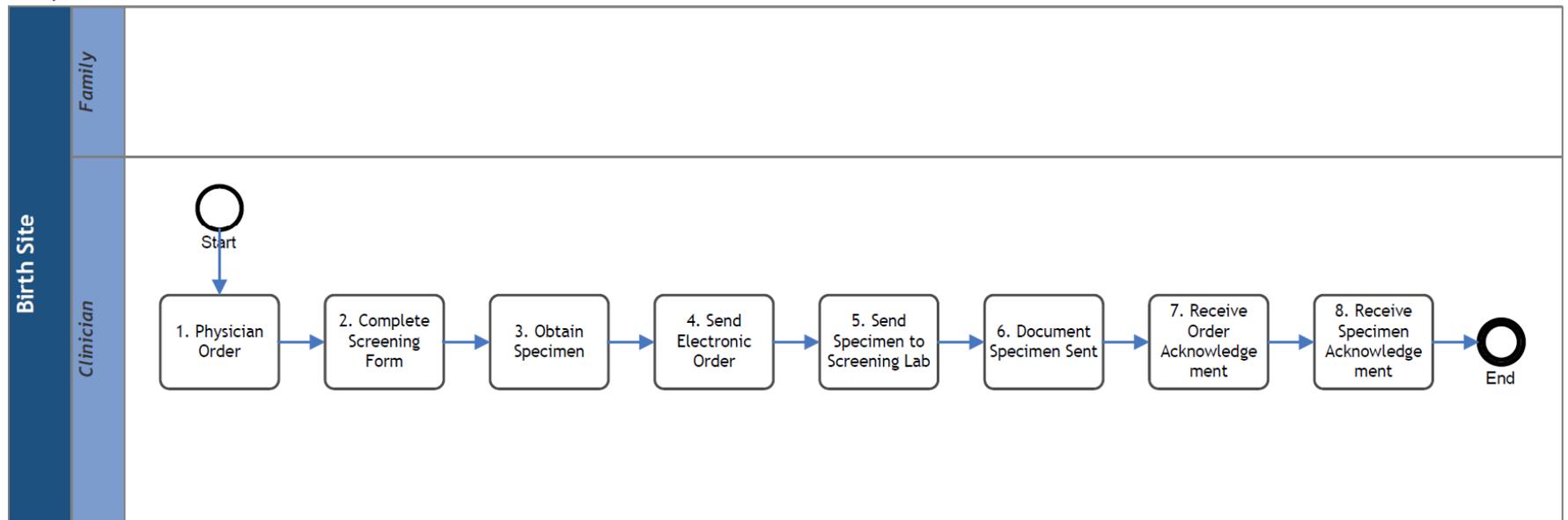


Figure 2-6: Activity detail and narrative for Laboratory Orders for NDBS Repeat Screening

<b>Activity Details / Narrative</b>	<p><b><u>General Process Notes</u></b> Objective: Ensure all infants are screened 24 hours after birth, as possible, and as indicated in other cases.</p> <p><b>1. Physician Order</b></p> <ul style="list-style-type: none"> <li>The NDBS order is documented via a system, log, or other procedure.</li> </ul> <p><b>2. Complete Screening Form</b></p> <ul style="list-style-type: none"> <li>Information is transferred to the screening form.</li> </ul> <p><b>3. Obtain Specimen</b></p> <ul style="list-style-type: none"> <li>The specimen is collected from the newborn.</li> </ul> <p><b>4. Send Electronic Order</b> An electronic order is sent to the screening laboratory.</p> <p><b>5. Send Specimen to Screening Lab</b></p> <ul style="list-style-type: none"> <li>Specimens are sent to the screening lab via courier or other means (USPS, UPS, FedEx, etc.)</li> <li>Specimens may be sent directly from the nursery or from the laboratory.</li> </ul> <p><b>6. Document Specimen Sent</b></p> <ul style="list-style-type: none"> <li>Outgoing specimen log updated</li> </ul> <p><b>7. Receive Order Acknowledgement</b></p> <ul style="list-style-type: none"> <li>Receive order acknowledgement electronically</li> </ul> <p><b>8. Receive Specimen Acknowledgement</b></p> <ul style="list-style-type: none"> <li>Receive specimen acknowledgment electronically</li> </ul>
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### 3. High-Level Interaction Model

This Guide provides specifications for the placing of a laboratory test order from the originating ordering application to the laboratory fulfilling the order, in the form of an order message OML^O21.

The following diagram illustrates where the OML^O21 message fits into an order interaction between the two systems.

The two systems involved are the ordering application (placer) and the laboratory system (filler). The ordering application originates an order and sends the order message (OML^O21) to the laboratory fulfilling the order. The order may be an initial screening laboratory order or a repeat screening laboratory order.

Upon receipt of the order message, the laboratory may synchronously respond with an ACK message to acknowledge that the laboratory received the electronic order message. The ACK message validates that the message is accepted or rejected due to errors. The sending of an ACK message is optional and should be defined by an agreement between placer and filler, since not all placers are able to accept an ACK message, nor can all fillers generate an ACK message.

Once the physical specimen (the NDBS card) is received by the laboratory, the laboratory may send a message to the placer to acknowledge the receipt of the physical specimen. There are two options for acknowledging the receipt of the physical specimen:

- Sending ORL^O22: This message type is a *general laboratory response message to any OML message* and may be used to acknowledge physical receipt of a specimen.

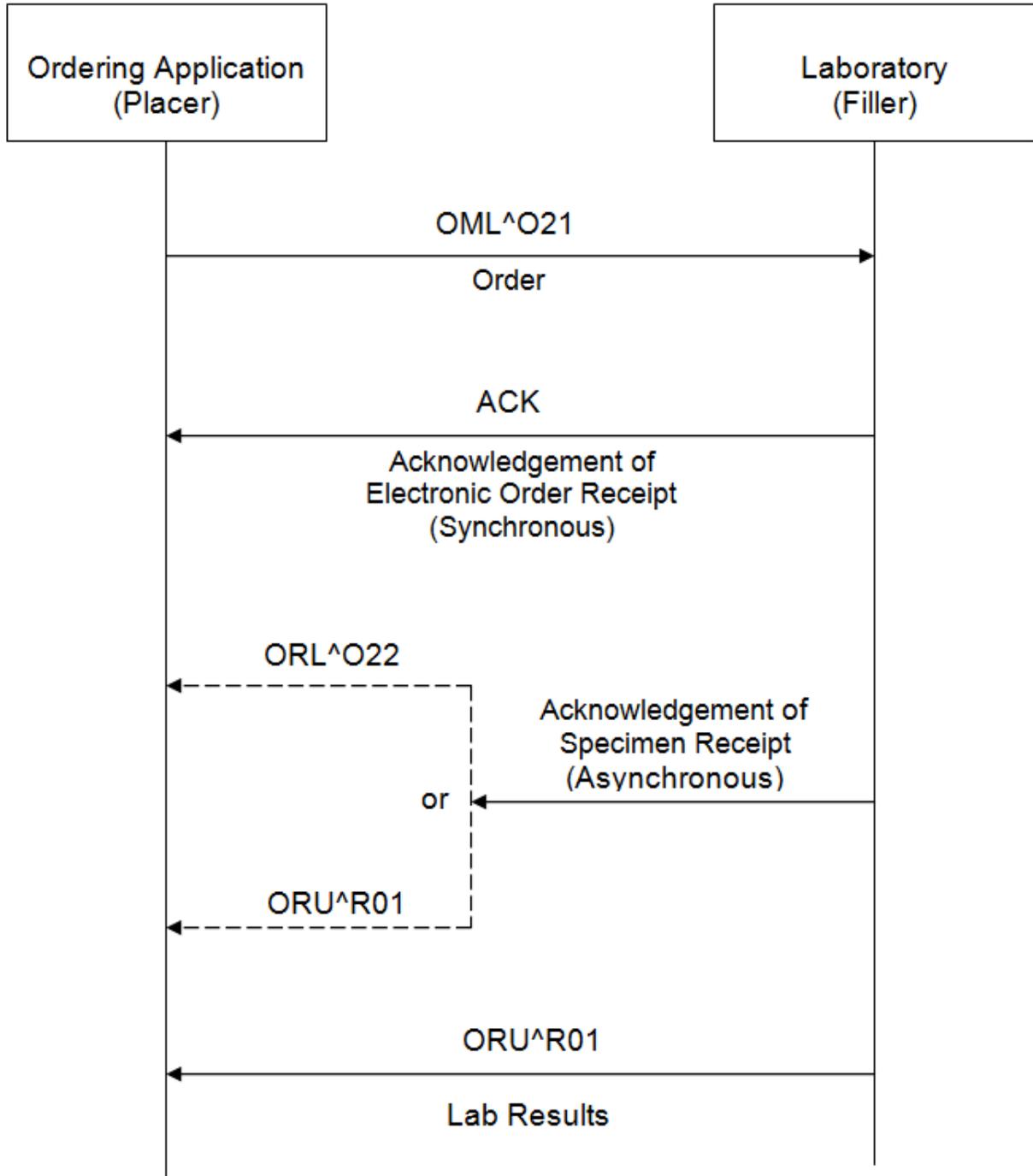
Note: Since use of the message type, ORL^O22, may not be common, future versions of this Guide may no longer support and may remove reference to this message type.

- Using ORU^R01: This message type is normally used to report laboratory results. In this case, the message would be used to report the preliminary lab status of a received physical specimen and indicate "Specimen in lab; results pending".

The sending of a message to acknowledge a physical specimen is optional and should be defined by an agreement between placer and filler.

After the laboratory testing is completed, the laboratory will send the results of the test back to the ordering application through a lab results message (ORU^R01).

Figure 3-1: High-level Interaction Model between placer and filler for NDBS laboratory test orders



## 4. Basic HL7 Construction Rules

This section describes the HL7 encoding rules for sending and receiving messages.

### 4.1. Encoding Rules for Sending

While constructing and sending a message, HL7 requires the following rules to be followed:

- Encode each message in the order specified in the abstract message format, which consists of a collection of segments.
- Place the Segment ID first in each segment.
- Precede each data field in each segment with the appropriate field separator.
- Encode the data fields in the order and data type specified in the segment definition table.
- End each segment with the segment terminator <CR> for “carriage return”.
- Components, subcomponents, or repetitions that are not valued at the end of a field need not be represented by component separators. The data fields below, for example, are equivalent:

|^XXX&YYY&&^| is equal to |^XXX&YYY^|

|ABC^DEF^^| is equal to |ABC^DEF|

- If a field allows repetition, the specified length for the field applies to each repetition.

### 4.2. Encoding Rules for Receiving

The following rules apply to receiving HL7 messages and converting their content to data values:

- All the required segments must be present.
- If an optional data segment is not included, treat the data segment as if all data fields that could have been included in that segment were not present.
- If a data segment is included that is not expected, ignore it; this is not an error.
- If the end of a data segment has unexpected data fields, ignore these data fields; this is not an error.

### 4.3. Implications of the Encoding Rules

The following table lists the expected outcome implied by the encoding rules above<sup>7</sup>:

<sup>7</sup> Center for Disease Control and Prevention, “Implementation Guide for Immunization Messaging HL7 Version 2.5.1”, Atlanta, GA, May 2010.

Figure 4-1: Outcome of encoding rule breaches

Condition	Immediate Outcome	Secondary Outcome
Required segment not present.	Message rejected.	Error message returned to sending system.
Segments not in correct order	Out of sequence segment ignored.	If this segment is required, then message rejected.
Segment not expected	Segment is ignored	
Non-repeating segment is repeated	Repeated segment is ignored. First segment is processed normally.	Information in the repeated segment is lost to receiving system.
Required segment has required fields that are not present or rejected due to errors	Message is rejected.	Error message returned to sending system.
Optional segment has required field that is not present or rejected due to errors.	Segment is ignored	Message is not rejected because of this error. Error message returned
Required field is not present.	Segment is ignored / rejected.	If segment is required, then message is rejected. If segment is not required, the information in the segment is lost to receiving system.
Required field is rejected due to errors.	Segment is ignored / rejected.	If segment is required, then message is rejected. If segment is not required, the information in the segment is lost to receiving system.
Incoming data value is not in the list of expected values for a field that is constrained to a list of values.	Accept the data as is and accept the message.	The receiving system should flag the deviation. Manual evaluation of the data should be conducted.

## 4.4. Use of Escape Sequences in Text Fields

### Formatting codes

When a field of type TX or FT is being encoded, the escape character may be used to signal certain special characteristics of portions of the text field. The escape character is whatever display ASCII character is specified in the <escape character> component of *MSH-2-encoding characters*. For purposes of this Guide, the character “\” will be used to represent the character so designated in a message. An **escape sequence** consists of the escape character followed by

an escape code ID of one character, zero (0) or more data characters, and another occurrence of the escape character.

The **escape sequences** for field separator, component separator, subcomponent separator, repetition separator, and escape character are also valid within an ST data field.

The following escape sequences are defined:

\H\	start highlighting
\N\	normal text (end highlighting)
\F\	field separator
\S\	component separator
\T\	subcomponent separator
\R\	repetition separator
\E\	escape character
\Xddd...\	hexadecimal data
\Zddd...\	locally defined escape sequence

No escape sequence may contain a nested escape sequence.

**Formatted text**

If the field is of the formatted text (FT) data type, formatting commands also may be surrounded by the escape character. Each command begins with the "." (period) character. The following formatting commands are available:

.sp <number>	End current output line and skip <number> vertical spaces. <number> is a positive integer or absent. If <number> is absent, skip one space. The horizontal character position remains unchanged. Note that only for purposes of compatibility with previous versions of HL7, “^\.sp\” is equivalent to “\br\.”
.br	Begin new output line. Set the horizontal position to the current left margin and increment the vertical position by 1.
.fi	Begin word wrap or fill mode. This is the default state. It can be changed to a no-wrap mode using the .nf command.
.nf	Begin no-wrap mode.
.in <number>	Indent <number> of spaces, where <number> is a positive or negative integer. This command cannot appear after the first printable

	character of a line.
.ti <number>	Temporarily indent <number> of spaces where number is a positive or negative integer. This command cannot appear after the first printable character of a line.
.sk <number>	Skip <number> spaces to the right.
.ce	End current output line and center the next line.

The component separator that marks each line defines the extent of the temporary indent command (.ti), and the beginning of each line in the no-wrap mode (.nf). Examples of formatting instructions that are NOT included in this data type include: width of display, position on page or screen, and type of output devices.

The following is an example of the FT data type from a radiology impression section of a radiology report:

Formatted text as transmitted:

```
\.in+4\\.ti-4\ 1. The cardiomediastinal silhouette is now within normal limits.\.br\\.ti-4\ 2. Lung fields show minimal ground glass appearance.\.br\\.ti-4\ 3. A loop of colon visible in the left upper quadrant is distinctly abnormal with the appearance of mucosal effacement suggesting colitis.\.in-4\|
```

The following box shows one way of presenting the data in the previous box. The receiving system can create many other interpretations by varying the right margin.

Formatted text in one possible presentation:

```
The cardiomediastinal silhouette is now within normal limits.

Lung fields show minimal ground glass appearance.

    A loop of colon visible in the left upper quadrant is distinctly
    abnormal with the appearance of mucosal effacement suggesting
    colitis.
```

## 5. HL7 Definitions

### 5.1. Terms

**Message:** A message is an entire unit of data transferred between systems in a single transmission. It is composed of segments in a defined sequence as defined in this Guide.

**Segment:** A segment is a logical grouping of data fields. Each segment is named and is represented by a unique 3-letter code.

Example:

```
PID|1||123456789^^^Assigning
Authority^MR||Smith^Tammy^Sue^^^^L||20100414|F|||123 Main
Street^^New York^NY^10025^^L
```

The 3-letter code of “PID” corresponds to the Patient Identifier segment of the message. In the example above, the PID segment contains the patient’s medical record number (123456789), the patient’s name (Tammy Sue Smith), along with the patient’s date of birth, sex, and address.

Segments within a defined message may be required or optional, may occur only once or may be allowed to repeat. Segments use the following convention to represent optionality and to specify whether the segment repeats:

Character	Description
XXX	Required
[ XXX ]	Optional
{ XXX }	Repeating
[ { XXX } ]	Optional and Repeating

**Field:** A field is a string of characters that represents the value for the field. Each field is identified by the segment and its position within the segment, such as MSH-2, which represents the second field in the Message Header segment. Data type and maximum length are specified for each field.

**Component:** A component is one of a logical grouping of items that comprise the contents of a field. For a field that has several components, not all components are required to be valued.

For example, the PID-5 field (Smith^Tammy^Sue^^^L), includes components for the patient’s last, first, and middle names.

**Null and empty fields:** The null value is transmitted as two double quote marks (“”). A field containing a null valued differs from an empty field. An empty field indicates that the sending system has no information for the field and that the receiving system should not modify or overwrite previously stored data for the field in the database. A null value means that any previous value stored in the receiving system database for this field should be overwritten and nullified.

**Delimiters:** Delimiter characters are used to separate segments, fields, components, and subcomponents in an HL7 message. Delimiter values are specified in MSH-2. The delimiter values used in the MSH segment are the delimiter values used throughout the entire message. The delimiters specified in this implementation guide include the following:

Character	Description
<CR>	Segment Terminator
	Field Separator
^	Component Separator
&	Sub-Component Separator
~	Repetition Separator

## 5.2. Usage Definitions

Usage refers to the circumstances under which an element (segment, field, component, or subcomponent) appears in a message. Some elements must always be present, others may never be present, and others may only be present in certain circumstances. A set of codes has been defined to clearly identify the rules governing the presence of a particular element.

Figure 5-1: Definition of Usage Codes

Value	Description	Comment
R	Required	<p>A conforming sending application shall populate all “R” elements with a non-empty value. Conforming receiving application shall process or ignore the information conveyed by required elements.</p> <p>A conforming receiving application must not raise an error due to the presence of a required element, but may raise an error due to the absence of a required element.</p>
RE	Required but may be empty	<p>The element may be missing from the message, but must be sent by the sending application if there is relevant data. A conforming sending application must be capable of providing all "RE" elements. If the conforming sending application knows the required values for the element, then it must send that element. If the conforming sending application does not know the required values, then that element will be omitted.</p> <p>Receiving applications will be expected to process or ignore data contained in the element, but must be able to successfully process the message if the element is omitted (no error message should be generated because the element is missing).</p> <p><b>Summary:</b> Both the sending and receiving system must support a data element designated as RE. If the data for the field exists in the sending system, then that data must be sent. The receiving system must be capable of receiving the data in that field. However, it must not raise an error if data for that field is missing.</p>
O	Optional	<p>This element may be present if specified in local profile. Local partners may develop profiles that support use of this element. In the absence of a profile, conformant sending applications will not send the element. Conformant receiving applications will ignore the element if it is sent, unless local profile specifies otherwise. Conformant receiving applications may not raise an error if it receives an unexpected optional element.</p> <p><b>Summary:</b> Both the sending and receiving system must support a data element designated as Optional. The sending system must be capable of sending data for that field, and the receiving system must be capable of receiving data for that field. Whether data for that</p>

Value	Description	Comment
		field is captured and sent is negotiated between the sender and receiver. Usage of optional fields will vary across jurisdictions based on jurisdictional requirements.
C	Conditional	<p>This usage has an associated condition predicate. The associated condition predicate is specified in the HL7 message definition.</p> <p><b>If the predicate is satisfied:</b> A conformant sending application must always send the element. A conformant receiving application must process or ignore data in the element. It may raise an error if the element is not present.</p> <p><b>If the predicate is NOT satisfied:</b> A conformant sending application must NOT send the element. A conformant receiving application must NOT raise an error if the condition predicate is false and the element is not present, though it may raise an error if the element IS present.</p>
CE	Conditional but it may be empty	<p>This usage has an associated condition predicate. The associated condition predicate is specified in the HL7 message definition.</p> <p><b>If the predicate is satisfied:</b> If the conforming sending application knows the required values for the element, then the application must send the element. If the conforming sending application does not know the values required for this element, then the element shall be omitted. The conforming sending application must be capable of knowing the element (when the predicate is true) for all 'CE' elements.</p> <p>If the element is present, the conformant receiving application shall process or ignore the values of that element. If the element is not present, the conformant receiving application shall not raise an error due to the presence or absence of the element.</p> <p><b>If the predicate is not satisfied:</b> The conformant sending application shall not populate the element. The conformant receiving application may raise an application error</p>

Value	Description	Comment
		if the element is present.
X	Not supported	The element is not supported. Sending applications should not send this element. Receiving applications should ignore this element if present, or may raise an error.

### 5.3. Cardinality Definitions

Cardinality identifies the minimum and maximum number of repetitions for a particular element. A conformant application must always send at least the minimum number of repetitions, and may never send more than the maximum number of repetitions.

Figure 5-2: Definition of Cardinality Values

Value	Description
[0..0]	Element never present
[0..1]	Element may be omitted and it can have at most one occurrence
[1..1]	Element must have exactly one occurrence
[0..n]	Element may be omitted or may repeat up to n times
[1..n]	Element must appear at least once, and may repeat up to n times
[0..*]	Element may be omitted or repeat for an unlimited number of times
[1..*]	Element must appear at least once, and may repeat unlimited number of times
[m..n]	Element must appear at least <i>m</i> times and at most <i>n</i> times (where <i>m</i> and <i>n</i> are > 1)

## 6. HL7 Data Types

To achieve successful exchange of healthcare data, the meaning of the data being exchanged must be understood and defined in the same way by both the sender and the receiver. Data types provide that definition and are the basic building blocks used to construct the HL7 message.

For example, dates may be formatted in many ways. It is unclear whether “080510” represents August 5<sup>th</sup> 2010, May 10<sup>th</sup> 2008 or a different date. To ensure interoperability, the date format must be constrained and defined. In this example, the DTM (date/time) data type provides that definition.

Each field, component or subcomponent has a data type. The data type constrains and defines the field, component, or subcomponent at the most granular level, including specifications for formatting, additional rules, and usage details for each data type. Additionally, data types may contain subcomponents that are specified by data types.

This section describes the data types that are supported in this Guide. This section should be referenced when reviewing and implementing the segment definitions. This Guide does not contain a comprehensive list of all HL7 data types.

### List of Data Types

Below is a list of data types that are supported in this Guide.

Figure 6-1: List of HL7 data types supported in this Guide

Data Type	Description
CE	Coded Element
CX	Extended Composite ID with Check Digit
DTM	Date/Time
EI	Entity Identifier
ELD	Error Location and Description
ERL	Error Location
FN	Family Name
FT	Formatted Text Data
HD	Hierarchic Designator
ID	Coded Value for HL7 defined tables
IS	Coded Value for User defined tables
MSG	Message Type

Data Type	Description
NM	Numeric
PT	Processing Type
SAD	Street Address
SI	Sequence ID
ST	String Data
TM	Time
TN	Telephone Number. This data type is deprecated in HL7 version 2.5.1, but is allowed for use in the OBX segment.
TS	Time Stamp
VID	Version Identifier
XAD	Extended Address
XCN	Extended Composite ID Number and Name for Persons
XON	Extended Composite Name and ID Number for Organizations
XPN	Extended Person Name
XTN	Extended Telecommunications Number

## 6.1. CE – Coded Element

This data type transmits codes and the text associated with the code.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	20	ST	RE		Identifier	Unique identifying code.
2	999	ST	CE		Text	The descriptive or textual (local, human-readable string) name of the identifier, e.g., Mother. This description is used to facilitate human interpretation of the code  If sequence 1 is populated, this field should also be populated.
3	20	ID	C	0396	Name of Coding System	Identifies the coding scheme being used in the identifier component, e.g., HL70063. The combination of the <b>identifier</b> and <b>name of coding system</b> components will be a unique code for a data item. Each system has a unique identifier, found in HL7 Table 0396, Coding Systems.  If sequence 1 is populated, this field must be populated.
4	999	ST	RE		Alternate Identifier	The alternate identifier (from an alternate coding system) should be the closest match for the identifier found in sequence 1.
5	999	ST	CE		Alternate Text	The descriptive or textual name of the alternate identifier. This description is used to facilitate human interpretation

Seq	Len	DT	Usage	TBL#	Component Name	Comments
						of the code.  If sequence 4 is populated, this field should also be populated.
6	20	ID	CE	0396	Name of Alternate Coding System	Identifies the coding scheme being used in the alternate identifier component.. The combination of the <b>alternate identifier</b> and <b>name of alternate coding system</b> components will be a unique code for a data item. Each system has a unique identifier, found in HL7 Table 0396, Coding Systems.  If sequence 4 is populated, this field must be populated.

Example:

From NK1-3, Relationship:

|MTH^Mother^HL70063|

From OBR-4, Universal Service ID:

|54089-8^Newborn screening panel AHIC^LN|

## 6.2. CX - Extended Composite ID with Check Digit

This data type is used for specifying an identifier with its associated administrative detail.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	15	ST	R		ID Number	Value of the identifier. The ID Number component combined with the Assigning Authority component must uniquely identify the associated object.
2	1	ST	X		Check Digit	Not supported
3	3	ID	X	0061	Check Digit Scheme	Not supported
4	227	HD	R	0363	Assigning Authority	The assigning authority is a unique name or identifier of the system (or organization or agency or department) that creates the data.  Uniquely identifies the system, application, organization, etc. that assigned the value in sequence 1
5	5	ID	R	0203	Identifier Type Code	A code corresponding to the type of identifier. In some cases, this code may be used as a qualifier to the "Assigning authority" component

Seq	Len	DT	Usage	TBL#	Component Name	Comments
6	227	HD	RE		Assigning Facility	Uniquely identifies the place or location that assigned the value in sequence 1
7	8	DT	X		Effective Date	Not supported
8	8	DT	X		Expiration Date	Not supported
9	705	CE	X		Assigning Jurisdiction	Not supported
10	705	CE	X		Assigning Agency or Department	Not supported

The CX data type is used to carry identifiers. This Guide requires that all identifiers be accompanied by assigning authorities, and that all identifiers carry an identifier type. This method allows the exchange of unique identifiers for the associated object across organizational and enterprise boundaries, enabling broad interoperability. Although the Identifier Type Code component is required, it is not a part of the actual identifier. Rather, it is metadata about the identifier. The ID Number and Assigning Authority component, together, constitute the actual identifier.

Example from PID-3, Patient Identifier List:

```
|123456789^^^MVH&7839462089&NPI^MR|
```

This example shows the PID-3 field depicting a patient that has a medical record number of '123456789' assigned by Mountain View Hospital (abbreviation 'MVH'). Mountain View Hospital has an assigned NPI number of '7839462089'.

### 6.3. DTM – Date/Time

This data type specifies a point in time using a 24-hour clock notation.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	24		R		Date/Time	

The number of characters populated (excluding the time zone specification) specifies the precision. Format: YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]]]][+/-ZZZZ].

Thus:

- Four digits are used to specify a precision of "year"
- Six are used to specify a precision of "month"
- Eight are used to specify a precision of "day."
- the first ten are used to specify a precision of "hour"

- the first twelve are used to specify a precision of "minute"
- the first fourteen are used to specify a precision of "second"
- the first sixteen are used to specify a precision of "one tenth of a second"
- the first nineteen are used to specify a precision of " one ten thousandths of a second"

Example: |199904| specifies April 1999.

The time zone (+/-ZZZZ) is represented as +/- HHMM offset from Coordinated Universal Time (UTC) (formerly Greenwich Mean Time (GMT)), where +0000 or -0000 both represent UTC (without offset). When the time zone is not included, it is presumed to be the time zone of the sender.

## 6.4. EI - Entity Identifier

The entity identifier defines a given entity within a specified series of identifiers. The EI data type is used to carry identifiers.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	199	ST	RE		Entity Identifier	<p>Unique identifier for the entity.</p> <p>The following list includes the types of unique identifiers that may be used:</p> <ul style="list-style-type: none"> <li>• National Provider Identifier (NPI);</li> <li>• Object Identifier (OID);</li> <li>• Clinical Laboratory Improvement Amendments (CLIA);</li> <li>• College of American Pathologists (CAP)</li> </ul>
2	20	IS	CE	0363	Namespace ID	<p>This field is used for a locally defined name/id.</p> <p>If Entity identifier in sequence 1 is populated, then either this field (sequence 2) AND/OR sequence 3 and 4 shall be populated.</p>
3	199	ST	CE		Universal ID	<p>This field is used for a universally recognizable identifier. The value is the equivalent to Namespace ID (sequence 2).</p> <p>If Sequence 1 is populated, then either sequence 2 AND/OR sequence 3 and 4 shall be populated. This field shall be populated if sequence 4 is populated.</p> <p>The following list includes the types of unique identifiers that may be used. This</p>

Seq	Len	DT	Usage	TBL#	Component Name	Comments
						list is not an exhaustive list: <ul style="list-style-type: none"> <li>• National Provider Identifier (NPI);</li> <li>• Object Identifier (OID);</li> <li>• Clinical Laboratory Improvement Amendments (CLIA);</li> <li>• College of American Pathologists (CAP)</li> </ul>
4	6	ID	CE	0301	Universal ID Type	<p>Sequence 4 governs the interpretation of sequence 3. If Universal ID (sequence 3) is populated, this field must also be populated.</p> <p>Enter the corresponding entity that created the value in Universal ID (sequence 2).</p> <p>Note that in this Guide, HL7 table 0301 has been extended to include values “NPI”, “CLIA”, and “CAP”. “CLIA” has been formally added to HL7 table 0301 in HL7 version 2.7. This workgroup will petition to have “NPI” formally added to the table.</p> <ul style="list-style-type: none"> <li>• If sequence 2 contains an NPI number, use literal value: ‘NPI’.</li> <li>• If sequence 2 contains an OID number, use literal value: ‘ISO’;</li> <li>• If sequence 2 contains a CLIA number, use literal value: ‘CLIA’;</li> <li>• If sequence 2 contains a CAP number, use literal value: ‘CAP’</li> </ul>

This Guide requires that all entity identifiers be accompanied by assigning authorities. This allows the exchange of unique identifiers for the associated object across organizational and enterprise boundaries, enabling broad interoperability. In the EI data type, the Namespace ID, Universal ID, and Universal ID type, together, are commonly considered the assigning authority for the identifier and correspond to the HD data type identified elsewhere. The Entity Identifier and Assigning Authority components, together, constitute the actual identifier.

## 6.5. ELD – Error Location and Description

This data type specifies the segment that contains an error and describes the nature of the error. Retained for backward compatibility as of HL7 version 2.5.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
-----	-----	----	-------	------	----------------	----------

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	3	ST	RE		Segment ID	The segment containing the error in a different message
2	2	NM	RE		Segment Sequence	Specifies the specific occurrence if the segment specified in sequence 1 occurs more than once in the message.
3	2	NM	RE		Field Position	Ordinal position of the data field within the segment. For systems that do not use the HL7 Encoding Rules, the data item number may be used for the third component.
4	48 3	CE	RE	0357	Code Identifying Error	A code that describes the nature of the error

Example of ERR segment:

```
ERR||PID^5|101^required field missing^HL70357|E
```

## 6.6. ERL – Error Location

This data type identifies the segment and its constituent where an error has occurred.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	3	ST	R		Segment ID	Specifies the 3-letter name for the segment.
2	2	NM	R		Segment Sequence	Identifies the segment occurrence within the message.
3	2	NM	RE		Field Position	Identifies the number of the field within the segment. The first field is assigned a number of 1. Field number should not be specified when referring to the entire segment.
4	2	NM	RE		Field Repetition	Identifies the repetition number of the field. The first repetition is counted as 1. If a Field Position is specified, but Field Repetition is not, Field Repetition should be assumed to be 1. If Field Position is not specified, Field Repetition should not be specified.
5	2	NM	RE		Component Number	Identifies the number of the component within the field. The first component is assigned a number of 1. Component number should not be specified when referring to the entire field.
6	2	NM	RE		Sub-Component Number	Identifies the number of the sub-component within the component. The first sub-component is assigned a number of 1. Sub-component number should not be specified when referring to the entire component.

## 6.7. FN – Family Name

This data type contains a person’s family name or surname.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	50	ST	R		Surname	Last name
2	20	ST	RE		Own Surname Prefix	Prefix for a surname or first portion of a hyphenated last name. Example: “van” in “Ludwig van Beethoven”. “Edwards” in “Martha Edwards-Pierce”
3	50	ST	RE		Own Surname	Person’s own last name, or second portion of a hyphenated last name  Example: “Beethoven” in “Ludwig van Beethoven”. “Pierce” in “Martha Edwards-Pierce”
4	20	ST	X		Surname Prefix From Partner/Spouse	Not supported
5	50	ST	X		Surname From Partner/Spouse	Not supported

## 6.8. FT - Formatted Text Data

This data type is derived from the string data type by allowing the addition of embedded formatting instructions. These instructions are limited to those that are intrinsic and independent of the circumstances under which the field is being used.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	65536		O		Formatted Text Data	

The FT field is of arbitrary length (up to 64k) and may contain formatting commands enclosed in escape characters.

See section 5 on the use of escape sequences for formatting text.

Example:

```
|\.sp\ (skip one vertical line) |
```

## 6.9. HD – Hierarchic Designator

HD identifies an entity (administrative, system, application, or other) that has responsibility for managing or assigning a defined set of instance identifiers (such as placer or filler number,

patient identifiers, provider identifiers, etc.). This entity could be a particular health care application such as a registration system that assigns patient identifiers, a governmental entity such as a licensing authority that assigns professional identifiers or drivers' license numbers, or a facility where such identifiers are assigned.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	20	IS	CE	0300	Namespace ID	This field is used for a locally defined name/id. Either this field (sequence 1) AND/OR sequence 2 and 3 shall be populated.
2	199	ST	CE		Universal ID	<p>This field is used for a universally recognizable identifier. The value is the equivalent to Namespace ID (sequence 1).</p> <p>Either sequence 1 AND/OR sequence 2 and sequence 3 shall be populated.</p> <p>The following list includes the types of unique identifiers that may be used. This list is not an exhaustive list:</p> <ul style="list-style-type: none"> <li>• National Provider Identifier (NPI);</li> <li>• Object Identifier (OID);</li> <li>• Clinical Laboratory Improvement Amendments (CLIA);</li> <li>• College of American Pathologists (CAP)</li> </ul>
3	6	ID	CE	0301	Universal ID Type	<p>This field shall be populated if sequence 2 is populated.</p> <p>Sequence 3 governs the interpretation of sequence 2. Sequence 2 is a universal ID of the type specified in sequence 3.</p> <p>Enter the corresponding entity that created the value in Universal ID (sequence 2).</p> <p>Note that in this Guide, HL7 table 0301 has been extended to include values "NPI", "CLIA", and "CAP". "CLIA" has been formally added to HL7 table 0301 in HL7 version 2.7. This workgroup will petition to have "NPI" formally added to the table.</p> <ul style="list-style-type: none"> <li>• If sequence 2 contains an NPI number, use literal value: 'NPI'.</li> <li>• If sequence 2 contains an OID number, use literal value: 'ISO';</li> <li>• If sequence 2 contains a CLIA number, use literal value: 'CLIA';</li> <li>• If sequence 2 contains a CAP number, use literal value: 'CAP'</li> </ul>

The HD is designed to be used either as a local identifier (with only the <namespace ID> valued) or a publicly-assigned identifier, a UID (<universal ID> and <universal ID type> both valued).

Example:

For a receiving facility of 'Tennessee State Public Health Laboratory' with namespace = 'TSPHL' and CLIA # = 05D0936767:

MSH-6 may be depicted as:

```
|TSPHL|
or
|^05D0936767^CLIA|
or
|TSPHL^05D0936767^CLIA|
```

Other examples:

```
|NPI^2.16.840.1.113883.4.6^ISO|
|SSN^2.16.840.1.113883.4.1^ISO|
|^1.2.344.24.1.1.3^ISO|
|NPI|
```

## 6.10. ID - Coded Value for HL7 Defined Tables

This data type is used for coded values from an HL7 table. The difference between data type ID and CE is that ID contains only the coded value, whereas CE includes the identification of the table used. Generally, ID should be used in common situations where the meaning of the coded value is obvious without referencing the table.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	Variable	-	R		Coded Value for HL7-Defined Tables	

The value of this field follows the formatting rules for an ST field except that it is drawn from a table of specified values. There shall be an HL7 table number associated with ID data types. This data type should be used only for HL7 tables

Example from PID-24, Multiple Birth Indicator:

```
|Y|
```

Example from PID-5-7, Name Type Code:

```
|L|
```

## 6.11. IS - Coded Value for User-defined Tables

This data type is used for codes from User-defined Tables.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	20	-	R		Coded Value for User-Defined Tables	

The value of this field follows the formatting rules for a ST field except that it is drawn from a site-defined (or user-defined) table. There shall be an HL7 table number associated with IS data types. This data type should be used only for user-defined tables. The reverse is not true, since in some circumstances, it is more appropriate to use the CE data type for user-defined tables.

Example from PID-8 Sex:

| F |

## 6.12. MSG – Message Type

This field contains the message type, trigger event, and the message structure ID for the message.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	3	ID	R	0076	Message Code	Specifies the message type code. Literal value (based on message): 'OML' 'ACK' 'ORL'
2	3	ID	R	0003	Trigger Event	Specifies the trigger event code. Literal value (based on message): 'O21' 'O22'
3	7	ID	R	0354	Message Structure	Specifies the abstract message structure code. Literal value (based on message): 'OML_O21' 'ACK' 'ORL_O22'

Example from MSH-9, Message Type:

| OML^O21^OML\_O21 |

### 6.13. NM – Numeric

A number represented as a series of ASCII numeric characters consisting of an optional leading sign (+ or -), the digits and an optional decimal point. In the absence of a sign, the number is assumed to be positive. If there is no decimal point the number is assumed to be an integer.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	16				Numeric	

Leading zeros, or trailing zeros after a decimal point, are not significant. Except for the optional leading sign (+ or -) and the optional decimal point (.), no non-numeric ASCII characters are allowed. Note that use of scientific notation for numbers is not supported by this data type.

Examples:

|999|  
|-123.792|

### 6.14. PT – Processing Type

This data type indicates whether to process a message as defined in HL7 Application (level 7) Processing rules.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	1	ID	R	0103	Processing ID	Indicates the intent for processing the message.
2	1	ID	X	0207	Processing Mode	Not supported

Example from MSH-11, Processing ID:

|P|

### 6.15. SAD – Street Address

This data type specifies an entity's street address and associated detail.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	120	ST	R		Street or Mailing Address	This component specifies the street or mailing address of a person or institution.
2	50	ST	X		Street Name	Not supported
3	12	ST	X		Dwelling Number	Not supported

## 6.16. SI – Sequence ID

A non-negative integer in the form of a NM field.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	4				Sequence ID	

The uses of this data type are defined in the chapters defining the segments and messages in which it appears.

The maximum length is 4. This allows for a number between 0 and 9999 to be specified.

## 6.17. ST – String Data

This data type is typically used for short text strings.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	199		R		String Data	

String data is left justified with no leading blanks (space characters) permitted. Trailing blanks are permitted.

Any displayable (printable) ACSII characters (hexadecimal values between 20 and 7E, inclusive, or ASCII decimal values between 32 and 126), are accepted except the defined escape characters and defined delimiter characters.

To include any HL7 delimiter character (except the segment terminator) within a string data field, use the appropriate HL7 escape sequence. See chapter 5 on the use of escape sequences for formatting text.

Example from MSH-2, Encoding Characters:

```
|^~\&|
```

Example from PID-10-2, Race Text:

```
^American Indian or Alaska Native^
```

## 6.18. TM – Time

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	16				Time	Format: HH[MM][+/-ZZZZ]

Granularity finer than minutes may be ignored.

The time zone (+/-ZZZZ) is represented as +/-HHMM offset from Co-ordinated Universal Time (UTC) (formerly Greenwich Mean Time (GMT)), where +0000 or -0000 both represent UTC (without offset).

Example from OBX-3, Time of Birth:

```
OBX|9|TM|57715-5^Birth time^LN|1|0632-0500|||||O
```

## 6.19. TN – Telephone Number

This data type is deprecated in HL7 version 2.5.1, but is allowed for use in the OBX segment.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1					Telephone number	Format: [NN] [(999)]999- 9999[X99999][B99999][C any text]

For use in the United States and conforming countries, the telephone number is always in the format indicated above.

The optional first two digits are the country code. The optional **X** portion gives an extension. The optional **B** portion gives a beeper code. The optional **C** portion may be used for comments like, **After 6:00**. While no explicit limit is placed on the text field, receiving systems may be expected to truncate values that are more than 10 characters long. To accommodate the variability of institutional phone systems, the length of the extension and beeper numbers may be extended by local agreement.

Examples:

```
| (415) 925-0121X305 |
| 234-4532CWEEKENDS |
```

## 6.20. TS – Time Stamp

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	24	DTM	R		Time	Format:  YYYY[MM[DD[HH[MM[SS[.S[S[S]]]]]]][+/-ZZZZ]
2	1	ID	X	0529	Degree of Precision - DEPRECATED	Not supported

The time zone (+/-ZZZZ) is represented as +/-HHMM offset from Co-ordinated Universal Time (UTC) (formerly Greenwich Mean Time (GMT)), where +0000 or -0000 both represent UTC (without offset).

Example from MSH-7, Date/Time of Message:

```
|20101014210405-0400|
```

## 6.21. TX – Text Data

The TX data type is used to carry string data intended for display purposes.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1					Text Data	

TX can contain leading blanks (space characters) since it may contribute greatly to the clarity of the presentation to the user. Because this type of data is intended for display, it may contain certain escape character sequences designed to control the display. Leading spaces should be included. Trailing spaces should be removed.

See chapter 5 on the use of escape sequences for formatting text.

Example:

```
| leading spaces are allowed. |
```

## 6.22. VID – Version Identifier

This data type is used to specify the HL7 version.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	5	ID	R	0104	Version ID	Used to identify the HL7 version. Literal value '2.5.1'
2	483	CE	X	0399	Internationalization Code	Not supported
3	483	CE	X		International Version ID	Not supported

## 6.23. XAD – Extended Address

This data type specifies the address of a person, place or organization plus associated information.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	184	SAD	R		Street Address	
2	120	ST	RE		Other Designation	Other designation or second line of address, ie. Suite 444 or Fourth Floor
3	50	ST	R		City	City of address
4	50	ST	R		State or Province	State of address
5	12	ST	R		Zip or Postal Code	Zip Code of address
6	3	ID	RE	0399	Country	Country of address
7	3	ID	X	0190	Address Type	Not supported
8	50	ST	X		Other Geographic Designation	Not supported
9	20	IS	R	0289	County/Parish Code	County of address
10	20	IS	X	0288	Census Tract	Not supported
11	1	ID	X	0465	Address Representation Code	Not supported
12	53	DR	X		Address Validity Range	Not supported
13	26	TS	X		Effective Date	Not supported
14	26	TS	X		Expiration Date	Not supported

Example of usage for US from NK-4, Address:

```
|123 Main Street^Apartment 3-C^Knoxville^TN^37917^USA^^^093|
```

## 6.24. XCN - Extended Composite ID Number and Name for Persons

This data type is used where there is a need to specify the ID number and name of a person.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	15	ST	R		ID Number	Unique identifier assigned by the assigning authority
2	194	FN	R		Family Name	Last Name
3	30	ST	R		Given Name	First Name
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Multiple middle names may be included by separating them with spaces.
5	20	ST	RE		Suffix (e.g., JR or III)	Used to specify a name suffix (e.g., Jr. or III).
6	20	ST	RE		Prefix (e.g., DR)	Used to specify a name prefix (e.g., Dr.).
7	5	IS	X	0360	Degree (e.g., MD)	Not supported. Deprecated as of v 2.5
8	4	IS	X	0297	Source Table	Not supported
9	227	HD	CE	0363	Assigning Authority	Required if sequence 1 (ID number) is populated.  The assigning authority is a unique identifier of the system (or organization or agency of department) that creates the data.
10	1	ID	RE	0200	Name Type Code	A code that represents the type of name
11	1	ST	X		Identifier Check Digit	Not supported
12	3	ID	X	0061	Check Digit Scheme	Not supported
13	5	ID	CE	0203	Identifier Type Code	Required if sequence 1 (ID number) is populated
14	227	HD	RE		Assigning Facility	
15	1	ID	X	0465	Name Representation Code	Not supported
16	483	CE	X	0448	Name Context	Not supported
17	53	DR	X		Name Validity Range	Not supported
18	1	ID	X	0444	Name Assembly Order	Not supported
19	26	TS	X		Effective Date	Not supported
20	26	TS	X		Expiration Date	Not supported
21	199	ST	RE		Professional Suffix	Professional suffix, such as MD.
22	705	CE	X		Assigning Jurisdiction	Not supported
23	705	CE	X		Assigning Agency or Department	Not supported

Example from ORC-12, Ordering Provider:

```
|987654321^Edwards^Emily^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^
^^^^^^MD|
```

## 6.25. XON – Extended Composite Name and Identification Number for Organizations

This data type is used to specify the name and ID number of an organization.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	50	ST	R		Organization Name	Name of the organization
2	20	IS	X	0204	Organization Name Type Code	Not supported
3	4	NM	X		ID Number – DEPRECATED	Not supported
4	1	NM	X		Check Digit	Not supported
5	3	ID	X	0061	Check Digit Scheme	Not supported
6	227	HD	R	0363	Assigning Authority	The assigning authority is a unique identifier of the system (or organization or agency or department) that creates the data. Assigning authorities are unique across a given HL7 implementation
7	5	ID	R	0203	Identifier Type Code	A code corresponding to the type of identifier
8	227	HD	X		Assigning Facility	Not supported
9	1	ID	X	0465	Name Representation Code	Not supported
10	20	ST	R		Organization Identifier	This component contains the code that uniquely identifies the organization referenced in sequence 1

Example from ORC-21, Ordering Facility Name:

```
|Mountain View  
Hospital^^^^^NPI&2.16.840.1.113883.4.6&ISO^NPI^^^7839462089|
```

## 6.26. XPN – Extended Person Name

This data type is used to represent a person’s name.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	194	FN	R		Family Name	Last name
2	30	ST	R		Given Name	First name
3	30	ST	RE		Second and Further Given Names or Initials Thereof	Multiple middle names may be included by separating them with spaces.
4	20	ST	RE		Suffix (e.g., JR or III)	Used to specify a name suffix (e.g., Jr. or III).

Seq	Len	DT	Usage	TBL#	Component Name	Comments
5	20	ST	RE		Prefix (e.g., DR)	Used to specify a name prefix (e.g., Dr.).
6	6	IS	X	0360	Degree (e.g., MD)	Not supported. Use sequence 14 (Professional Suffix) instead.
7	1	ID	RE	0200	Name Type Code	A code that represents the type of name  Example values are: A Alias Name B Name at Birth C Adopted Name L Legal Name
8	1	ID	X	0465	Name Representation Code	Not supported
9	483	CE	X	0448	Name Context	Not supported
10	53	DR	X		Name Validity Range	Not supported
11	1	ID	X	0444	Name Assembly Order	Not supported
12	26	TS	X		Effective Date	Not supported
13	26	TS	X		Expiration Date	Not supported
14	199	ST	RE		Professional Suffix	Professional suffix, such as MD.

## 6.27. XTN - Extended Telecommunication Number

This data type contains the extended telephone number.

Seq	Len	DT	Usage	TBL#	Component Name	Comments
1	199	ST	X		Telephone Number	Not supported. Deprecated as of 2.3.
2	3	ID	X	0201	Telecommunication Use Code	Not supported
3	8	ID	X	0202	Telecommunication Equipment Type	Not supported
4	199	ST	X		Email Address	Not supported
5	3	NM	X		Country Code	Not supported
6	5	NM	R		Area/City Code	3-digit area code
7	9	NM	R		Local Number	7-digit telephone number
8	5	NM	RE		Extension	Extension to telephone number
9	199	ST	X		Any Text	Not supported
10	4	ST	X		Extension Prefix	Not supported
11	6	ST	X		Speed Dial Code	Not supported
12	199	ST	X		Unformatted Telephone number	Not supported

Example: Phone number (734) 677-7777 extension 432

^^^^^^734^6777777^432

## 7. Management of NDBS Card Variables

The workgroup identified the most commonly collected NDBS data elements based on a sample of existing NDBS specimen collection cards.

This section describes how to manage the NDBS card variables by mapping the data elements on the card to a corresponding field in the HL7 message. Some elements match existing HL7 fields, while other elements are transmitted through observation result OBX segments.

**The NDBS card variables described in this section should be included in the laboratory order message only where allowed by jurisdictional law.**

### **Note 1: Identifiers**

It is recommended that the National Provider Identifier (NPI) be used to uniquely identify facilities, laboratories, and health providers. If NPI is not available, then a different unique identifier, such as OID, CLIA, CAP, or a state-designated identifier should be used. For laboratories, if NPI is not available, then the CLIA or CAP number should be used. Unique bar code numbers are preprinted on the specimen collection cards and should be supplemented by the hospital order and patient identifiers and the laboratory accession number. The unique barcodes are alphanumeric and should be entered as string data.

### **Note 2: Caregivers or Custodians other than the Baby's Mother**

The NK1 segment can be repeated to reflect additional caregivers in the situation in which the mother is not the custodian, with NK1-3 valued accordingly to reflect the relationship between the caregiver and the baby. Other fields in that particular NK1 segment then would be populated with the data pertaining to that person if that person is not the baby's mother.

### **Note 3: Definition of Optional fields**

Both the sending and receiving system must support a data element designated as Optional. The sending system must be capable of sending data for that field, and the receiving system must be capable of receiving data for that field. Whether data for that field is captured and sent is negotiated between the sender and receiver. Usage of optional fields will vary across jurisdictions based on jurisdictional requirements.

## 7.1. NDBS Card Variables Mapped to Matching/Pre-defined HL7 fields

Figure 7-1: List of NDBS Card Variables Mapped to Matching HL7 Fields

#	NDBS Data Element	Mapped HL7 Element	Usage	Comments
1	Hospital Order Number (HL7 system-generated number for message tracking)	ORC-2: Placer Order Number OBR-2: Placer Order Number	R	
2	Collection Date/Time	OBR-7: Observation Date / Time	R	
3	Hospital/Submitter Information: Identifier, Name, Address, Phone Number	ORC-21: Ordering Facility Name ORC-22: Ordering Facility Address ORC-23: Ordering Facility Phone Number	R	Apply Note 1 from above.
4	Ordering provider	ORC-12: Ordering Provider OBR-16: Ordering Provider	R	
5	Receiving Newborn Screening Laboratory Information (ID)	MSH-6: Receiving Facility	R	Apply Note 1 from above.
6	Collector of Specimen (Person that collects the specimen)	OBR-10: Collector Identifier: 10.1: ID Number 10.2: Family Name 10.3: Given Name 10.9: Collector Identifier Assigning Authority	O	Use any unique identifier.  See Note 3 above.  Hospitals typically record only the collector's initials. The transmitting of data for fields such as ID Number, Family Name, etc. is optional and must be negotiated between the sender and receiver of the data.
7	Baby's name	PID-5: Patient Name	R	PID-5 is a repeating field. The primary

#	NDBS Data Element	Mapped HL7 Element	Usage	Comments
				or legal name is reported first. For PID-5.7 - Name Type Code, use value "L - Legal name"
8	Multiple Birth Information: Multiple Birth Indicator, Birth Order	PID-24: Multiple Birth Indicator (RE) PID-25: Birth Order (RE)  These card variables are related to Birth Plurality (mapped to OBX)	RE	For PID-24, enter (Y/N) whether baby is part of a multiple birth.  For PID-25 (Birth Order): If Multiple Birth Indicator (PID-24) is "N", then leave Birth Order empty or enter "1". If Multiple Birth Indicator (PID-24) is "Y", then Birth Order must be populated with the number indicating the baby's birth order, with the literal value "1" for the first child born, "2" for the second child, and so on.  Note: It is strongly encouraged that this field be explicitly used to indicate birth order rather than the convention of using the baby's name (e.g. Baby Boy 1, Baby Boy 2, etc).
9	Date of Birth	PID-7: Date of Birth	R	Use PID-7 to report Date of Birth only. Use OBX segment to report Time of Birth (see Table 8.2, Row 32).
10	Baby's Sex	PID-8: Sex	R	Use HL7 2.5.1 Table 0001
11	Baby's Aliases	PID-5: Patient Name	RE	PID-5 is a repeating field. The primary or legal name is reported first, followed by aliases or other names.  For PID-5.7 - Name Type Code, use value "A-Alias"
12	Baby's Race	PID-10: Race	RE	Use HL7 2.5.1 Table 0005 (User-defined table)
13	Baby's Ethnicity	PID-22: Ethnic Group	RE	Use HL7 2.5.1 Table 0189
14	Baby's Medical Record Number	PID-3: Patient Identifier List: 3.1: ID Number 3.5: Identifier Type Code	RE	For PID-3, use value "MR" to indicate "Medical Record Number" (HL7 2.5.1 table 00106)
15	Mother's Name	NK1-2: Next of Kin Name NK1-3: Relationship	R	For NK1-3, use value "MTH" to indicate "Mother" (HL7 2.5.1 table 0063). See Note 2 above.

#	NDBS Data Element	Mapped HL7 Element	Usage	Comments
16	Mother's Maiden Name	PID-6: Mother's Maiden Name	R	
17	Mother's Birthdate	NK1-16: Next of Kin Date/Time of Birth	R	See Note 2 above.
18	Mother's Phone	NK1-5: Next of Kin Phone Number	R	See Note 2 above.
19	Mother's / Baby's Address: Street Address, City, State, Zip Code, County	NK1-4: Next of Kin Address  PID-11: Patient Address	R	Enter the mother's address in NK1-4 (Next of Kin Address). See Note 2 above.  For PID-11 (Patient Address): If the baby will live with the mother, use the mother's address in PID-11.  If the baby will not live with the mother, then enter the address where the baby will reside in PID-11.
20	Mother's Medicaid Number (if eligible)	NK1-33.1: ID Number NK1-33.5: Identifier Type Code	O	For NK1-33.5, use value "MA" which indicates "Patient Medicaid Number" (in HL7 2.5.1 table 0203) for the Mother's Medicaid Number.  See Note 3 above.
21	Mother's SSN	NK1-33.1: ID Number NK1-33.4: Assigning Authority NK1-33.5: Identifier Type Code	O	For NK1-33.5, use value "SS" to indicate "Social Security Number" (HL7 2.5.1 table 0203)
22	Father's Name	NK1-2: Next of Kin Name NK1-3: Relationship	O	For NK1-3, use value "FTH" to indicate "Father" (HL7 2.5.1 table 0063). See Note 2 above.  Some states report father's information.  See Note 3 above.
23	Father's Address: Street Address, City, State, Zip Code, County	NK1-4: Next of Kin Address	O	See Note 2 above. See Note 3 above.

#	NDBS Data Element	Mapped HL7 Element	Usage	Comments
24	Caregiver/ Other Guardian Name	NK1-2: Next of Kin Name NK1-3: Relationship	O	This indicates a caregiver /guardian in adoption/foster situations, etc., other than the birth mother or father.  For NK1-3, use value "CGV" to indicate "Care giver" or other code that applies to the specific relationship (HL7 2.5.1 table 0063).  See Note 2 above. See Note 3 above.
25	Caregiver Address: Street Address, City, State, Zip Code, County	NK1-4: Next of Kin Address	O	This indicates a caregiver /guardian in adoption/foster situations, etc., other than the birth mother or father.  For NK1-3, use value "CGV" to indicate "Care giver" or other code that applies to the specific relationship (HL7 2.5.1 table 0063).  See Note 2 above. See Note 3 above.

## 7.2. NDBS Card Variables Mapped to an Observation Result (OBX) Segment

The LOINC code answer lists for this section are described in the Appendix of this Implementation Guide.

The LOINC codes referenced in this section have likely been modified since the release of this Implementation Guide. For the latest and most updated NDBS LOINC codes, go to <http://newbornscreeningcodes.nlm.nih.gov/HL7>.

Figure 7-2: List of NDBS Card Variables Mapped to an Observation Result OBX Segment

#	NDBS Data Element	Usage	Comments
26	State printed on filter paper card	R	This variable refers to the State that is printed on the filter paper card.  2 letter FIPS code

#	NDBS Data Element	Usage	Comments
			<p><b>Example:</b> OBX 1 ST 57716-3^State [Identifier] in NBS card^LN 2 TN   N   F</p>
27	<p>Pre-Printed Unique Filter Paper Number</p> <p>(Bar Code Number of Current Sample)</p>	R	<p>For OBX-3, use LOINC Code 57723-9 ("Unique bar code number of Current sample")</p> <p><b>Example:</b> OBX 1 ST 57723-9^Unique bar code number of Current sample^LN 1 97893203      O</p>
28	Initial/Repeat	RE	<p>For OBX-3, use LOINC Code 57721-3 ("Reason for lab test in Dried blood spot").</p> <p><b>Example:</b> OBX 2 CE 57721-3^Reason for lab test in Dried blood spot^LN 1 LA12421-6^Initial screen^LN      O</p>
29	<p>Filter Paper Number of Initial Test</p> <p>(Bar Code Number of Initial Sample)</p>	RE	<p>For OBX-3, use LOINC Code 57711-4 ("Unique bar code number of Initial sample")</p> <p><b>Example:</b> OBX 3 ST 57711-4^Unique bar code number of Initial sample^LN 1 43554432      O</p>
30	<p>Post-discharge Provider:</p> <ul style="list-style-type: none"> <li>• Identifier,</li> <li>• Name</li> </ul>	RE	<p>Apply Note 1 from above.</p> <p>For Identifier, OBX-3 = LOINC Code 62323-1 For Name, OBX-3 = LOINC Code 62324-9</p> <p><b>Examples:</b> OBX 4 TX 62323-1^Post-discharge provider ID [Identifier]^LN  4444444444      O  OBX 5 TX 62324-9^Post-discharge provider name in Provider^LN  Dr. Bob Healthy, MD      O</p>
31	<p>Post-discharge Practice:</p> <ul style="list-style-type: none"> <li>• Identifier,</li> <li>• Name,</li> <li>• Address,</li> <li>• Phone Number</li> </ul>	R	<p>Apply Note 1 from above.</p> <p>For Identifier, OBX-3 = LOINC Code 62325-6  For Name, OBX-3 = LOINC Code 62326-4  For Address, OBX-3 = LOINC Code 62327-2</p>

#	NDBS Data Element	Usage	Comments
			<p>For Telephone Number, OBX-3 = LOINC Code 62328-0</p> <p><b>Examples:</b></p> <p>OBX 6 TX 62325-6^Post-discharge practice ID^LN  5555555555     O</p> <p>OBX 7 TX 62326-4^Post-discharge provider practice name^LN  Healthy Clinic     O</p> <p>OBX 8 TX 62327-2^Post-discharge provider practice address^LN  100 Small Street, Suite 3B, Anytown, Tennessee 55555     O</p> <p>OBX 9 TN 62328-0^Post-discharge provider practice telephone number in Provider^LN  (865) 542-3333     O</p>
32	Multiple Birth Information: Birth Plurality	RE	<p>For OBX-3: If Multiple Birth Indicator (PID-24) is “Y”, then OBX-3 = LOINC Code 57722-1 ("Birth plurality of Pregnancy").</p> <p>If Multiple Birth Indicator (PID-24) is “N”, then use LOINC code LA12411-7 for answer ‘singleton’.</p> <p><b>Example:</b></p> <p>OBX 8 CE 57722-1^Birth plurality of Pregnancy^LN 1 LA12412-5^Twins^LN     O</p>
33	Time of Birth	R	<p>Use OBX segment to report Time of Birth down to the minute. Use PID-7 to report Date of Birth (see Table 8.1, row 9 above).</p> <p>OBX-3 = LOINC Code 57715-5 ("Birth time")</p> <p><b>Note:</b> Granularity finer than minutes may be ignored.</p> <p><b>Example:</b></p> <p>OBX 9 TM 57715-5^Birth time^LN 1 0632-0500     O</p>
34	Birth Hospital: <ul style="list-style-type: none"> <li>• Identifier,</li> <li>• Name,</li> <li>• Address,</li> <li>• Phone Number</li> </ul>	C	<p>Conditionally required: If the birth hospital is different than the submitting hospital / facility (Table 8.1, Row 3), then this field is required.</p> <p>For Identifier, OBX-3 = LOINC Code 62329-8</p> <p>For Name, OBX-3 = LOINC Code 62330-6</p>

#	NDBS Data Element	Usage	Comments
			<p>For Address, OBX-3 = LOINC Code 62331-4</p> <p>For Telephone Number, OBX-3 = LOINC Code 62332-2</p> <p><b>Examples:</b>                      OBX 12 TX 62329-8^Birth hospital facility ID [Identifier] in Facility^LN  5555555555     O</p> <p>OBX 13 TX 62330-6^Birth hospital facility name^LN  Healthy Clinic     O</p> <p>OBX 14 TX 62331-4^Birth hospital facility address^LN  100 Small Street, Suite 3B, Anytown, Tennessee 55555     O</p> <p>OBX 15 TN 62332-2^ Birth hospital facility phone number in Facility^LN  (865) 542-3333     O</p>
35	Birth Weight	CE	<p>Conditional: Either the Birth Weight OR Weight at Time of Sample must be provided.</p> <p>States may override field usage per State requirements. Please check with your State to determine specific requirements regarding which field is required.</p> <p>Report weight in grams (not pounds and ounces) since unit is standard in hospitals.</p> <p>OBX-3 = LOINC Code 8339-4 ("Birthweight ")</p> <p>Use UCUM code for units: "g" for gram.</p> <p><b>Example:</b>                      OBX 11 NM 8339-4^Birthweight^LN 1 2921 g^gram     O</p>
36	Weight at Time of Sample	CE	<p>Conditional: Either the Birth Weight OR Weight at Time of Sample must be provided.</p> <p>States may override field usage per state requirements. Please check with your State to determine specific requirements regarding which field is required.</p> <p>Report weight in grams (not pounds and ounces) since unit is standard in hospitals.</p>

#	NDBS Data Element	Usage	Comments
			<p>OBX-3 =LOINC Code 58229-6 ("Body weight measured - when specimen taken")</p> <p>Use UCUM code for units: "g" for gram.</p> <p>Example:                      OBX 12 NM 58229-6^Body weight Measured --when specimen taken^LN 1 2930 g^gram     O</p>
37	Gestational Age at Birth (Number of Weeks)	R	<p>Report as complete weeks and "round down" (i.e. only report weeks not days), e.g. "38 weeks" would be reported for gestational age of exactly 38 weeks, 38 weeks and 3 days, or 38 weeks and 6 days.</p> <p>For OBX-3, use LOINC Code 57714-8 ("Obstetric estimation of gestational age")</p> <p>Use UCUM code for units: "wk" for weeks.</p> <p>Example:                      OBX 13 NM 57714-8^Obstetric estimation of gestational age^LN 1 37 wk^weeks     O</p>
38	Parental Refusal	CE	<p>If the parent refuses an NDBS Screening, then the indication of parental refusal must be provided.</p> <p>For OBX-3, use LOINC Code 57721-3 ("Reason for lab test in Dried blood spot").</p> <p>The applicable LOINC answer for OBX-5 is LA14132-7 ("No sample collected due to parental refusal").</p> <p>Example:                      OBX 2 CE 57721-3^Reason for lab test in Dried blood spot^LN 1  LA14132-7^No sample collected due to parental refusal ^LN     O</p>

#	NDBS Data Element	Usage	Comments
			<p>The following fields were represented in the OBX segment through LOINC Code 57713-0, <b>Infant NICU factors that affect newborn screening interpretation</b>, which was formerly named “Clinical events that affect newborn screening interpretation.”</p> <p>The LOINC code 57713-0 has now been supplemented by two additional LOINC codes: 67704-7 <b>Feeding types</b> and 67706-2 <b>Maternal factors that affect newborn screening interpretation</b>. Each of these codes may be omitted, used once, or more than once in separate OBX segments to relevant data fields on the card used by a particular state and to accommodate all of the data entry needs for a given infant regarding all clinical factors that affect newborn screening interpretation such as multiple feeding types.</p> <p>For LOINC Code 57713-0 <b>Infant NICU factors that affect newborn screening interpretation</b>, the applicable LOINC answers (OBX-5) are:  <i>[This was formerly called “Clinical events that affect newborn screening interpretation. The answer list has been modified.]</i></p> <ul style="list-style-type: none"> <li>• LA137-2: None</li> <li>• LA12419-0: Infant in ICU at time of specimen collection</li> <li>• LA12417-4: Any blood product transfusion (including ECMO)</li> <li>• LA16923-7: Dopamine</li> <li>• LA16924-5: Topical iodine</li> <li>• LA16925-2: Parenteral steroid treatment</li> <li>• LA12420-8: Systemic antibiotics before newborn screening specimen</li> <li>• LA16927-8: Meconium ileus or other bowel obstruction</li> <li>• LA46-8: Other</li> </ul> <p>For LOINC Code 67704-7 <b>Feeding types</b>, the applicable LOINC answers (OBX-5) are:</p> <ul style="list-style-type: none"> <li>• LA16914-6: Breast milk</li> <li>• LA16915-3: Lactose formula</li> <li>• LA14041-0: Lactose free formula (including soy or hydrolyzed)</li> <li>• LA16917-9: NPO</li> <li>• LA12418-2: TPN</li> <li>• LA16918-7: Carnitine</li> <li>• LA16919-5: MCT (medium-chain triglyceride) oil</li> <li>• LA16920-3: IV dextrose</li> <li>• LA46-8: Other</li> <li>• LA4489-6: Unknown</li> </ul> <p>For LOINC Code 67706-2 <b>Maternal factors that affect newborn screening interpretation</b>, the applicable LOINC answers (OBX-5) are:</p> <ul style="list-style-type: none"> <li>• LA137-2: None</li> <li>• LA16928-6: HELLP syndrome</li> <li>• LA16929-4: Fatty liver of pregnancy</li> </ul>

#	NDBS Data Element	Usage	Comments
			<ul style="list-style-type: none"> <li>• LA16930-2: Packed red blood cell (PRBC) transfusion</li> <li>• LA16931-0: Steroid treatment</li> <li>• LA16932-8: Thyroid treatment (including propylthiouracil (PTU), methimazole (Tapazole), or past treatment with radioactive iodine (I-131))</li> <li>• LA12418-2: TPN</li> <li>• LA46-8: Other</li> </ul> <p>The OBX segment should repeat using LOINC codes 57713-0, 67704-7, or 67706-2 for as many answers as applicable. If none apply, then use LOINC Code LA137-2 ("None") for OBX-5.</p> <p>Whenever answer code LA46-8 Other is used, add an additional OBX segment to enter the string text for the other answer value using the appropriate LOINC code that matches the LOINC code with the "other" answer:</p> <p>67703-9 Other infant NICU factors that affect newborn screening interpretation          67705-4 Other feeding types          67707-0 Other maternal factors that affect newborn screening interpretation</p>
39	Feeding Type or Status	R	<p>For this field, use LOINC Code 67704-7 ("Feeding types") for OBX-3.</p> <p>The applicable LOINC answers (for OBX-5) are:</p> <ul style="list-style-type: none"> <li>• LA16914-6: Breast milk</li> <li>• LA16915-3: Lactose formula</li> <li>• LA14041-0: Lactose free formula (including soy or hydrolyzed)</li> <li>• LA16917-9: NPO</li> <li>• LA12418-2: TPN</li> <li>• LA16918-7: Carnitine</li> <li>• LA16919-5: MCT (medium-chain triglyceride) oil</li> <li>• LA16920-3: IV dextrose</li> <li>• LA46-8: Other</li> <li>• LA4489-6: Unknown</li> </ul> <p>Examples:</p> <pre>OBX 14 CE 67704-7^Feeding types^LN 1 LA14041-0^Lactose free formula including soy or hydrolyzed^LN     O</pre> <pre>OBX 14 CE 67704-7^Feeding types^LN 1 LA12418-2^TPN^LN     O</pre> <pre>OBX 14 CE 67704-7^Feeding types^LN 1 LA46-8^Other^LN     O</pre> <pre>OBX 15 ST 67705-4^Other feeding types^LN 1 Experimental formula ABC     O</pre>

#	NDBS Data Element	Usage	Comments
			The option to enter free text other responses should be used only when necessary to convey information that will affect newborn screening information. It should not be used to enter clinical details such as the specific brand of commercial formulas or use of premature infant formulas, if this information will not affect the interpretation of the newborn screening results. Choices on the answer list for feeding types should be used whenever possible.
40	Any Blood Product Transfusion Before NBS Specimen Collection?	R	<p>If answer is “yes”, for OBX-3, use LOINC Code 57713-0 (“Infant NICU factors that affect newborn screening interpretation”) with LOINC answer LA12417-4 (“Any blood product transfusion (including ECMO)”) for OBX-5.</p> <p>Example:                      OBX 15 CE 57713-0^Infant NICU factors that affect newborn screening interpretation^LN 2 LA12417-4^Any blood product transfusion (including ECMO)^LN     O</p>
41	If Yes, Date of Last Blood Product Transfusion	C	<p>Field is conditionally required. If answer to field “Any Blood Products Transfusion Before NBS Specimen Collection?” is “yes”, then Date of Last Transfusion must be provided.</p> <p>For OBX-3, use LOINC Code 62317-3 (“Date of Last Blood Product Transfusion”).</p> <p>The correct value data type in OBX-2 is DTM for date/time and not TS for time stamp which is used only in fixed position header segment fields and not in an OBX segment. The time is optional, but is conditionally required if the transfusion occurred on the same day as the specimen to indicate if the transfusion occurred before or after the specimen. Value types are defined in HL7 table 0125 and data types are defined in HL7 table 0440.</p> <p>Example:                      OBX 21 DTM 62317-3^Date of Last Blood Product Transfusion^LN  201010131723     O</p>
42	Infant in ICU at Time of Specimen Collection?	R	<p>For OBX-3, use LOINC Code 57713-0 (“Infant NICU factors that affect newborn screening interpretation”), with LOINC answer LA12419-0 (“Infant in ICU at time of specimen collection”) for OBX-5.</p> <p>Example:                      OBX 18 CE 57713-0^Infant NICU factors that affect newborn screening interpretation^LN 3 LA12419-0^Infant in ICU at time of specimen collection^LN     O</p>

## 8. Message Definition

### 8.1. OML^O21 – Condensed Definition of Laboratory Order Message

This implementation guide provides specifications for the placing of a laboratory test order from the originating ordering application to the laboratory fulfilling the order, in the form of an order message OML^O21. Note that the order may be an initial screening laboratory order or a repeat screening laboratory order.

The table below shows the segments that are supported in this Guide. Segments that are *not* supported in this Guide have been omitted in the following table.

Segment	Name	Usage	Cardinality
MSH	Message Header	R	[1..1]
PID	Patient Identification	R	[1..1]
NK1	Next of Kin/Associated Parties	R	[1..*]
ORC	Common Order	R	[1..1]
OBR	Observation Request	R	[1..1]
{ OBX }	Observation/Result	R	[1..*]

#### 8.1.1. OML^O21 – Full Definition of Laboratory Order Message

The following table contains the same definition of the laboratory order message for supported segments as described in Section 9.1. However, in addition to the supported segments, the table below includes non-supported segments.

Segment	Name	Usage	Cardinality
MSH	Message Header	R	[1..1]

Segment	Name	Usage	Cardinality
{{ SFT }}	Software	X	[0..0]
{{ NTE }}	Notes and Comments (for Header)	X	[0..0]
	--- PATIENT begin		
PID	Patient Identification	R	[1..1]
[ PD1 ]	Additional Demographics	X	[0..0]
{{ NTE }}	Notes and Comments (for Patient Identification)	X	[0..0]
NK1	Next of Kin/Associated Parties	R	[1..*]
[	--- PATIENT_VISIT begin		
PV1	Patient Visit	X	[0..0]
[ PV2 ]	Patient Visit- Additional Info	X	[0..0]
]	--- PATIENT_VISIT end		
{	--- INSURANCE begin		
IN1	Insurance	X	[0..0]
[ IN2 ]	Insurance Additional Info	X	[0..0]
[ IN3 ]	Insurance Additional Info - Cert.	X	[0..0]
}}	--- INSURANCE end		
[ GT1 ]	Guarantor	X	[0..0]
{{ AL1 }}	Allergy Information	X	[0..0]
	--- PATIENT end		
	--- ORDER begin		
ORC	Common Order	R	[1..1]
{	--- TIMING begin		
TQ1	Timing/Quantity	X	[0..0]
{{ TQ2 }}	Timing/Quantity Order Sequence	X	[0..0]
}}	--- TIMING end		
	--- OBSERVATION_REQUEST begin		
OBR	Observation Request	R	[1..1]
[ TCD ]	Test Code Details	X	[0..0]
[ NTE ]	Notes and Comments (for Detail)	X	[0..0]

Segment	Name	Usage	Cardinality
[ CTD ]	Contact Data	X	[0..0]
{{ DG1 }}	Diagnosis	X	[0..0]
{	--- OBSERVATION begin		
OBX	Observation/Result	R	[1..*]
[ TCD ]	Test Code Detail	X	[0..0]
{{ NTE }}	Notes and Comments (for Results)	X	[0..0]
}	--- OBSERVATION end		
{{	--- SPECIMEN begin		
SPM	Specimen	X	[0..0]
{{ OBX }}	Observation/Result related to specimen	X	[0..0]
{{	--- CONTAINER begin		
SAC	Specimen Container	X	[0..0]
{{ OBX }}	Observation/Result related to container	X	[0..0]
}}	--- CONTAINER end		
}}	--- SPECIMEN end		
{{	--- PRIOR_RESULT begin		
[	--- PATIENT_PRIOR begin		
PID	Patient Identification – previous result	X	[0..0]
[ PD1 ]	Additional Demographics – previous result	X	[0..0]
]	--- PATIENT_PRIOR end		
[	--- PATIENT_VISIT_PRIOR begin		
PV1	Patient Visit – previous result	X	[0..0]
[ PV2 ]	Patient Visit Add. Info – previous result	X	[0..0]
]	--- PATIENT_VISIT_PRIOR end		
{{ AL1 }}	Allergy Information - previous result	X	[0..0]
{	--- ORDER_PRIOR begin		
[ ORC ]	Common Order - previous result	X	[0..0]
OBR	Order Detail - previous result	X	[0..0]
{{ NTE }}	Notes and Comments - previous result	X	[0..0]

Segment	Name	Usage	Cardinality
{	--- TIMING_PRIOR begin		
TQ1	Timing/Quantity	X	[0..0]
{{ TQ2 }}	Timing/Quantity Order Sequence	X	[0..0]
}	--- TIMING_PRIOR end		
{	--- OBSERVATION_PRIOR begin		
OBX	Observation/Result - previous result	X	[0..0]
{{ NTE }}	Notes and Comments - previous result	X	[0..0]
}	--- OBSERVATION_PRIOR end		
}	--- ORDER_PRIOR end		
}}	--- PRIOR_RESULT end		
	--- OBSERVATION_REQUEST end		
{{ FT1 }}	Financial Transaction	X	[0..0]
{{ CTI }}	Clinical Trial Identification	X	[0..0]
[ BLG ]	Billing Segment	X	[0..0]
	--- ORDER end		

## 8.2. ACK – General Acknowledgement Message Definition

Upon receipt of the order message, the laboratory may synchronously respond with an ACK message to acknowledge that the laboratory received the electronic order message. The ACK message validates that the message is accepted or rejected due to errors. The sending of an ACK message is optional and should be defined by the agreement between placer and filler, since not all placers are able to accept an ACK message, nor all fillers able to generate an ACK message. Note that if an acknowledgement is sent, it is more common to transmit an acknowledgement from the filler to the placer at the time the specimen is received, using a lab result message (ORU^R01) with the status of the result set accordingly (e.g., “Specimen in lab; results pending”).

Segment	Name	Usage	Cardinality
MSH	Message Header	R	[1..1]
{{ SFT }}	Software segment	X	[0..0]
MSA	Message Acknowledgment	R	[1..1]

Segment	Name	Usage	Cardinality
{{ ERR }}	Error	O	[0..*]

### 8.3. ORL^O22 – General Laboratory Order Response Message to Any OML Message Definition

Once the physical specimen (the NDBS card) is received by the laboratory, the laboratory may send an ORL^O22 message to the placer to acknowledge the receipt of the specimen. The sending of an ORL^O22 message is optional and should be defined by an agreement between placer and filler, since not all placers are able to accept an ORL message, nor all fillers able to generate an ORL message.

Note: Since use of the message type, ORL^O22, may not be common, future versions of this Guide may no longer support and may remove reference to this message type.

Segment	Name	Usage	Cardinality
MSH	Message Header	R	[1..1]
MSA	Message Acknowledgment	R	[1..1]
{{ ERR }}	Error	O	[0..*]
{{ SFT }}	Software	X	[0..0]
{{ NTE }}	Notes and Comments (for Header)	X	[0..0]
[	--- RESPONSE begin		
PID	Patient Identification	R	[1..1]
ORC	Common Order	R	[1..1]
{{	--- TIMING begin		
TQ1	Timing/Quantity	X	[0..0]
{{ TQ2 }}	Timing/Quantity Order Sequence	X	[0..0]
}}	--- TIMING end		
OBR	Observation Request	R	[1..1]
{{	--- SPECIMEN begin		
SPM	Specimen	X	[0..0]
{{ SAC }}	Specimen Container Details	X	[0..0]
}}	--- SPECIMEN end		

Segment	Name	Usage	Cardinality
]	--- RESPONSE end		

## 8.4. HL7 Batch Protocol

There are instances when it is convenient to transfer a batch of HL7 messages. A batch begins with a batch header statement (BHS) and ends with a batch trailer segment (BTS).

In addition, batches may be turned into files of batches using a file header segment (FHS) to begin and a file trailer segment (FTS) to end.

A single batch does not require a file header segment (FHS) and file trailer segment (FTS).

Layout of a single batch message appears as follows:

Segment	Name
[BHS]	(batch header segment)
{ [	--- MESSAGE begin
MSH	(zero or more HL7 messages)
....	
....	
....	
] }	--- MESSAGE end
[BTS]	(batch trailer segment)

Layout of a file of batch messages appears as follows:

Segment	Name
[FHS]	(file header segment)
{	--- BATCH begin
[BHS]	(batch header segment)
{ [	--- MESSAGE begin
MSH	(zero or more HL7 messages)

Segment	Name
....	
....	
....	
] }	--- MESSAGE end
[BTS]	(batch trailer segment)
}	--- Batch end
[FTS]	(file trailer segment)

## 9. Segment Definitions

The following table provides a description of the attributes used to define the segment in this section.

Figure 9-1: Definition of attributes used in the segment definition

Column Name	Definition
Seq	Sequence. Placement of the field in the segment.
Length	Maximum length specified for each field
DT	Data type. See data type section for details.
Usage	Refers to whether an element must appear in the message. See Usage definition under HL7 Definitions section.
Cardinality	Minimum and maximum number of times the element may appear. See Cardinality definition under HL7 Definitions section.
TBL#	Table number of the HL7 Code set. See Appendix B for details.
Item #	Unique identifier for each field across all segments
Element Name	Name of the element
Description	Description of the field with constraints, rules, and definitions

**NOTE:**

In the segment definitions below, specific components and subcomponents are listed only if:

- 1) there is a specific constraint, emphasis, or value specification for that particular component or subcomponent;
- 2) there is a deviation from the standard definition specified in the HL7 Data Types section.

If a component or subcomponent is omitted in the tables below, the standard definition applies as specified in the HL7 Data Types section of this Guide. **Omission of a component or subcomponent in the tables below does *not* imply that the component or subcomponent is not supported.**

## 9.1. MSH – Message Header Segment

The MSH segment defines the intent, source, destination, and other specifics of the syntax of a message. For the purposes of NDBS, the segment can be terminated following Sequence # 12.

Figure 9-2: Message Header segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	ITEM #	MSH Element Name	Description
1	1	ST	R	[1..1]		00001	Field Separator	Character used as the field separator for the rest of the message (ASCII 124).  Use literal value: ' '
2	4	ST	R	[1..1]		00002	Encoding Characters	Component separator, repetition separator, escape character, and subcomponent separator (ASCII 94, 126, 92, 38, respectively).  Use literal value: '^~\&'
3	227	HD	X	[0..0]	0361	00003	Sending Application	Not supported
4	227	HD	R	[1..1]	0362	00004	Sending Facility	The facility sending the order message.  Use NPI. If NPI is not available, use a different unique identifier, such as OID, CLIA, CAP, or a State-designated identifier.
5	227	HD	X	[0..0]	0361	00005	Receiving Application	Not supported
6	227	HD	R	[1..1]	0362	00006	Receiving Facility	The laboratory receiving the order message.  See Note 1 from Chapter 8 regarding identifiers. Use NPI. If NPI is not available, use a different unique identifier, such as CLIA, CAP, OID, or a State-designated identifier.
7	26	TS	R	[1..1]		00007	Date/Time Of Message	Date/time the sending application created the message. The minimum granularity is to the second. If the time zone is not included, the time zone defaults to the local time zone of the sender.
8	40	ST	X	[0..0]		00008	Security	Not supported
9	15	MS	R	[1..1]	0076	00009	Message Type	The message type, trigger event, and structure ID for the

Seq	Len	DT	Usage	Cardinality	TBL#	ITEM #	MSH Element Name	Description
		G						message. Use literal value: 'OML^O21^OML_O21'
10	20	ST	R	[1..1]		00010	Message Control ID	Unique ID for the message from the sending application. Use a counter.
11	3	PT	R	[1..1]	0103	00011	Processing ID	Indicator for the intent for processing the message. Use literal value: 'P' to indicate Production.
12	60	VID	R	[1..1]	0104	00012	Version ID	Specifies the HL7 version Use literal value: '2.5.1'
13	15	NM	X	[0..0]		00013	Sequence Number	Not supported
14	180	ST	X	[0..0]		00014	Continuation Pointer	Not supported
15	2	ID	X	[0..0]	0155	00015	Accept Acknowledgment Type	Not supported
16	2	ID	X	[0..0]	0155	00016	Application Acknowledgment Type	Not supported
17	3	ID	X	[0..0]	0399	00017	Country Code	Not supported
18	16	ID	X	[0..0]	0211	00692	Character Set	Not supported
19	250	CE	X	[0..0]		00693	Principal Language Of Message	Not supported
20	20	ID	X	[0..0]	0356	01317	Alternate Character Set Handling Scheme	Not supported
21	427	EI	X	[0..0]		1598	Message Profile Identifier	Not supported

## 9.2. PID – Patient Identification Segment

The PID segment is used by all applications as the primary means of communicating patient identification information (i.e., newborn baby information). This segment contains permanent patient identifying and demographic information that is not likely to change frequently.

Figure 9-3: Patient Identification segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	PID Element Name	Description
1	4	SI	R	[1..1]		00104	Set ID - PID	Use literal value: '1'
2	20	CX	X	[0..0]		00105	Patient ID	Not supported. Use PID-3 for baby's medical record number.
3	250	CX	R	[1..*]		00106	Patient Identifier List	Unique identifier for baby.  Baby's medical record number must be sent and should be sent in the first instance of PID-3 if this field repeats.  Other unique identifiers for baby may be sent, if available.
3.1	15	ST	RE	[0..1]			ID Number	Enter baby's medical record number. Enter other unique identifiers for the baby, if available.
3.5	5	ID	RE	[0..1]	0203		Identifier Type Code	Use Literal value: 'MR' to indicate Medical Record Number. For other unique identifiers, enter the corresponding identifier type code.
4	20	CX	X	[0..0]			Alternate Patient ID	Not supported
5	250	XPN	R	[1..*]		00108	Patient Name	Baby's name(s), including aliases.  This field is repeating. The primary or legal name is reported first with Name Type Code (PID-5.7) as literal value "L" for Legal name.  Aliases or other names will follow with the appropriate Name type Code.

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	PID Element Name	Description
								For alias, use Name Type Code (PID-5.7) as literal value "A" for Alias.  Note that in the case with newborn screening, 'Baby boy' may be the legal name at birth and then may become an alias by the time the results are reported
5.7	1	ID	RE	[0..1]	0200		Name Type Code	Example values are: "A" for Alias Name "B" for Name at Birth "C" for Adopted Name "L" for Legal Name
6	250	XPN	R	[1..1]		00109	Mother's Maiden Name	Baby's mother's maiden name
6.2		ST	X	[0..0]			Given Name	Not supported
6.3		ST	X	[0..0]			Second and Further Given Names or Initials Thereof	Not supported
6.4		ST	X	[0..0]			Suffix (e.g., JR or III)	Not supported
6.5		ST	X	[0..0]			Prefix (e.g., DR)	Not supported
6.7		ID	X	[0..0]	0200		Name Type Code	Not supported
6.14		TS	X	[0..0]			Professional Suffix	Not supported
7	26	TS	R	[1..1]		00110	Date/Time of Birth	Baby's date of birth.  Use OBX segment to report time of birth separately, even if time of birth is included in this field.
8	1	IS	R	[1..1]	0001	00111	Sex	Enter baby's sex.
9	250	XPN	X	[0..0]		00112	Patient Alias	Not supported. Use PID-5 (repeating field) for Patient Alias(es).
10	250	CE	RE	[0..*]	0005	00113	Race	Baby's race
10.1	20	ST	RE	[0..*]			Identifier	Enter code that represents baby's race
10.2	999	ST	CE	[0..*]			Text	Enter text description that represents baby's race  If PID-10.1 is populated, this component should also be populated.

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	PID Element Name	Description
10.3	20	ST	C	[0..*]			Name of Coding System	Use literal value: 'HL70005'  If PID-10.1 is populated, this component must be populated.
11	250	XAD	RE	[0..1]		00114	Patient Address	Address where the baby resides. If baby resides with mother, then enter mother's address. If baby does not reside with mother, then enter address where baby specifically resides.
12	4	IS	RE	[0..1]	0289	00115	County Code	County where baby resides. If baby resides with mother, then enter mother's county of residence. If baby does not reside with mother, then enter county where baby specifically resides.
13	250	XTN	RE	[0..1]		00116	Phone Number - Home	Baby's phone number. If baby resides with mother, then enter mother's phone number. If baby does not reside with mother, then enter phone number for where baby specifically resides.
14	250	XTN	X	[0..0]		00117	Phone Number - Business	Not supported
15	250	CE	X	[0..0]	0296	00118	Primary Language	Not supported
16	250	CE	X	[0..0]	0002	00119	Marital Status	Not supported
17	250	CE	X	[0..0]	0006	00120	Religion	Not supported
18	250	CX	X	[0..0]		00121	Patient Account Number	Not supported
19	16	ST	X	[0..0]		00122	SSN Number - Patient	Not supported
20	25	DLN	X	[0..0]		00123	Driver's License Number - Patient	Not supported
21	250	CX	X	[0..0]		00124	Mother's Identifier	Not supported
22	250	CE	RE	[0..*]	0189	00125	Ethnic Group	Baby's ethnicity
22.1	20	ST	RE	[0..*]			Identifier	Enter code that represents baby's ethnicity.
22.2	999	ST	CE	[0..*]			Text	Enter text description that represents baby's ethnicity.  If PID-22.1 is populated, this component should also be populated.
22.3	20	ID	C	[0..*]			Name of Coding	Literal value: 'HL70189'

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	PID Element Name	Description
							System	If PID-10.1 is populated, this component must be populated.
23	250	ST	X	[0..0]		00126	Birth Place	Not supported. Enter baby's birth hospital under OBX segment.
24	1	ID	RE	[0..1]	0136	00127	Multiple Birth Indicator	Enter (Y/N) to indicate whether baby is part of a multiple birth.
25	2	NM	RE	[0..1]		00128	Birth Order	<p>If Multiple Birth Indicator (PID-24) is "Y", then enter the number indicating the baby's birth order, with literal value "1" for the first child born, "2" for the second child, and so on.</p> <p>If Multiple Birth Indicator (PID-24) is "N", then leave empty or enter "1".</p> <p>Note: It is strongly encouraged that this field be explicitly used to indicate birth order rather than the convention of using the baby's name (e.g. Baby Boy 1, Baby Boy 2, etc).</p>
26	250	CE	X	[0..0]	0171	00129	Citizenship	Not supported
27	250	CE	X	[0..0]	0172	00130	Veterans Military Status	Not supported
28	250	CE	X	[0..0]	0212	00739	Nationality	Not supported
29	26	TS	CE	[0..1]		00740	Patient Death Date and Time	<p>Date and time that patient death occurred.</p> <p>If MSH-30 is 'Y' to indicate that the patient is deceased, then populate this field.</p>
30	1	ID	RE	[0..1]	0136	00741	Patient Death Indicator	Indicates whether patient is deceased.
31	1	ID	X	[0..0]	0136	1535	Identity Unknown Indicator	Not supported
32	20	IS	X	[0..0]	0445	1536	Identity Reliability Code	Not supported
33	26	TS	X	[0..0]		1537	Last Update Date/Time	Not supported
34	241	HD	X	[0..0]		1538	Last Update Facility	Not supported
35	250	CE	X	[0..0]	0446	1539	Species Code	Not supported
36	250	CE	X	[0..0]	0447	1540	Breed Code	Not supported
37	80	ST	X	[0..0]		1541	Strain	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	PID Element Name	Description
38	250	CE	X	[0..0]	0429	1542	Production Class Code	Not supported
39	250	CE	X	[0..0]	0171	1840	Tribal Citizenship	Not supported

### 9.3. NK1 – Next of Kin / Associated Parties Segment

The NK1 segment contains information about the baby’s mother, father, or caregiver. Baby’s mother’s information is required. Baby’s father or caregiver information is optional.

Figure 9-4: Next of Kin/Associated Parties segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	NK1 Element Name	Description
1	4	SI	R	[1..1]		00190	Set ID - NK1	Literal value: '1'
2	250	XPN	R	[1..*]		00191	Name	Baby's mother/father/caregiver's name. Baby's mother's name is required and must be provided. Father/caregiver's name is optional.
3	250	CE	R	[1..*]	0063	00192	Relationship	Relationship of the mother/father/caregiver to the baby
3.1	20	ST	R	[1..1]			Identifier	Enter the code of the person's relationship to the baby. If mother, then enter "MTH".
3.2	999	ST	R	[1..1]			Text	Enter the text description of the person's relationship to the baby. If mother, enter "Mother".
3.3	20	ST	R	[1..1]			Name of Coding System	Literal value 'HL70063'
4	250	XAD	R	[1..*]		00193	Address	Address of the baby's mother / father/caregiver. Mother's address is required and must be provided. Father/caregiver's address is optional.
4.9	20	IS	R	[1..1]	0289		County/Parish code	Enter county code where the mother/father/ caregiver resides.

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	NK1 Element Name	Description
								Mother's county of residence is required and must be provided. Father/caregiver's county of residence is optional.
5	250	XTN	R	[1..*]		00194	Phone Number	Mother / father / caregiver's phone number. Mother's phone number is required and must be provided. Father/caregiver's phone number is optional.
6	250	XTN	X	[0..0]		00195	Business Phone Number	Not supported
7	250	CE	X	[0..0]	0131	00196	Contact Role	Not supported
8	8	DT	X	[0..0]		00197	Start Date	Not supported
9	8	DT	X	[0..0]		00198	End Date	Not supported
10	60	ST	X	[0..0]		00199	Next of Kin / Associated Parties Job Title	Not supported
11	20	JCC	X	[0..0]	0327/0328	00200	Next of Kin / Associated Parties Job Code/Class	Not supported
12	250	CX	X	[0..0]		00201	Next of Kin / Associated Parties Employee Number	Not supported
13	250	XON	X	[0..0]		00202	Organization Name - NK1	Not supported
14	250	CE	X	[0..0]	0002	00119	Marital Status	Not supported
15	1	IS	X	[0..0]	0001	00111	Administrative Sex	Not supported
16	26	TS	R	[1..*]		00110	Date/Time of Birth	Date of birth of mother / father / caregiver. Mother's date of birth is required and must be provided. Father/caregiver's date of birth is optional.
17	2	IS	X	[0..0]	0223	00755	Living Dependency	Not supported
18	2	IS	X	[0..0]	0009	00145	Ambulatory Status	Not supported
19	250	CE	X	[0..0]	0171	00129	Citizenship	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	NK1 Element Name	Description
20	250	CE	X	[0..0]	0296	00118	Primary Language	Not supported
21	2	IS	X	[0..0]	0220	00742	Living Arrangement	Not supported
22	250	CE	X	[0..0]	0215	00743	Publicity Code	Not supported
23	1	ID	X	[0..0]	0136	00744	Protection Indicator	Not supported
24	2	IS	X	[0..0]	0231	00745	Student Indicator	Not supported
25	250	CE	X	[0..0]	0006	00120	Religion	Not supported
26	250	XPN	X	[0..0]		00109	Mother's Maiden Name	Not supported. Use PID-6 for baby's mother's maiden name.
27	250	CE	X	[0..0]	0212	00739	Nationality	Not supported
28	250	CE	X	[0..0]	0189	00125	Ethnic Group	Not supported
29	250	CE	X	[0..0]	0222	00747	Contact Reason	Not supported
30	250	XPN	X	[0..0]		00748	Contact Person's Name	Not supported
31	250	XTN	X	[0..0]		00749	Contact Person's Telephone Number	Not supported
32	250	XAD	X	[0..0]		00750	Contact Person's Address	Not supported
33	250	CX	O	[0..*]		00751	Next of Kin/Associated Party's Identifiers	Baby's mother's: 1) Medicaid Number (if eligible); and 2) Social Security Number
33.1	15	ST	O	[0..1]			ID Number	1) For Medicaid Number: Enter mother's Medicaid Number.  2) For SSN: Enter mother's social security number
33.4	227	HD	O	[0..1]			Assigning Authority	Assigning Authority for: 1) Medicaid Number 2) For SSN
33.4.1	20	IS	O	[0..1]			Namespace ID	Enter name of assigning authority: 1) For Medicaid number: use the name of the State (2- letter FIPS code). 2) For SSN: use literal value 'SSA'
33.4.2	199	ST	O	[0..1]			Universal ID	1) For Medicaid Number, if available, use OID for the State. 2) For 'SSA', use literal value:

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	NK1 Element Name	Description
								'2.16.840.1.113883.4.1'
33.4.3	6	ID	O	[0..1]			Universal ID Type	Use literal value: 'ISO'
33.5	5	ID	O	[0..*]	0203		Identifier Type Code	1) For Medicaid Number: use literal value: 'MA' 2) For SSN: use literal value: 'SS'
34	2	IS	X	[0..0]	0311	00752	Job Status	Not supported
35	250	CE	X	[0..0]	0005	00113	Race	Not supported
36	2	IS	X	[0..0]	0295	00753	Handicap	Not supported
37	16	ST	X	[0..0]		00754	Contact Person Social Security Number	Not supported
38	250	ST	X	[0..0]		01905	Next of Kin Birth Place	Not supported
39	2	IS	X	[0..0]	0099	00146	VIP Indicator	Not supported

## 9.4. ORC – Common Order Segment

The Common Order segment (ORC) is used to transmit fields that are common to all orders.

Figure 9-5: Common Order segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ORC Element Name	Description
1	2	ID	R	[1..1]	0119	00215	Order Control	Describes the type of action of trigger event related to the order message. Enter the order control code that corresponds to the message action. Literal value: "NW" to indicate new order/service.  Resubmissions or repeat screenings still use the value "NW". Matching of resubmitted orders to the original order will be done by the laboratory.

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ORC Element Name	Description
2	22	EI	R	[1..1]		00216	Placer Order Number	Order number for the message assigned by the order placer (hospital). Same value as OBR-2.
3	22	EI	X	[0..0]		00217	Filler Order Number	Not supported
4	22	EI	X	[0..0]		00218	Placer Group Number	Not supported
5	2	ID	X	[0..0]	0038	00219	Order Status	Not supported
6	1	ID	X	[0..0]	0121	00220	Response Flag	Not supported
7	200	TQ	X	[0..0]		00221	Quantity/Timing	Not supported
8	200	EIP	X	[0..0]		00222	Parent	Not supported
9	26	TS	X	[0..0]		00223	Date/Time of Transaction	Not supported
10	250	XCN	X	[0..0]		00224	Entered By	Not supported
11	250	XCN	X	[0..0]		00225	Verified By	Not supported
12	250	XCN	R	[1..1]		00226	Ordering Provider	Provider ordering the laboratory test. Same value as OBR-16.
12.1	15	ST	R	[1..1]			ID Number	Use NPI. If NPI is not available, use a different unique identifier, such as OID or a State-designated identifier.
12.9	227	HD	CE	[0..1]	0363		Assigning Authority	Enter the system or entity that assigned the ordering provider identifier in ORC-12.1
12.9.1	20	IS	CE	[0..1]			Namespace ID	If NPI, use literal value 'NPI'
12.9.2	199	ST	CE	[0..1]			Universal ID	If NPI, use literal value: '2.16.840.1.113883.4.6'
12.9.3	6	ID	CE	[0..1]			Universal ID Type	Use literal value 'ISO'
13	80	PL	X	[0..0]		00227	Enterer's Location	Not supported
14	250	XTN	X	[0..0]		00228	Call Back Phone Number	Not supported
15	26	TS	X	[0..0]		00229	Order Effective Date/Time	Not supported
16	250	CE	X	[0..0]		00230	Order Control Code Reason	Not supported
17	250	CE	X	[0..0]		00231	Entering Organization	Not supported
18	250	CE	X	[0..0]		00232	Entering Device	Not supported
19	250	XCN	X	[0..0]		00233	Action By	Not supported
20	250	CE	X	[0..0]	0339	01310	Advanced Beneficiary Notice	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ORC Element Name	Description
							Code	
21	250	XON	R	[1..1]		01311	Ordering Facility Name	Name of the facility or hospital placing the order message.
21.6	227	HD	R	[1..1]			Assigning Authority	Enter the system or entity that assigned the facility or hospital identifier in ORC-21.10
21.6.1	20	IS	CE	[0..1]			Namespace ID	If NPI, use literal value 'NPI'
21.6.2	199	ST	CE	[0..1]			Universal ID	If NPI, use literal value: '2.16.840.1.113883.4.6'
21.6.3	6	ID	CE	[0..1]			Universal ID Type	Use literal value 'ISO'
21.7	5	IS	R	[1..1]			Identifier Type Code	Enter the type of identifier used by the facility or hospital ordering the message. e.g., literal value 'NPI'
21.10	20	ST	R	[1..1]			Organization Identifier	Unique identifier number for facility or hospital submitting the order message.  Use NPI. If NPI is not available, use a different unique identifier, such as OID, CLIA, CAP, or a State-designated identifier.
22	250	XAD	R	[1..1]		01312	Ordering Facility Address	Address of the facility placing the order message.
23	250	XTN	R	[1..1]		01313	Ordering Facility Phone Number	Phone number of facility placing the order message
24	250	XAD	X	[0..0]		01314	Ordering Provider Address	Not supported
25	250	CE	X	[0..0]		01473	Order Status Modifier	Not supported
26	60	CE	X	[0..0]	0552	01641	Advanced Beneficiary Notice Override Reason	Not supported
27	26	TS	X	[0..0]		01642	Filler's Expected Availability Date/Time	Not supported
28	250	CE	X	[0..0]	0177	00615	Confidentiality Code	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ORC Element Name	Description
29	250	CE	RE	[0..1]	0482	01643	Order Type	Literal value: "I" (Inpatient) or "O" (Outpatient)
30	250	CNE	X	[0..0]	0483	01644	Enterer Authorization Mode	Not supported
31	250	CE	X	[0..0]		02286	Parent Universal Service Identifier	Not supported

## 9.5. OBR – Observation Request Segment

The Observation Request (OBR) segment is used to transmit information specific to an order. The Observation Request segment defines the attributes of a particular request for laboratory services.

Figure 9-6: Observation Request segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBR Element Name	Description
1	4	SI	R	[1..1]		00237	Set ID - OBR	Literal value: '1' for the first OBR segment transmitted; '2' for the next OBR segment and on
2	22	EI	R	[1..1]		00216	Placer Order Number	Order number for the message assigned by the order placer (hospital).  Same value as ORC-2.
3	22	EI	X	[0..0]		00217	Filler Order Number	Not supported
4	250	CE	R	[1..1]		00238	Universal Service ID	Code for the observation request
4.1	20	ST	RE	[1..1]			Identifier	Use literal value: '54089-8'
4.2	999	ST	CE	[0..1]			Text	Use literal value 'Newborn screening panel AHIC'
4.3	20	ID	C	[0..1]			Name of Coding System	Use literal value 'LN'
5	2	ID	X	[0..0]		00239	Priority - OBR	Not supported
6	26	TS	X	[0..0]		00240	Requested Date/Time	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBR Element Name	Description
7	26	TS	R	[1..1]		00241	Observation Date/Time #	Enter the specimen collection date/time
8	26	TS	X	[0..0]		00242	Observation End Date/Time #	Not supported
9	20	CQ	X	[0..0]		00243	Collection Volume	Not supported
10	250	XCN	O	[0..1]		00244	Collector Identifier	Person that collected the specimen. Hospitals typically record only the collector's initials. The transmitting of data for fields such as ID Number, Family Name, etc. is optional and should be negotiated between the sender and receiver of the data.
11	1	ID	X	[0..0]	0065	00245	Specimen Action Code	Not supported
12	250	CE	X	[0..0]		00246	Danger Code	Not supported
13	300	ST	X	[0..0]		00247	Relevant Clinical Info.	Not supported
14	26	TS	X	[0..0]		00248	Specimen Received Date/Time	Not supported
15	300	SPS	X	[0..0]		00249	Specimen Source	Not supported
16	250	XCN	R	[1..1]		00226	Ordering Provider	Provider ordering the laboratory test. Same value as ORC-12.
16.1		ST	R	[1..1]			ID Number	Use NPI. If NPI is not available, use a different unique identifier, such as OID or a State-designated identifier.
16.9		HD	R	[1..1]			Assigning Authority	Enter the system or entity that assigned the ordering provider identifier in OBR-16.1
16.9.1		IS	CE	[1..1]			Namespace ID	If NPI, use literal value 'NPI'
16.9.2		ST	CE	[1..1]			Universal ID	If NPI, use literal value: '2.16.840.1.113883.4.6'
16.9.3		ID	CE	[1..1]			Universal ID Type	Use literal value 'ISO'
17	250	XTN	X	[0..0]		00250	Order Callback Phone Number	Not supported
18	60	ST	X	[0..0]		00251	Placer Field 1	Not supported
19	60	ST	X	[0..0]		00252	Placer Field 2	Not supported
20	60	ST	X	[0..0]		00253	Filler Field 1	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBR Element Name	Description
21	60	ST	X	[0..0]		00254	Filler Field 2	Not supported
22	26	TS	X	[0..0]		00255	Results Rpt/Status Chng - Date/Time	Not supported
23	40	MOC	X	[0..0]		00256	Charge to Practice	Not supported
24	10	ID	X	[0..0]	0074	00257	Diagnostic Serv Sect ID	Not supported
25	1	ID	X	[0..0]	0123	00258	Result Status	Not supported
26	400	PRL	X	[0..0]		00259	Parent Result	Not supported
27	200	TQ	X	[0..0]		00221	Quantity/Timing	Not supported
28	250	XCN	X	[0..0]		00260	Result Copies To	Not supported
29	200	EIP	X	[0..0]		00261	Parent	Not supported
30	20	ID	X	[0..0]	0124	00262	Transportation Mode	Not supported
31	250	CE	X	[0..0]		00263	Reason for Study	Not supported
32	200	NDL	X	[0..0]		00264	Principal Result Interpreter	Not supported
33	200	NDL	X	[0..0]		00265	Assistant Result Interpreter	Not supported
34	200	NDL	X	[0..0]		00266	Technician	Not supported
35	200	NDL	X	[0..0]		00267	Transcriptionist	Not supported
36	26	TS	X	[0..0]		00268	Scheduled Date/Time	Not supported
37	4	NM	X	[0..0]		01028	Number of Sample Containers	Not supported
38	250	CE	X	[0..0]		01029	Transport Logistics of Collected Sample	Not supported
39	250	CE	X	[0..0]		01030	Collector's Comment	Not supported
39.1	20	ST	X	[0..0]			Identifier	Not supported.
39.2	999	ST	X	[0..0]			Text	Not supported
40	250	CE	X	[0..0]		01031	Transport Arrangement Responsibility	Not supported
41	30	ID	X	[0..0]	0224	01032	Transport Arranged	Not supported
42	1	ID	X	[0..0]	0225	01033	Escort Required	Not supported
43	250	CE	X	[0..0]		01034	Planned Patient Transport Comment	Not supported
44	250	CE	X	[0..0]	0088	00393	Procedure Code	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBR Element Name	Description
45	250	CE	X	[0..0]	0340	01316	Procedure Code Modifier	Not supported
46	250	CE	X	[0..0]	0411	01474	Placer Supplemental Service Information	Not supported
47	250	CE	X	[0..0]	0411	01475	Filler Supplemental Service Information	Not supported
48	250	CE	X	[0..0]	0476	01646	Medically Necessary Duplicate Procedure Reason.	Not supported
49	2	IS	X	[0..0]	0507	01647	Result Handling	Not supported
50	250	CE	X	[0..0]		02286	Parent Universal Service Identifier	Not supported

## 9.6. OBX – Observation Result Segment

The OBX segment is used to transmit a single observation or observation fragment. For orders, the OBX carries clinical information needed by the filler to interpret the observation the filler makes.

For details on the individual use of the OBX segment for each relevant NDBS data element, see **Section 8: NDBS Data Set Mapped to HL7 Elements**.

Figure 9-7: Observation Result segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBX Element Name	Description
1	4	SI	R	[1..1]		00569	Set ID - OBX	Literal value: '1' for the first OBX segment transmitted; '2' for the next OBX segment, etc.
2	2	ID	R	[1..1]	0125	00570	Value Type	Enter the data type of the observation value. In addition to the data types accepted in HL7 version 2.5.1, the TN data type is allowed in the OBX segment.
3	Var	Vari	R	[1..1]		00571	Observation Identifier	Unique identifier for the observation. The

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBX Element Name	Description
	ies	es						“question” that needs to be answered.
3.1		ST	R	[1..1]			Identifier	Use the appropriate LOINC code that represents the “question” that needs to be answered.
3.2		ST	R	[1..1]			Text	Use the text that corresponds to the LOINC code in OBX 3.1.
3.3		ID	R	[1..1]			Name of Coding System	Use literal value ‘LN’ for LOINC. This is required for OBX segments that use LOINC codes as specified in Chapter 8.  If a secondary coding system is used, such as the use of local codes, then use the appropriate value for that coding system.
4	20	ST	CE	[0..1]		00572	Observation Sub-ID	Enter the Observation Sub-ID. Field is required if there are multiple OBX with the same OBX-3 associated with the same OBR.  When valued, this field shall contain integer values, with the first occurrence starting at ‘1’; ‘2’ for the next occurrence, etc.
5	Varies	Varies	R	Varies		00573	Observation Value	Data type of this field matches the data type specified in OBX-2.  Enter the Observation value. This is the “answer” to the “question” in OBX-3.
6	250	CE	RE	[0..1]		00574	Units	Enter units of the Observation value, if applicable.
7	60	ST	O	[0..1]		00575	References Range	Interpretation range that applies to the value reported in OBX-5. It should provide enough information to understand the abnormal flags reported in OBX-8.
8	5	IS	O	[0..1]	0078	00576	Abnormal Flags	Indicator of the normalcy of the result found in OBX-5.
9	5	NM	X	[0..0]		00577	Probability	Not supported
10	2	ID	X	[0..0]	0080	00578	Nature of Abnormal Test	Not supported

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	OBX Element Name	Description
11	1	ID	R	[1..1]	0085	00579	Observation Result Status	Use literal value: 'O' to indicate Order Detail Description Only (No Result)
12	26	TS	X	[0..0]		00580	Effective Date of Reference Range Values	Not supported
13	20	ST	X	[0..0]		00581	User Defined Access Checks	Not supported
14	26	TS	X	[0..0]		00582	Date/Time of the Observation	Not supported
15	250	CE	X	[0..0]		00583	Producer's Reference	Not supported
16	250	XCN	X	[0..0]		00584	Responsible Observer	Not supported
17	250	CE	X	[0..0]		00936	Observation Method	Not supported
18	22	EI	X	[0..0]		01479	Equipment Instance Identifier	Not supported
19	26	TS	X	[0..0]		01480	Date/Time of the Analysis	Not supported
20			X	[0..0]			Reserved for harmonization with V2.6	Not supported
21			X	[0..0]			Reserved for harmonization with V2.6	Not supported
22			X	[0..0]			Reserved for harmonization with V2.6	Not supported
23	567	XON	X	[0..0]		02283	Performing Organization Name	Not supported
24	631	XAD	X	[0..0]		02284	Performing Organization Address	Not supported
25	300 2	XCN	X	[0..0]		02285	Performing Organization Medical Director	Not supported

## 9.7. MSA – Message Acknowledgement Segment

The MSA segment contains information sent while acknowledging another message.

Figure 9-8: Message Acknowledgement segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	MSA Element Name	Description
1	2	ID	R	[1..1]	0008	00018	Acknowledgment Code	Code indicating receiver's acknowledgement of message  If the message was accepted without errors, then use literal value 'AA'.  If the message was accepted but contained non-fatal errors, then use literal value 'AE'.  If the message was rejected due to fatal errors, then use literal value 'AR'.
2	20	ST	R	[1..1]		00010	Message Control ID	This field echoes the value in MSH-10
3	80	ST	X	[0..0]		00020	Text Message	Not supported
4	15	NM	X	[0..0]		00021	Expected Sequence Number	Not supported
5			X	[0..0]		00022	Delayed Acknowledgment Type	Not supported
6	250	CE	X	[0..0]	0357	00023	Error Condition	Not supported

## 9.8. ERR – Error Segment

The ERR segment is used to add error comments to acknowledgment messages.

Figure 9-9: Error segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ERR Element Name	Description
-----	-----	----	-------	-------------	------	--------	------------------	-------------

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	ERR Element Name	Description
1	493	ELD	X	[0..0]		00024	Error Code and Location	Not supported for HL7 version 2.5 and above
2	18	ERL	RE	[0..1]		01812	Error Location	If an error involves the entire message (e.g., the message cannot be parsed) then location is not applicable. In this case, leave the field empty.
3	705	CE	R	[1..1]	0357	01813	HL7 Error Code	Conveys the error
3.1	20	ST	RE				Identifier	Enter code that represents type of error
3.2	199	ST					Text	Enter text description that represents error
3.3	20	ID					Name of Coding System	Use literal value 'HL70357'.  If ERR-3.1 is populated, this component must be populated.
4	2	ID	RE	[0..1]	0516	01814	Severity	Conveys the severity of the error
4.1		ST					Identifier	Enter code that represents the severity of the error.
4.2		ST					Text	Enter text description that represents the severity of the error.
4.3		ID					Name of Coding System	Use literal value 'HL70516'.  If ERR-4.1 is populated, this component must be populated.
5	705	CE	X	[0..0]	0533	01815	Application Error Code	
6	80	ST	X	[0..0]		01816	Application Error Parameter	
7	2048	TX	RE	[0..1]		01817	Diagnostic Information	Enter relevant diagnostic information.
8	250	TX	RE	[0..1]		01818	User Message	Enter relevant user messages.
9	20	IS	X	[0..0]	0517	01819	Inform Person Indicator	
10	705	CE	X	[0..0]	0518	01820	Override Type	
11	705	CE	X	[0..0]	0519	01821	Override Reason Code	
12	652	XTN	RE	[0..1]		01822	Help Desk Contact Point	Contact information for help desk.

## 9.9. FHS – File Header Segment

Batches may be turned into files of batches using a file header segment (FHS) to begin and a file trailer segment (FTS) to end. The FHS segment defines the start of a file.

Figure 9-10: File Header segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	FHS Element Name	Description
1	1	ST	R	[1..1]		00067	File Field Separator	Use literal value: ' '
2	4	ST	R	[1..1]		00068	File Encoding Characters	Use literal value: '^~\&'
3	227	HD	X	[0..0]		00069	File Sending Application	Not supported
4	227	HD	R	[1..1]		00070	File Sending Facility	Same definition as corresponding field in MSH segment.
5	227	HD	X	[0..0]		00071	File Receiving Application	Not supported
6	227	HD	R	[1..1]		00072	File Receiving Facility	Same definition as corresponding field in MSH segment.
7	26	TS	R	[1..1]		00073	File Creation Date/Time	Same definition as corresponding field in MSH segment.
8	40	ST	X	[0..0]		00074	File Security	Not supported
9	20	ST	X	[0..0]		00075	File Name/ID	Not supported
10	80	ST	X	[0..0]		00076	File Header Comment	Not supported
11	20	ST	RE	[0..1]		00077	File Control ID	This field is used to identify a particular file uniquely. It can be echoed back in FHS-12 Reference File Control ID.
12	20	ST	RE	[0..1]		00078	Reference File Control ID	This field contains the value of FHS-11 File Control ID when this file was originally transmitted. Not present if this file is being transmitted for the first time.

## 9.10. FTS – File Trailer Segment

Batches may be turned into files of batches using a file header segment (FHS) to begin and a file trailer segment (FTS) to end. The FTS segment defines the end of a file.

Figure 9-11: File Trailer segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	FTS Element Name	Description
1	10	NM	R	[1..1]		00079	File Batch Count	Contains the number of batches contained in this file.
2	80	ST	RE	[0..1]		00080	File Trailer Comment	Trailer comment

## 9.11. BHS – Batch Header Segment

There are instances when it is convenient to transfer a batch of HL7 messages. A batch begins with a batch header statement (BHS) and ends with a batch trailer segment (BTS). The BHS segment defines the start of a batch.

Figure 9-12: Batch Header segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	BHS Element Name	Description
1	1	ST	R	[1..1]		00081	Batch Field Separator	Use literal value: ' '
2	3	ST	R	[1..1]		00082	Batch Encoding Characters	Use literal value: '^~\&'
3	227	HD	X	[0..0]		00083	Batch Sending Application	Same definition as corresponding field in MSH segment.
4	227	HD	R	[1..1]		00084	Batch Sending Facility	Same definition as corresponding field in MSH segment.
5	227	HD	X	[0..0]		00085	Batch Receiving Application	Same definition as corresponding field in MSH segment.
6	227	HD	R	[1..1]		00086	Batch Receiving Facility	Same definition as corresponding field in MSH segment.
7	26	TS	R	[1..1]		00087	Batch Creation Date/Time	Same definition as corresponding field in MSH segment.
8	40	ST	O	[0..1]		00088	Batch Security	Same definition as corresponding field in MSH segment.
9	20	ST	X	[0..0]		00089	Batch Name/ID/Type	Not supported
10	80	ST	X	[0..0]		00090	Batch Comment	Not supported
11	20	ST	RE	[0..1]		00091	Batch Control ID	This field is used to identify a particular file uniquely. It can be echoed back in BHS-12 Reference File Control ID.
12	20	ST	RE	[0..1]		00092	Reference Batch Control ID	This field contains the value of BHS-11 File Control ID when this file was originally transmitted. Not present if this file is being transmitted for the first time.

## 9.12. BTS – Batch Trailer Segment

There are instances when it is convenient to transfer a batch of HL7 messages. A batch begins with a batch header statement (BHS) and ends with a batch trailer segment (BTS). The BTS segment defines the end of a batch.

Figure 9-13: Batch Header segment definition

Seq	Len	DT	Usage	Cardinality	TBL#	Item #	BTS Element Name	Description
1	10	ST	RE	[0..1]		00093	Batch Message Count	Contains the count of the individual messages contained within the batch.
2	80	ST	RE	[0..1]		00090	Batch Comment	Comment for the batch
3	100	NM	RE	[0..*]		00095	Batch Totals	Contains the batch total

## 10. Sample Messages

Sample messages are provided in the sections that follow. While message segments may wrap in this document, the end of each segment is indicated with a <CR>.

### 10.1. OML^O21

#### Storyboard:

Lois Lane and her husband, who reside at 123 Main Street, Apt. 3-C, Anytown, TN 55555, are the proud parents of twins. The twins, Jane (a girl) and Shane (a boy), were delivered at St. Elsewhere Hospital on October 13, 2010.

St. Elsewhere Hospital, NPI #999999999, is located at 211 Small Street in Anytown, Tennessee 55555. The Hospital's phone number is (865) 444-2222.

Lois' home phone number is (865) 555-1212 and her date of birth is July 10, 1985. Lois and her husband reside in Nice County (county code 333). Her maiden name is Smith. Her Social Security number is 123-12-1234 and Medicaid Number is 22222222A2.

Jane Mary Lane, born as Baby Girl Smith, weighed 2920 grams when she was born at 6:32 AM (a full 10 minutes before her brother, Shane). Her gestational age was 37 weeks and 2 days.

It was necessary to give Jane a blood transfusion the first day of life at 5:23 PM. Prior to the blood transfusion, the parents provide their consent for initial NDBS screening and Jane's first NDBS screening is collected. The filter paper number (bar code) of the initial test specimen is 43554432. After the blood transfusion, a second NDBS specimen is collected. This second NDBS test is ordered by Dr. Minnie Smiles, NPI # 111111111. The specimen for Jane is collected on October 14, 2010 at 6:53 PM by Nurse Vary Helpful. At the time of collection, Jane weighs 2750 grams. The filter paper number (bar code) for the second specimen is 97893203. This second specimen is required by protocol because the first specimen was appropriately collected before the blood transfusion, but when the infant was less than 24 hours old.

Jane is in ICU for 6 days, including at the time of the second sample collection. Jane is being fed breast milk supplemented by soy milk. Jane's medical record number assigned by St. Elsewhere Hospital is 123456789. The Hospital also recorded Jane's race (White) and ethnicity (not Hispanic or Latino). Jane's post-discharge provider is Dr. Bob Healthy, NPI #4444444444. The post-discharge practice is Healthy Clinic (NPI #555555555) at 100 Small Street, Suite 3B, Anytown, Tennessee 55555. The phone number for the clinic is (865) 542-3333.

St. Elsewhere Hospital, using their lab ordering system, electronically submits the second NDBS order for each newborn to Tennessee State Public Health Laboratory's (abbreviated as 'TNSPHLAB'; CLIA # 77D7777777) laboratory information system, PHLIMS (OID # 3.11.333.1.333333.1.333), on October 14, 2010 at 9:04PM.

The NDBS OML^O21 sample order message for Jane Mary Lane's second NDBS specimen, order #128993, is shown below.

**Summary of Data Elements**

Figure 10-1: Summary of data elements described in storyboard

#	NDBS Data Element	Value	Mapped HL7 Element
1	Hospital Order Number (HL7 system-generated number for message tracking)	128993	ORC-2: Placer Order Number OBR-2: Placer Order Number
2	Collection Date/Time	October 14, 2010 at 6:53 PM	OBR-7: Observation Date / Time
3	Hospital/Submitter Information: Identifier, Name, Address, Phone Number	NPI #: 9999999999 Name: St. Elsewhere Hospital Address: 211 Small Street in Anytown, Tennessee 55555 Phone Number: (865) 444-2222	ORC-21: Ordering Facility Name ORC-22: Ordering Facility Address ORC-23: Ordering Facility Phone Number
4	Ordering provider	NPI #: 1111111111 Dr. Minnie Smiles	ORC-12: Ordering Provider OBR-16: Ordering Provider
5	Receiving Newborn Screening Laboratory Information (ID)	CLIA number: 77D7777777 Tennessee State Public Health Laboratory Abbreviation ' TNSPHLAB'	MSH-6: Receiving Facility
6	Collector of Specimen (Person that collects the specimen)	Nurse Vary Helpful (initials: VH)  (ID is optional and omitted in this case)	OBR-10: Collector Identifier (all are optional fields): 10.1: ID Number 10.2: Family Name 10.3: Given Name 10.9: Collector Identifier Assigning Authority
7	Baby's name	Jane Mary Lane	PID-5: Patient Name

#	NDBS Data Element	Value	Mapped HL7 Element
8, 31	Multiple Birth Information: Multiple Birth Indicator, Birth Order Multiple Birth Information: Birth Plurality	Yes, twins. Birth Order: 1	PID-24: Multiple Birth Indicator PID-25: Birth Order OBX Segment
9	Date of Birth	October 13, 2010	PID-7: Date of Birth
10	Baby's Sex	Female	PID-8: Sex
11	Baby's Aliases	Baby Girl Smith	PID-5: Patient Name
12	Baby's Race	White	PID-10: Race
13	Baby's Ethnicity	Not Hispanic or Latino	PID-22: Ethnic Group
14	Baby's Medical Record Number	123456789 at St. Elsewhere Hospital, NPI # 9999999999	PID-3: Patient Identifier List: 3.1: ID Number 3.5: Identifier Type Code
15	Mother's Name	Lois Lane	NK1-2: Next of Kin Name NK1-3: Relationship
16	Mother's Maiden Name	Smith	PID-6: Mother's Maiden Name
17	Mother's Birthdate	July 10, 1985	NK1-16: Next of Kin Date/Time of Birth
18	Mother's Phone	(865) 555-1212	NK1-5: Next of Kin Phone Number
19	Mother's/Baby's: Street Address, City, State, Zip Code, County	123 Main Street, Apt 3-C Anytown, TN 55555 Nice County (county code 333)	NK1-4: Next of Kin Address PID-11: Patient Address
20	Mother's Medicaid Number (if eligible)	222222222A2	NK1-33.1: ID Number NK1-33.5: Identifier Type Code
21	Mother's SSN	123-12-1234	NK1-33.1: ID Number NK1-33.4: Assigning Authority NK1-33.5: Identifier Type Code
26	Pre-Printed Unique Filter Paper Number (Bar Code)	97893203	OBX Segment
27	Initial/Repeat	Repeat per protocol	OBX Segment
28	Filter Paper Number of Initial Test	43554432	OBX Segment

#	NDBS Data Element	Value	Mapped HL7 Element
29	Post-discharge Provider: Identifier, Name	NPI#: 4444444444  Name: Dr. Bob Healthy	OBX Segment
30	Post-discharge Practice: • Identifier, • Name, • Address, • Phone Number	NPI #: 5555555555  Name: Healthy Clinic  Address: 100 Small Street, Suite 3B, Anytown, Tennessee 55555  Phone Number: (865) 542-3333	OBX Segment
32	Time of Birth	6:32 AM	OBX Segment
33	Birth Hospital: • Identifier, • Name, • Address, • Phone Number	St. Elsewhere Hospital  NPI # 9999999999  Address: 211 Small Street, Anytown, Tennessee 55555  Phone Number: (865) 444-2222	OBX Segment
34	Birth Weight	2920 grams	OBX Segment
35	Weight at Time of Sample	2750 grams	OBX Segment
36	Gestational Age at Birth (Reported as Number of Completed Weeks)	37 weeks and 2 days (reported as 37 weeks)	OBX Segment
38	Feeding Type or Status	Being fed soy milk and breast milk	OBX Segment
39	Any Blood Product Transfusion Before NBS Specimen Collection?	Yes	OBX Segment
40	If Yes, Date of Last Blood Product Transfusion	October 13, 2010 at 5:23 PM	OBX Segment
41	Infant in ICU at Time of Specimen Collection?	Yes	OBX Segment
42	Maternal factors that affect newborn screening interpretation	Mother has Lupus	Two OBX segments to transmit the other free text response

**Sample Message:**

MSH|^~\&||ST ELSEWHERE HOSPITAL^9999999999^NPI||TNSPHLAB^  
77D7777777^CLIA|20101014210405-0500||OML^O21^OML\_O21|123|P|2.5.1<CR>

PID|1||123456789^^^ST ELSEWHERE HOSPITAL&9999999999&NPI^MR||  
Lane^Jane^Mary^^^^L~Smith^Baby Girl^^^^A|Smith|20101013|F||2106-  
3^white^HL70005|123 Main Street^Apartment 3-C^Anytown^TN^55555^USA  
^^^333|333|^^^^^865^5551212|||||||||N^Not Hispanic or Latino  
^HL70189||Y|1|||||N<CR>

NK1|1|Lane^Lois^^^^L|MTH^Mother^HL70063|123 Main Street^Apartment 3-  
C^Anytown^TN^55555^USA^^^333|^^^^^865^5551212|||||||||19850710  
|||||||||123121234^^^SSA&2.16.840.1.113883.4.1&ISO^SS~22222222  
2A2^^^TN^MA<CR>

ORC|NW|128993^ST ELSEWHERE HOSPITAL^9999999999^NPI|||||||1111111111  
^Smiles^Minnie^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^^^^^MD|  
|||||||ST ELSEWHERE HOSPITAL^^^NPI&2.16.840.1.113883.4.6&ISO  
^NPI^^^9999999999|211 Small Street^^Anytown^TN^55555^USA^^^333  
|^^^^^865^4442222||||||I<CR>

OBR|1|128993^ST ELSEWHERE HOSPITAL^9999999999^NPI||54089-8^Newborn  
screening panel AHIC^LN||20101014185317|||^VH|||||1111111111^Smiles  
^Minnie^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI ^^^^^^^MD<CR>

OBX|1|ST|57716-3^State printed on filter paper card [Identifier] in  
NBS card^LN|2|TN||||||O<CR>

OBX|2|ST|57723-9^Unique bar code number of Current sample^LN  
||97893203||||||O<CR>

OBX|3|CE|57721-3^Reason for lab test in Dried blood spot^LN||LA12426-  
5^Subsequent screen - required by protocol^LN||||||O<CR>

OBX|4|ST|57711-4^Unique bar code number of Initial sample^LN||43554432  
||||||O<CR>

OBX|5|CE|57722-1^Birth plurality of Pregnancy^LN||LA12412-  
5^Twins^LN||||||O<CR>

OBX|6|TM|57715-5^Birth time^LN||0632-0500||||||O<CR>

OBX|7|NM|57714-8^Obstetric estimation of gestational age^LN||37  
|wk^weeks||||||O<CR>

OBX|8|NM|8339-4^ Birthweight^LN||2920|g^gram||||||O<CR>

OBX|9|NM|58229-6^Body weight Measured --when specimen taken^LN||2750|  
g^gram|||||O<CR>

OBX|10|TX|62323-1^Post-discharge provider ID [Identifier]^LN||4444444444  
|||||O<CR>

OBX|11|TX|62324-9^Post-discharge provider name in Provider^LN||Dr. Bob  
Healthy, MD|||||O<CR>

OBX|12|TX|62325-6^Post-discharge provider practice ID^LN||5555555555  
|||||O<CR>

OBX|13|TX|62326-4^Post-discharge provider practice name^LN||Healthy  
Clinic|||||O<CR>

OBX|14|TX|62327-2^Post-discharge provider practice address^LN||100  
Small Street, Suite 3B, Anytown, Tennessee 55555|||||O<CR>

OBX|15|TN|62328-0^Post-discharge provider practice telephone number in  
Provider^LN||(865) 542-3333|||||O<CR>

OBX|16|TX|62329-8^Birth hospital facility ID [Identifier] in  
Facility^LN||9999999999|||||O<CR>

OBX|17|TX|62330-6^Birth hospital facility name^LN||ST ELSEWHERE  
HOSPITAL|||||O<CR>

OBX|18|TX|62331-4^Birth hospital facility address^LN||211 Small  
Street, Anytown, Tennessee 55555|||||O<CR>

OBX|19|TN|62332-2^Birth hospital facility phone number in Facility^LN  
||(865) 444-2222|||||O<CR>

OBX|20|CE|67704-7^Feeding types^LN||LA14041-0^Lactose free formula  
(including soy or hydrolyzed)^LN|||||O<CR>

OBX|21|CE|67704-7^Feeding types^LN|2|LA16914-6^Breast milk^LN  
|||||O<CR>

OBX|22|CE|57713-0^Infant NICU factors that affect newborn screening  
interpretation^LN|1|LA12419-0^Infant in ICU at time of specimen  
collection^LN|||||O<CR>

OBX|23|CE|57713-0^Infant NICU factors that affect newborn screening  
interpretation^LN|2|LA12417-4^Any blood product transfusion (including  
ECMO)^LN|||||O<CR>

OBX|24|DTM|62317-3^Date of Last Blood Product Transfusion^LN  
||201010131723|||||O<CR>

```
OBX|25|CE|67706-2^Maternal factors that affect newborn screening
interpretation^LN||LA46-8^Other^LN|||||O<CR>
```

```
OBX|26|TX|67707-0^Other maternal factors that affect newborn screening
interpretation^LN||Mother has Lupus|||||O<CR>
```

## 10.2. ACK in Response to OML^O21

### Order Message Accepted (No Errors):

The previous section of the Guide contained an OML^O21 message example (message ID 688140900) sent to Tennessee State Public Health Laboratory (abbreviated as ‘TNSPHLAB’) from St. Elsewhere Hospital. As soon as the laboratory information system, PHLIMS (CLIA #3.11.333.1.333333.1.333), receives the order message, it will return an ACK in acknowledgement. Since the order message sent by St. Elsewhere Hospital did not contain any errors and, therefore, was accepted by Tennessee State Public Health Laboratory, the ACK will contain Acknowledgement Code “AA” in MSA-2. An example of the ACK message sent by Tennessee State Public Health Laboratory is shown below:

```
MSH|^~\&|PHLIMS^3.11.333.1.333333.1.333^ISO|TNSPHLAB^77D7777777^CLIA||
ST ELSEWHERE HOSPITAL ^9999999999^NPI|20101014210405-
0400||ACK^V04^ACK|123|P|2.5.1<CR>
```

```
MSA|AA|123<CR>
```

### Order Message Rejected (Fatal Errors):

When a message contains errors, the errors will be categorized as fatal or non-fatal. Fatal errors indicate that the message was received but could not be processed. When processing an HL7 message, there are a number of problems that, based on HL7 rules, may result in a fatal error. For example, if a required field is missing, then the segment is treated as missing. If that segment is required, then the error becomes fatal.

If the message sent by the Hospital had contained fatal errors and, therefore, the message could not be accepted by the Lab, the ACK would contain Acknowledgement Code “AR” in MSA-2 to indicate that the message was rejected due to fatal errors.

```
MSH|...
```

```
MSA|AR|123<CR>
```

Optionally, one or more ERR segments may also be sent as part of the ACK to indicate the error(s) that caused the rejection. One ERR segment would be sent for each error. For example, if the OML\_O21 message sent by the Hospital was missing the PID-5 field, then the ERR segment(s) would provide the Hospital with the following detail that the Hospital could then use to correct their order message.

MSH|...

MSA|AR|123<CR>

ERR||PID^5|101^required field missing^HL70357|E^Error^HL70516<CR>

ERR||PID|100^required segment missing^HL70357|E^Error^HL70516<CR>

### **Order Message Accepted (With Non-Fatal Errors):**

A non-fatal error indicates that the message was received, contained some type of error, but the error did not prevent the message from being processed. Although the non-fatal error did not cause the message to be rejected, some data may have been lost as a result of the non-fatal error.

If an optional field or component contained malformed data, this would be considered a non-fatal error. For example, an identifier for the mother, such as Social Security Number or Medicaid number, was provided in NK1-33.1. But, rather than valuing NK1-33.5 with the corresponding identifier code of “SS” or “MA”, a value not supported by Identifier Type Code table 0293 was sent in NK1-33.5. The mother’s identifier would be lost and the invalid code would be considered a non-fatal error since NK1-33 is an optional field.

If a message is accepted but contains non-fatal errors, the ACK will contain Acknowledgement Code “AE” in MSA-2 to indicate the message was accepted with non-fatal errors.

MSH|...

MSA|AE|123<CR>

ERR||NK1^33^5|103^Table value not found^HL70357|W^Warning^HL70516<CR>

## **10.3. ORL^O22**

A previous section of the Guide contained an OML^O21 message example (message ID 688140900) sent to Tennessee State Public Health Laboratory (abbreviated as ‘TNSPHLAB’) from St. Elsewhere Hospital. In addition to the electronic order message, the hospital will send the corresponding physical specimen (the NDBS card) to the laboratory. Once the Tennessee

State Public Health Laboratory receives the physical specimen, it may send an ORL^22 message in acknowledgement of the physical receipt of the specimen.

In this example, the quality of the physical specimen is satisfactory and therefore, accepted by the Tennessee State Public Health Laboratory for testing. An example of the ORL^O22 message sent by Tennessee State Public Health Laboratory is shown below:

**Sample Message:**

```
MSH|^~\&|PHLIMS^3.11.333.1.333333.1.333^ISO|TNSPHLAB^77D7777777^CLIA
||ST ELSEWHERE HOSPITAL ^9999999999^NPI|20101014210405-
0400||ORL^O22^ORL_O22|123|P|2.5.1<CR>
```

```
MSA|AA|123<CR>
```

```
PID|1||123456789^^^ST ELSEWHERE HOSPITAL&9999999999&NPI^MR
||Lane^Jane^Mary^^^^L~Smith^Baby Girl^^^^^A|Smith|20101013|F||2106-
3^white^HL70005|123 Main Street^Apartment 3-C^Anytown^TN^55555^USA
^^^333|333|^^^^^865^5551212 |||||||N^Not Hispanic or
Latino^HL70189||Y|1|||||N<CR>
```

```
ORC|NW|128993^ST ELSEWHERE HOSPITAL^9999999999^NPI|||||||||
1111111111^Smiles^ Minnie^^^Dr^^^NPI&2.16.840.1.113883.4.6
&ISO^L^^^NPI^^^^^^^MD |||||||ST ELSEWHERE HOSPITAL
^^^^^NPI&2.16.840.1.113883.4.6&ISO^NPI^^^9999999999|211 Small
Street^^Anytown^TN^55555^USA^^^333|^^^^^865^4442222|||||I<CR>
```

## 11. Appendix A: Hearing Loss Risk Indicators

Early Hearing Detection and Intervention (EHDI) evaluations are conducted as part of newborn screening. At times, hearing test results are available prior to the sending of an NDBS laboratory order to the laboratory. If available, the order placer may provide additional information regarding the EHDI test results.

EHDI test results may be provided using the Observation Result Segment (OBX) using the following LOINC codes (repeat as many as apply).

Note: the LOINC code set below may have been modified since the release of this Guide. For the latest and most updated NDBS LOINC codes, go to <http://newbornscreeningcodes.nlm.nih.gov/>.

Figure 11-1: LOINC Codes for Hearing Loss Indicators

LOINC #	DT	LOINC Name	
58232-0	CE	Hearing loss risk indicators	
		ID	Answer list
		LA137-2	None
		LA12667-4	Caregiver concern about hearing
		LA12668-2	Family Hx of hearing loss
		LA12669-0	ICU stay > 5 days
		LA12670-8	ECMO
		LA12671-6	Assisted ventilation
		LA12672-4	Ototoxic medication use
		LA12673-2	Exchange transfusion for Hyperbilirubinemia
		LA12674-0	In utero infection(s)
		LA12675-7	Craniofacial anomalies
		LA12681-5	Physical findings of syndromes that include hearing loss
		LA12676-5	Syndromes associated with hearing loss
		LA12677-3	Neurodegenerative disorders
		LA12678-1	Postnatal infections

LOINC #	DT	LOINC Name
		LA12679-9 Head trauma
		LA6172-6 Chemotherapy
<b>57712-2</b>	CE	Mother's education
	ID	Answer list
		LA36-9 8th grade/less
		LA12456-2 9th - 12th grade, no diploma
		LA12457-0 High school graduate or GED completed
		LA12458-8 Some college credit but no degree
		LA12459-6 Associate degree (e.g., AA, AS)
		LA12460-4 Bachelor's degree (e.g., BA, AB, BS)
		LA12461-2 Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
		LA12462-0 Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

**Example:**

```
OBX|27|CE|58232-0^Hearing loss risk indicators^LN||LA12669-0^ICU stay > 5 days^LN|||||O<CR>
```

```
OBX|28|CE|57712-2^Mother's education^LN||LA12457-0^High school graduate or GED completed^LN|||||O<CR>
```

## 12. Appendix B Code Tables

### 12.1. LOINC Code Tables

This section specifies the LOINC codes referenced in this Guide. It does not list the entire set of LOINC Codes that are available.

Note: the LOINC code set below may have been modified since the release of this Guide. For the latest and most updated NDBS LOINC codes, go to <http://newbornscreeningcodes.nlm.nih.gov/HL7>.

Figure 12-1: LOINC Code Table

LOINC #	DT	LOINC Name																
57716-3	ST	State printed on filter paper card [Identifier] in NBS card																
57723-9	ST	Unique bar code number of Current sample																
57721-3	CE	Reason for lab test in Dried blood spot																
		<table border="1"> <thead> <tr> <th>ID</th> <th>Answer list</th> </tr> </thead> <tbody> <tr> <td>LA12421-6</td> <td>Initial screen</td> </tr> <tr> <td></td> <td>This code is used for the first screen performed on an infant after birth. When the first specimen obtained is of unacceptable quality and cannot be used, a replacement specimen is still considered the initial screen. When an initial screen is performed before 24 hrs because of a planned transfusion or an extremely ill infant, it is still considered the initial screen even though it may need to be repeated later.</td> </tr> <tr> <td>LA12425-7</td> <td>Subsequent screen - by law</td> </tr> <tr> <td></td> <td>This code is used for mandatory second screens as required by law and assumes that the first screen was normal and that the second screen was performed only because it was mandated by law. For example, [give name of state(s)] currently performs a second screen on every infant born in the state at a particular point in time, such as between 1 and 2 weeks. The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed.</td> </tr> <tr> <td>LA12426-5</td> <td>Subsequent screen - required by protocol</td> </tr> <tr> <td></td> <td>This code is used for subsequent screens that are performed because of clinical conditions in the newborn that require a repeat screen as specified by a protocol to assure valid test results. Many of these subsequent screens have abnormal or out-of-range results on the initial screen that can be explained by the clinical condition of the infant. Typical examples include premature infants, infants who receive blood product transfusions, and infants who are receiving intravenous alimentation. This category should not include abnormal tests that should be considered presumptive positives (which would require a diagnostic evaluation rather than a repeat screen by protocol). The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed.</td> </tr> <tr> <td>LA12427-3</td> <td>Subsequent screen – for clarification of initial results (not by law or protocol)</td> </tr> </tbody> </table>	ID	Answer list	LA12421-6	Initial screen		This code is used for the first screen performed on an infant after birth. When the first specimen obtained is of unacceptable quality and cannot be used, a replacement specimen is still considered the initial screen. When an initial screen is performed before 24 hrs because of a planned transfusion or an extremely ill infant, it is still considered the initial screen even though it may need to be repeated later.	LA12425-7	Subsequent screen - by law		This code is used for mandatory second screens as required by law and assumes that the first screen was normal and that the second screen was performed only because it was mandated by law. For example, [give name of state(s)] currently performs a second screen on every infant born in the state at a particular point in time, such as between 1 and 2 weeks. The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed.	LA12426-5	Subsequent screen - required by protocol		This code is used for subsequent screens that are performed because of clinical conditions in the newborn that require a repeat screen as specified by a protocol to assure valid test results. Many of these subsequent screens have abnormal or out-of-range results on the initial screen that can be explained by the clinical condition of the infant. Typical examples include premature infants, infants who receive blood product transfusions, and infants who are receiving intravenous alimentation. This category should not include abnormal tests that should be considered presumptive positives (which would require a diagnostic evaluation rather than a repeat screen by protocol). The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed.	LA12427-3	Subsequent screen – for clarification of initial results (not by law or protocol)
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LOINC #	DT	LOINC Name																				
		When the results of the initial screen are abnormal or out of range, many states perform an “immediate” repeat screen to confirm the results before considering the test a presumptive positive that will require a diagnostic evaluation. Many of these results may be considered or reported as equivocal or borderline until a clear abnormality is confirmed on the subsequent screen. This category does not include abnormal or borderline results for which there is a clear clinical explanation, such as prematurity, for which there is a clear protocol for obtaining a second screen. The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed.																				
		<table border="1"> <tr> <td>LA16473-3</td> <td>Subsequent screen – reason unknown</td> </tr> </table> <p>The purpose of identifying the reason for a subsequent screen is that it will change the expected time interval when the subsequent screen should be performed. States should use this code if they are unable to identify the specific reason for a subsequent screen, but they are able to separate initial screens from subsequent screens. The reason for the second screen might be any of the above. A repeat initial screen because the first specimen was of unacceptable quality should not be considered a subsequent screen, but some states may use this code if they are unable to track that the reason for a second specimen was unacceptable quality of the first screen.</p> <table border="1"> <tr> <td>LA14132-7</td> <td>No sample collected due to parental refusal</td> </tr> </table> <p>This code is used to document parental refusal of newborn screening so that a report can be generated which will contain no test results because no specimen was submitted. This will enable complete matching of newborn screening results to all infants born even if no laboratory testing was performed.</p>	LA16473-3	Subsequent screen – reason unknown	LA14132-7	No sample collected due to parental refusal																
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LA14132-7	No sample collected due to parental refusal																					
57711-4	ST	Unique bar code number of Initial sample																				
62323-1	TX	Post-discharge provider ID [Identifier]																				
62324-9	TX	Post-discharge provider name in Provider																				
62325-6	TX	Post-discharge provider practice ID																				
62326-4	TX	Post-discharge provider practice name																				
62327-2	TX	Post-discharge provider practice address																				
62328-0	TN	Post-discharge provider practice telephone number in Provider																				
57722-1	CE	Birth plurality of Pregnancy																				
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LOINC #	DT	LOINC Name																				
57715-5	TM	Birth time																				
62329-8	TX	Birth hospital facility ID [Identifier] in Facility																				
62330-6	TX	Birth hospital facility name																				
62331-4	TX	Birth hospital facility address																				
62332-2	TN	Birth hospital facility phone number in Facility																				
8339-4	NM	Birthweight																				
58229-6	NM	Body weight Measured --when specimen taken																				
57714-8	NM	Obstetric estimation of gestational age																				
62317-3	DTM	Date of Last Blood Product Transfusion																				
57713-0	CE	Infant NICU factors that affect newborn screening interpretation																				
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67703-9	TX	Other infant NICU factors that affect newborn screening interpretation																				
67706-2	CE	Maternal factors that affect newborn screening interpretation																				
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LA12418-2	TPN																					
LA46-8	Other																					
67707-0	TX	Other maternal factors that affect newborn screening interpretation																				
67704-7	CE	Feeding types																				
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LOINC #	DT	LOINC Name	
		LA16915-3	Lactose formula
		LA14041-0	Lactose-free formula (including soy or hydrolyzed)
		LA16917-9	NPO
		LA12418-2	TPN
		LA16918-7	Carnitine
		LA16919-5	MCT (medium-chain triglyceride) oil
		LA16920-3	IV dextrose
		LA46-8	Other
		LA4489-6	Unknown
67705-4	TX	Other feeding types	

## 12.2. HL7 Code Tables

This section lists the HL7 code tables referenced in this Guide. . It does not list the entire set of HL7 Codes that are available<sup>8</sup>.

**User-defined Tables:** A user-defined table is a set of values that are locally or site defined. This accommodates certain fields that will have values that vary from institution to institution. Even though these tables are not defined in the Standard, they are given a user-defined table number to facilitate implementations. HL7 sometimes publishes suggested values that a site may use as a starter set (e.g., *table 0001- Sex*). The IS data type is often used to encode values for these tables. Note that some of these tables may reference common master files.

There are some user-defined tables that contain values that might be standardized across institutions but for which no applicable official standard exists. For these, a set of **suggested** values may be listed. It is recommended that these values be used where applicable within an institution and serve as a basis for extensions as required. These values may, however, be redefined locally.

**HL7 Tables:** An HL7 table is a set of values defined and published by HL7. They are a part of the HL7 Standard because they affect the interpretation of the messages that contain them. These values may not be redefined locally; however, the table itself may be extended to accommodate locally defined values. The ID data type is most often used to encode values for HL7 tables.

Figure 12-2: HL7 Code Tables

<sup>8</sup> Health Level Seven, Inc, "HL7 Messaging Standard Version 2.5.1: An Application Protocol for Electronic Data Exchange in Healthcare Environments", Ann Arbor, MI, 2007.

Type	Table	Name	Value	Description
User		Administrative Sex		
	0001		A	Ambiguous
	0001		F	Female
	0001		M	Male
	0001		N	Not applicable
	0001		O	Other
	0001		U	Unknown
HL7		Event type		
	0003		O21	OML - Laboratory order
	0003		O22	ORL - General laboratory order response message to any OML
	0003		O33	OML - Laboratory order for multiple orders related to a single specimen
	0003		O34	ORL - Laboratory order response message to a multiple order related to single specimen OML
	0003		O35	OML - Laboratory order for multiple orders related to a single container of a specimen
	0003		O36	ORL - Laboratory order response message to a single container of a specimen OML
	0003		R01	ORU/ACK - Unsolicited transmission of an observation message
User		Race		
	0005		1002-5	American Indian or Alaska Native
	0005		2028-9	Asian
	0005		2054-5	Black or African American
	0005		2076-8	Native Hawaiian or Other Pacific Islander
	0005		2106-3	White
	0005		2131-1	Other Race
HL7		Acknowledgment code		
	0008		AA	Original mode: Application Accept - Enhanced mode: Application acknowledgment: Accept
	0008		AE	Original mode: Application Error - Enhanced mode: Application acknowledgment: Error
	0008		AR	Original mode: Application Reject - Enhanced mode: Application acknowledgment: Reject
	0008		CA	Enhanced mode: Accept acknowledgment: Commit Accept
	0008		CE	Enhanced mode: Accept acknowledgment: Commit Error
	0008		CR	Enhanced mode: Accept acknowledgment: Commit Reject
User		Relationship		
	0063		BRO	Brother
	0063		CGV	Care giver
	0063		EMC	Emergency contact
	0063		EXF	Extended family
	0063		FND	Friend

Type	Table	Name	Value	Description
	0063		FTH	Father
	0063		GRD	Guardian
	0063		GRP	Grandparent
	0063		MGR	Manager
	0063		MTH	Mother
	0063		OAD	Other adult
	0063		OTH	Other
	0063		PAR	Parent
	0063		SIB	Sibling
	0063		SIS	Sister
	0063		UNK	Unknown
	0063		WRD	Ward of court
	0063		SEL	Self
	0063		SIB	Sibling
	0063		SIS	Sister
	0063		SPO	Spouse
	0063		TRA	Trainer
	0063		UNK	Unknown
	0063		WRD	Ward of court
	0063		SEL	Self
	0063		SIB	Sibling
	0063		SIS	Sister
	0063		SPO	Spouse
HL7		Message type		
	0076		ACK	General acknowledgment message
	0076		OML	Laboratory order message
	0076		ORL	Laboratory acknowledgment message (unsolicited)
	0076		ORU	Unsolicited transmission of an observation message
HL7		Observation result status codes interpretation		
	0085		C	Record coming over is a correction and thus replaces a final result
	0085		D	Deletes the OBX record
	0085		F	Final results; Can only be changed with a corrected result.
	0085		I	Specimen in lab; results pending
	0085		N	Not asked; used to affirmatively document that the observation identified in the OBX was not sought when the universal service ID in OBR-4 implies that it would be sought.
	0085		O	Order detail description only (no result)
	0085		P	Preliminary results
	0085		R	Results entered -- not verified
	0085		S	Partial results

Type	Table	Name	Value	Description
	0085		U	Results status change to final without retransmitting results already sent as a 'preliminary.' E.g., radiology changes status from preliminary to final
	0085		W	Post original as wrong, e.g., transmitted for wrong patient
	0085		X	Results cannot be obtained for this observation
HL7		Processing ID		
	0103		D	Debugging
	0103		P	Production
	0103		T	Training
HL7		Version ID		
	0104		2.5.1	Release 2.5.1
HL7		Source of comment		
	0105		L	Ancillary (filler) department is source of comment
	0105		O	Other system is source of comment
	0105		P	Orderer (placer) is source of comment
HL7		Order control codes		
	0119		AF	Order/service refill request approval
	0119		CA	Cancel order/service request
	0119		CH	Child order/service
	0119		CN	Combined result
	0119		CR	Canceled as requested
	0119		DC	Discontinue order/service request
	0119		DE	Data errors
	0119		DF	Order/service refill request denied
	0119		DR	Discontinued as requested
	0119		FU	Order/service refilled, unsolicited
	0119		HD	Hold order request
	0119		HR	On hold as requested
	0119		LI	Link order/service to patient care problem or goal
	0119		NA	Number assigned
	0119		NW	New order/service
	0119		OC	Order/service canceled
	0119		OD	Order/service discontinued
	0119		OE	Order/service released
	0119		OF	Order/service refilled as requested
	0119		OH	Order/service held
	0119		OK	Order/service accepted & OK
	0119		OP	Notification of order for outside dispense
	0119		OR	Released as requested
	0119		PA	Parent order/service
	0119		PR	Previous Results with new order/service
	0119		PY	Notification of replacement order for outside dispense
	0119		RE	Observations/Performed Service to follow

Type	Table	Name	Value	Description
	0119		RF	Refill order/service request
	0119		RL	Release previous hold
	0119		RO	Replacement order
	0119		RP	Order/service replace request
	0119		RQ	Replaced as requested
	0119		RR	Request received
	0119		RU	Replaced unsolicited
	0119		SC	Status changed
	0119		SN	Send order/service number
	0119		SR	Response to send order/service status request
	0119		SS	Send order/service status request
	0119		UA	Unable to accept order/service
	0119		UC	Unable to cancel
	0119		UD	Unable to discontinue
	0119		UF	Unable to refill
	0119		UH	Unable to put on hold
	0119		UM	Unable to replace
	0119		UN	Unlink order/service from patient care problem or goal
	0119		UR	Unable to release
	0119		UX	Unable to change
	0119		XO	Change order/service request
	0119		XR	Changed as requested
	0119		XX	Order/service changed, unsol.
HL7		Value type		
	0125		AD	Address
	0125		CE	Coded Entry
	0125		CF	Coded Element With Formatted Values
	0125		CK	Composite ID With Check Digit
	0125		CN	Composite ID And Name
	0125		CP	Composite Price
	0125		CX	Extended Composite ID With Check Digit
	0125		DT	Date
	0125		ED	Encapsulated Data
	0125		FT	Formatted Text (Display)
	0125		MO	Money
	0125		NM	Numeric
	0125		PN	Person Name
	0125		RP	Reference Pointer
	0125		SN	Structured Numeric
	0125		ST	String Data.
	0125		TM	Time
	0125		TN	Telephone Number
	0125		TS	Time Stamp (Date & Time)
	0125		TX	Text Data (Display)
	0125		XAD	Extended Address

Type	Table	Name	Value	Description
	0125		XCN	Extended Composite Name And Number For Persons
	0125		XON	Extended Composite Name And Number For Organizations
	0125		XPN	Extended Person Name
	0125		XTN	Extended Telecommunications Number
HL7		Yes/No Indicator		
	0136		Y	Yes
	0136		N	No
User		Ethnic Group		
	0189		H	Hispanic or Latino
	0189		N	Not Hispanic or Latino
	0189		U	Unknown
HL7		Name type		
	0200		A	Alias Name
	0200		B	Name at Birth
	0200		C	Adopted Name
	0200		D	Display Name
	0200		I	Licensing Name
	0200		L	Legal Name
	0200		M	Maiden Name
	0200		N	Nickname /â Call meâ Name/Street Name
	0200		P	Name of Partner/Spouse (retained for backward compatibility only)
	0200		R	Registered Name (animals only)
	0200		S	Coded Pseudo-Name to ensure anonymity
	0200		T	Indigenous/Tribal/Community Name
	0200		U	Unspecified
HL7		Identifier type		
	0203		AM	American Express
	0203		AN	Account number
	0203		ANC	Account number Creditor
	0203		AND	Account number debtor
	0203		ANON	Anonymous identifier
	0203		ANT	Temporary Account Number
	0203		APRN	Advanced Practice Registered Nurse number
	0203		BA	Bank Account Number
	0203		BC	Bank Card Number
	0203		BR	Birth registry number
	0203		BRN	Breed Registry Number
	0203		CC	Cost Center number
	0203		CY	County number
	0203		DDS	Dentist license number
	0203		DEA	Drug Enforcement Administration registration number
	0203		DFN	Drug Furnishing or prescriptive authority Number
	0203		DI	Diner's Club card
	0203		DL	Driver's license number

Type	Table	Name	Value	Description
	0203		DN	Doctor number
	0203		DO	Osteopathic License number
	0203		DPM	Podiatrist license number
	0203		DR	Donor Registration Number
	0203		DS	Discover Card
	0203		EI	Employee number
	0203		EN	Employer number
	0203		FI	Facility ID
	0203		GI	Guarantor internal identifier
	0203		GL	General ledger number
	0203		GN	Guarantor external identifier
	0203		HC	Health Card Number
	0203		IND	Indigenous/Aboriginal
	0203		JHN	Jurisdictional health number (Canada)
	0203		LI	Labor and industries number
	0203		LN	License number
	0203		LR	Local Registry ID
	0203		MA	Patient Medicaid number
	0203		MB	Member Number
	0203		MC	Patient's Medicare number
	0203		MCD	Practitioner Medicaid number
	0203		MCN	Microchip Number
	0203		MCR	Practitioner Medicare number
	0203		MD	Medical License number
	0203		MI	Military ID number
	0203		MR	Medical record number
	0203		MRT	Temporary Medical Record Number
	0203		MS	MasterCard
	0203		NE	National employer identifier
	0203		NH	National Health Plan Identifier
	0203		NI	National unique individual identifier
	0203		NII	National Insurance Organization Identifier
	0203		NIIP	National Insurance Payor Identifier (Payor)
	0203		NNxxx	National Person Identifier where the xxx is the ISO table 3166 3-character (alphabetic) country code
	0203		NP	Nurse practitioner number
	0203		NPI	National provider identifier
	0203		OD	Optometrist license number
	0203		PA	Physician Assistant number
	0203		PCN	Penitentiary/correctional institution Number
	0203		PE	Living Subject Enterprise Number
	0203		PEN	Pension Number
	0203		PI	Patient internal identifier
	0203		PN	Person number
	0203		PNT	Temporary Living Subject Number

Type	Table	Name	Value	Description
	0203		PPN	Passport number
	0203		PRC	Permanent Resident Card Number
	0203		PRN	Provider number
	0203		PT	Patient external identifier
	0203		QA	QA number
	0203		RI	Resource identifier
	0203		RN	Registered Nurse Number
	0203		RPH	Pharmacist license number
	0203		RR	Railroad Retirement number
	0203		RRI	Regional registry ID
	0203		SL	State license
	0203		SN	Subscriber Number
	0203		SR	State registry ID
	0203		SS	Social Security number
	0203		TAX	Tax ID number
	0203		TN	Treaty Number/ (Canada)
	0203		U	Unspecified identifier
	0203		UPIN	Medicare/CMS (formerly HCFA)'s Universal Physician Identification numbers
	0203		VN	Visit number
	0203		VS	VISA
	0203		WC	WIC identifier
	0203		WCN	Workers' Comp Number
	0203		XX	Organization identifier
	0203		CLIA	Clinical Laboratory Improvement Amendments <i>Table is extended for this Implementation Guide.</i>
User		County/Parish Code		
				No suggested values
User		Namespace ID		
	0300			No suggested values
HL7		Universal ID type		
	0301		DNS	An Internet dotted name. Either in ASCII or as integers
	0301		GUID	Same as UUID.
	0301		HCD	The CEN Healthcare Coding Scheme Designator. (Identifiers used in DICOM follow this assignment scheme.)
	0301		HL7	Reserved for future HL7 registration schemes
	0301		ISO	An International Standards Organization Object Identifier
	0301		L,M,N	These are reserved for locally defined coding schemes.
	0301		Random	Usually a base64 encoded string of random bits. The uniqueness depends on the length of the bits. Mail systems often generate ASCII string "unique names," from a combination of random bits and system names. Obviously, such identifiers will not be constrained to the base64 character set.
	0301		URI	Uniform Resource Identifier

Type	Table	Name	Value	Description
	0301		UUID	The DCE Universal Unique Identifier
	0301		x400	An X.400 MHS format identifier
	0301		x500	An X.500 directory name
	0301		NPI	National Provider Identifier. <i>Table is extended for this Implementation Guide.</i>
	0301		CLIA	Clinical Laboratory Improvement Amendments <i>Table is extended for this Implementation Guide.</i>
	0301		CAP	College of American Pathologists. <i>Table is extended for this Implementation Guide.</i>
HL7		Message structure		
	0354		ACK	Varies
	0354		OML_O21	O21
	0354		OML_O33	O33
	0354		OML_O35	O35
	0354		ORL_O22	O22
	0354		ORL_O34	O34
	0354		ORL_O36	O36
	0354		ORU_R01	R01
	0354		ORU_R30	R30
	0354		ORU_R31	R31
	0354		ORU_R32	R32
	0354		ORU_W01	W01
HL7		Message error condition codes		
	0357		0	Message accepted
	0357		100	Segment sequence error
	0357		101	Required field missing
	0357		102	Data type error
	0357		103	Table value not found
	0357		200	Unsupported message type
	0357		201	Unsupported event code
	0357		202	Unsupported processing id
	0357		203	Unsupported version id
	0357		204	Unknown key identifier
	0357		205	Duplicate key identifier
	0357		206	Application record locked
	0357		207	Application internal error
User		Degree/license/certificate		
	0360		AA	Associate of Arts
	0360		AAS	Associate of Applied Science
	0360		ABA	Associate of Business Administration
	0360		AE	Associate of Engineering
	0360		AS	Associate of Science
	0360		BA	Bachelor of Arts

Type	Table	Name	Value	Description
	0360		BBA	Bachelor of Business Administration
	0360		BE	Bachelor of Engineering
	0360		BFA	Bachelor of Fine Arts
	0360		BN	Bachelor of Nursing
	0360		BS	Bachelor of Science
	0360		BSL	Bachelor of Science - Law
	0360		BSN	Bachelor of Science - Nursing
	0360		BT	Bachelor of Theology
	0360		CANP	Certified Adult Nurse Practitioner
	0360		CER	Certificate
	0360		CMA	Certified Medical Assistant
	0360		CNM	Certified Nurse Midwife
	0360		CNP	Certified Nurse Practitioner
	0360		CNS	Certified Nurse Specialist
	0360		CPNP	Certified Pediatric Nurse Practitioner
	0360		CRN	Certified Registered Nurse
	0360		DBA	Doctor of Business Administration
	0360		DED	Doctor of Education
	0360		DIP	Diploma
	0360		DO	Doctor of Osteopathy
	0360		EMT	Emergency Medical Technician
	0360		EMTP	Emergency Medical Technician - Paramedic
	0360		FNP	Family Practice Nurse Practitioner
	0360		HS	High School Graduate
	0360		JD	Juris Doctor
	0360		MA	Master of Arts
	0360		MBA	Master of Business Administration
	0360		MCE	Master of Civil Engineering
	0360		MD	Doctor of Medicine
	0360		MDA	Medical Assistant
	0360		MDI	Master of Divinity
	0360		ME	Master of Engineering
	0360		MED	Master of Education
	0360		MEE	Master of Electrical Engineering
	0360		MFA	Master of Fine Arts
	0360		MME	Master of Mechanical Engineering
	0360		MS	Master of Science
	0360		MSL	Master of Science - Law
	0360		MSN	Master of Science - Nursing
	0360		MT	Master of Theology
	0360		NG	Non-Graduate
	0360		NP	Nurse Practitioner
	0360		PA	Physician Assistant
	0360		PharmD	Doctor of Pharmacy
	0360		PHD	Doctor of Philosophy

Type	Table	Name	Value	Description
	0360		PHE	Doctor of Engineering
	0360		PHS	Doctor of Science
	0360		PN	Advanced Practice Nurse
	0360		RMA	Registered Medical Assistant
	0360		RPH	Registered Pharmacist
	0360		SEC	Secretarial Certificate
	0360		TS	Trade School Graduate
User		Facility		
	0362			No suggested values
User		Assigning Authority		
	0363			No suggested values
User		Comment type		
	0364		1R	Primary Reason
	0364		2R	Secondary Reason
	0364		AI	Ancillary Instructions
	0364		DR	Duplicate/Interaction Reason
	0364		GI	General Instructions
	0364		GR	General Reason
	0364		PI	Patient Instructions
	0364		RE	Remark
HL7		Coding system		
	0396		99zzz or L	Local general code (where z is an alphanumeric character)
	0396		ACR	American College of Radiology finding codes
	0396		ANS+	HL7 set of units of measure
	0396		ART	WHO Adverse Reaction Terms
	0396		AS4	ASTM E1238/ E1467 Universal
	0396		AS4E	AS4 Neurophysiology Codes
	0396		ATC	American Type Culture Collection
	0396		C4	CPT-4
	0396		C5	CPT-5
	0396		CAS	Chemical abstract codes
	0396		CD2	CDT-2 Codes
	0396		CDCA	CDC Analyte Codes
	0396		CDCM	CDC Methods/Instruments Codes
	0396		CDS	CDC Surveillance
	0396		CE	CEN ECG diagnostic codes
	0396		CLP	CLIP
	0396		CPTM	CPT Modifier Code
	0396		CST	COSTART
	0396		CVX	CDC Vaccine Codes
	0396		DCM	DICOM Controlled Terminology
	0396		E	EUCLIDES
	0396		E5	Euclides quantity codes
	0396		E6	Euclides Lab method codes

Type	Table	Name	Value	Description
	0396		E7	Euclides Lab equipment codes
	0396		ENZC	Enzyme Codes
	0396		FDDC	First DataBank Drug Codes
	0396		FDDX	First DataBank Diagnostic Codes
	0396		FDK	FDA K10
	0396		HB	HIBCC
	0396		HCPCS	CMS (formerly HCFA) Common Procedure Coding System
	0396		HCPT	Health Care Provider Taxonomy
	0396		HHC	Home Health Care
	0396		HI	Health Outcomes
	0396		HL7nnnn	HL7 Defined Codes where nnnn is the HL7 table number
	0396		HOT	Japanese Nationwide Medicine Code
	0396		HPC	CMS (formerly HCFA )Procedure Codes (HCPCS)
	0396		I10	ICD-10
	0396		I10P	ICD-10 Procedure Codes
	0396		I9	ICD9
	0396		I9C	ICD-9CM
	0396		IBT	ISBT
	0396		IBTnnnn	ISBT 128 codes where nnnn specifies a specific table within ISBT 128.
	0396		IC2	ICHPPC-2
	0396		ICD10AM	ICD-10 Australian modification
	0396		ICD10CA	ICD-10 Canada
	0396		ICDO	International Classification of Diseases for Oncology
	0396		ICS	ICCS
	0396		ICSD	International Classification of Sleep Disorders
	0396		ISO+	ISO 2955.83 (units of measure) with HL7 extensions
	0396		ISONnnn	ISO Defined Codes where nnnn is the ISO table number
	0396		IUPC	IUPAC/IFCC Component Codes
	0396		IUPP	IUPAC/IFCC Property Codes
	0396		JC10	JLAC/JSML, nationwide laboratory code
	0396		JC8	Japanese Chemistry
	0396		JJ1017	Japanese Image Examination Cache
	0396		LB	Local billing code
	0396		LN	Logical Observation Identifier Names and Codes (LOINC <sup>®</sup> )
	0396		MCD	Medicaid
	0396		MCR	Medicare
	0396		MDDX	Medispan Diagnostic Codes
	0396		MEDC	Medical Economics Drug Codes
	0396		MEDR	Medical Dictionary for Drug Regulatory Affairs (MEDDRA)
	0396		MEDX	Medical Economics Diagnostic Codes
	0396		MGPI	Medispan GPI
	0396		MVX	CDC Vaccine Manufacturer Codes
	0396		NDA	NANDA
	0396		NDC	National drug codes

Type	Table	Name	Value	Description
	0396		NIC	Nursing Interventions Classification
	0396		NPI	National Provider Identifier
	0396		NUBC	National Uniform Billing Committee Code
	0396		OHA	Omaha System
	0396		POS	POS Codes
	0396		RC	Read Classification
	0396		SDM	SNOMED- DICOM Microglossary
	0396		SNM	Systemized Nomenclature of Medicine (SNOMED)
	0396		SNM3	SNOMED International
	0396		SNT	SNOMED topology codes (anatomic sites)
	0396		UC	UCDS
	0396		UMD	MDNS
	0396		UML	Unified Medical Language
	0396		UPC	Universal Product Code
	0396		UPIN	UPIN
	0396		USPS	United States Postal Service
	0396		W1	WHO record # drug codes (6 digit)
	0396		W2	WHO record # drug codes (8 digit)
	0396		W4	WHO record # code with ASTM extension
	0396		WC	WHO ATC
HL7		Country code		
	0399			Use 3-character (alphabetic) form of ISO 3166
HL7		Order Type		
	0482		I	Inpatient Order
	0482		O	Outpatient Order
HL7		Error severity		
	0516		E	Error
	0516		I	Information
	0516		W	Warning

## 13. Appendix C: Related Documents and References

1. Abhyankar, S, et al, "Standardizing Newborn Screening Results for Health Information Exchange," AMIA 2010 Symposium Proceedings, Nov 2010, available at: <http://www.ncbi.nlm.nih.gov/pubmed/21346929>.
2. Center for Disease Control and Prevention, "Electronic Transmission of Order and Result Messages by State Public Health Laboratories", Atlanta, GA, December 2009.
3. Center for Disease Control and Prevention, "Implementation Guide for Immunization Messaging HL7 Version 2.5.1", Atlanta, GA, May 2010.
4. Center for Disease Control and Prevention, "PHIN Messaging Standard Laboratory Order OML^O21 HL7 Version 2.5", Atlanta, GA, March 2005.
5. Health Level Seven, Inc, "HL7 Version 2.5.1 Implementation Guide: Orders and Observations; Interoperable Laboratory Result Reporting to EHR (US Realm), Release 1", Ann Arbor, MI, November 2007.
6. Health Level Seven, Inc, "HL7 Messaging Standard Version 2.5.1: An Application Protocol for Electronic Data Exchange in Healthcare Environments", Ann Arbor, MI, 2007.
7. Healthcare Information Technology Standards Panel, "HITSP Newborn Screening Interoperability Specification (IS92)", Chicago, IL, January 2010.
8. Public Health Informatics Institute, "Implementation Guide for Reporting Test Results of Newborn Dried Blood Spot (NDBS) Screening to Birth Facility and Other Interested Parties", Decatur, GA, June 2009.
9. Public Health Informatics Institute, "Taking Care of Business: A Collaboration to Define Local Health Department Business Processes", Decatur, GA, 2006.
10. U.S. National Library of Medicine, "Sending Newborn Screening Results Electronically with HL7 Messaging", Bethesda, MD, February 2010, available at <http://newbornscreeningcodes.nlm.nih.gov/HL7>.