



**Animal and Plant Health Inspection Service**

**National Animal Health Laboratory Network (NAHLN)**

**NAHLN/LMS HL7 Implementation Guide  
For Laboratory Results Messaging**

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## Contents

Introduction .....	6
Background .....	6
Scope .....	6
How to Read This Document .....	7
Message Structure .....	7
Segment Groups .....	7
Segments .....	8
Fields .....	8
Data Type Components .....	8
Value Set Tables .....	9
Message Flow .....	9
General Data Flow .....	9
Exceptional Data Flows .....	10
Note on Field Value States .....	11
Note on Identifiers and Their Assigning Authorities .....	12
Note on Coded Entries .....	13
Note on Data Lengths .....	13
Note on Optionality and Repeatability .....	14
Unsolicited Population/Location-Based Laboratory Observation Message (OPU_R25) .....	16
Detailed Message Walk-Through .....	18
Message Header Segment (MSH) .....	18
MSH Segment Structure .....	18
MSH.1 and MSH.2 - Field Separator and Encoding Characters (ST) - Required .....	18
MSH.3 - Sending Application (HD) - Required Or Empty .....	19
MSH.4 - Sending Facility (HD) - Required .....	19
MSH.5 - Receiving Application (HD) - Conditional .....	20
MSH.6 - Receiving Facility (HD) - Conditional .....	21
MSH.7 - Date/Time of Message (DTM) - Required .....	21
MSH.9 - Message Type (MSG) - Required .....	22
MSH.10 - Message Control ID (ST) - Required .....	22
MSH.11 - Processing ID (PT) - Required .....	22
MSH.12 - Version ID (VID) - Required .....	23
MSH.21 - Message Profile Identifier (EI) - Required .....	23
MSH.22 - Sending Responsible Organization (XON) - Optional .....	24
Patient Visit Segment (PV1) .....	24
PV1.2 - Patient Class (IS) - Required .....	25
PV1.7 - Attending Doctor (XCN) - Required or Empty .....	25
PV1.19 - Visit Number (CX) - Required .....	27
Visit Observation/Result Segment (OBX) <i>DEPRECATED AS REASON FOR TESTS</i> .....	28
Role Segment (ROL) .....	28
ROL.1 - Role Instance ID (EI) - Required or Empty .....	30
ROL.2 - Action Code (ID) - Required .....	30
ROL.3 - Role-ROL (CNE) - Required .....	30
ROL.4 - Role Person (XCN) - Required .....	31
ROL.11 - Office/Home Address (XAD) - Required or Empty .....	33
ROL.12 - Phone (XTN) - Required or Empty .....	34
ROL.13 - Person's Location (PL) - Conditional or Empty .....	36
ACCESSION DETAIL SEGMENT GROUP .....	37
Next of Kin/Associated Parties Segment (NK1) .....	37
NK1.1 Set ID - NK1 (SI) - Required .....	39
NK1.2 - Name (XPN) - Conditional or Empty .....	39
NK1.3 - Relationship (CNE) - Conditional .....	40
NK1.4 - Address (XAD) - Optional .....	41

NK1.5 - Phone Number (XTN) - Optional.....	41
NK1.6 - Business Phone Number (XTN) - Optional.....	42
NK1.13 - Organization Name (XON) - Conditional .....	43
NK1.20 - Primary Language (CWE) - Optional.....	43
PATIENT GROUP.....	45
Patient Identification Segment (PID).....	46
PID.3 - Patient Identifier List (CX) - Required .....	46
PID.5 - Patient Name (XPN) - Required .....	48
PID.7 - Date/Time of Birth (DTM) - Required or Empty.....	49
PID.8 - Administrative Sex (IS) - Required or Empty.....	49
PID.10 - Race (CWE) – Optional.....	49
PID.11 – Patient Address (XAD) – Deprecated .....	50
PID.29 - Patient Death Date Time (DTM) – Conditional or Empty .....	51
PID.30 - Patient Death Indicator (ID) – Required or Empty .....	51
PID.31 - Identity Unknown Indicator (ID) - Conditional .....	51
PID.35 – Species (CWE) - Required .....	51
PID.37 – Strain (ST) - Optional.....	52
PID.38 - Production Class Code (CWE) - Required or Empty.....	52
PATIENT_OBSERVATION GROUP .....	53
Patient Observation/Result Segment (OBX) .....	54
OBX.2 - Value Type (ID) - Required.....	55
OBX.3 - Observation Identifier (CNE) - Required.....	55
OBX.5 - Observation Value (VARIES) - Required .....	55
OBX.6 – Units (CNE) - Conditional .....	55
OBX.11 - Observation Result Status (ID) - Required .....	56
OBX-14 Date/Time of the Observation (DTM) – Required or Empty.....	56
SPECIMEN GROUP.....	56
Specimen Segment (SPM).....	57
SPM.2 - Specimen ID (EIP) - Required .....	58
SPM.3 - Specimen Parent IDs (EIP) - Required or Empty.....	60
SPM.4 - Specimen Type (CWE) - Required.....	61
SPM.6 - Specimen Additives (CWE) - Required or Empty .....	62
SPM.8 - Specimen Source Site (CWE) - Required or Empty.....	63
SPM.11 - Specimen Role (CNE) - Required .....	65
SPM.13 - Grouped Specimen Count (NM) - Conditional .....	65
SPM.14 - Specimen Description (ST) - Required or Empty.....	66
SPM.17 - Specimen Collection Date/Time (DR) - Required or Empty.....	66
SPM.18 - Specimen Received Date/Time (DTM) - Required.....	67
SPM.21 - Specimen Reject Reason (CWE) – Optional.....	67
SPM.22 - Specimen Quality (CWE) - Optional .....	69
SPM.23 - Specimen Appropriateness (CWE) - Required or Empty.....	70
SPM.24 - Specimen Condition (CWE) - Required or Empty .....	71
SPM.26 - Number of Specimen Containers (NM) - Optional .....	72
SPM.27 - Container Type (CWE) - Optional .....	72
SPM.28 - Container Condition (CWE) - Optional .....	73
SPECIMEN_OBSERVATION GROUP.....	74
Specimen Observation/Result Segment (OBX).....	74
OBX.2 - Value Type (ID) - Required.....	74
OBX.3 - Observation Identifier (CNE) - Required.....	74
OBX.5 - Observation Value (VARIES) - Required .....	75
OBX.6 – Units (CNE) - Conditional .....	75
OBX.11 - Observation Result Status (ID) - Required .....	76
OBX-14 Date/Time of the Observation (DTM) – Required or Empty.....	76
ORDER GROUP.....	76
Observation Order Segment (OBR).....	76

OBR.2 - Placer Order Number (EI) – Required or Empty .....	77
OBR.3 - Filler Order Number (EI) - Required .....	77
OBR.4 - Universal Service Identifier (CWE) - Required .....	78
OBR.22 - Results Rpt/Status Chng - Date/Time (DTM) - Required .....	80
OBR.23 – Charge to Practice (MOC) – Required or Empty .....	80
OBR.29 - Parent (EIP) – Required or Empty .....	81
OBR.31 – Reason for Study (CWE) – Required or Empty .....	81
Common Order Segment (ORC) .....	82
ORC.1 Order Control (ID) – Required .....	83
ORC.4 Placer Group Number (EI) - Required or Empty.....	84
ORC.5 Order Status (ID) - Required .....	85
ORC.9 Date/Time of Transaction (DTM) - Deprecated.....	85
ORC.10 Entered By (XCN) – Optional .....	85
ORC.11 Verified By (XCN) - Optional.....	86
RESULT GROUP .....	87
Observation/Result Segment (OBX) .....	87
OBX.2 - Value Type (ID) – Conditional .....	88
OBX.3 - Observation Identifier (CNE) - Required.....	89
OBX.4 Observation Sub-ID (ST) – Required or Empty .....	90
OBX.5 - Observation Value (Varies) – Conditional or Empty.....	90
OBX.6 – Units (CNE) - Conditional .....	91
OBX.8 - Abnormal Flags (IS) – Conditional or Empty.....	92
OBX.11 - Observation Results Status (ID) - Required.....	93
OBX.14 Date/Time of the Observation (DTM) – Required or Empty .....	93
OBX.16 Responsible Observer (XCN) – Required or Empty .....	94
OBX.17 - Observation Method (CWE) - Conditional.....	94
OBX.18 Equipment Instance Identifier (EI) – Required or Empty .....	95
OBX.19 - Date/Time of the Analysis (DTM) – Required or Empty .....	96
OBX.21 – Observation Instance Identifier (EI) – Required .....	96
Acknowledgment Message ACK .....	97
ACK Message Structure .....	97
Message Header Segment (MSH) .....	97
MSH.1 and MSH.2 Field Separator and Encoding Characters.....	97
MSH.4 Sending Facility .....	97
MSH.6 Receiving Facility .....	97
MSH.7 Date/Time of Message .....	98
MSH.9 Message Type .....	98
MSH.10 Message Control ID .....	98
MSH.11 Processing ID.....	98
MSH.12 Version ID.....	98
Message Acknowledgment Segment (MSA).....	98
MSA.1 Acknowledgment Code.....	98
MSA.2 Message Control ID .....	99
Error Segment (ERR) .....	99
ERR.3 HL7 Error Code .....	99
ERR.4 Severity .....	100
ERR.7 Diagnostic Information .....	100
Appendix A: XML Encoding .....	101
Validation .....	102
Location of Schemas .....	102
Namespaces .....	102
Appendix B: Full Sample Message .....	103
Appendix C: Example OID Tree .....	108

## Document Change Record

Version Number	Date	Description
1.0	December 1, 2005	Initial document.
1.1	December 16, 2005	Revision based on OPU_R25 version 1.20
1.2	January 13, 2006	Edits based on review by CRI
1.3	January 13, 2006	Correction of data types and example XML
1.5	January 20, 2006	Edit for consistency with MWB Profile
2.0	May 5, 2008	Title changed to reflect specificity to results messages Edits to include NAHLN IT CORE COMMITTEE decisions since prior version. Update for consistency with the NAHLN Messaging hitchhiker's guide
2.1	Dec 23, 2008	Program specific constraints for segments and fields added. Added requirement for MSH.21 (Profile Identifier) Content updated based on CCB decisions. Document content harmonized with Hitch-hiker's Guide. Segment description tables updated to normative version 2.6 format. Data type component tables updated to normative version 2.6 format. URL References to terminology system tables provided for coded vocabularies. Primary authorship and sources updated. Data types updated to normative 2.6. Appendix A: Data types used has been removed. Datatype definitions are inline with the supported fields. Removed references to DTDs in Appendix A (renamed from Appendix B) Updated example message in Appendix B to reflect new changes to reporting PCR results
3.0	Feb, 2013	End to end review and update
3.1	Mar/Apr, 2015	End to end review and update
	June 2016	
	Sept 2016	
	April – July 2017	End to end review and update
4	July 2017	Converted a number of RE fields to Optional or Deprecated. Added repeat to Specimen Condition.
5	May 2020	End to end review in coordination with Order message.

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## Introduction

### Background

The NAHLN has developed a series of messaging specifications to facilitate data transfer between approved laboratories and the NAHLN utilizing Health Level Seven (HL7) version 2.6 message structures. These basic message structures can also be used lab-to-lab or lab to state animal health authority. HL7 version 2.6 was approved American National Standards Institute on October 12, 2007. This implementation guide has been developed as a detailed reference manual to assist the laboratories in integrating HL7 messaging into their Laboratory Information Management System (LIMS). This guide provides laboratories with background information as well as definitions and descriptions of how data segments and fields map to their laboratory data. NAHLN messaging also requires the use of a set of strictly controlled vocabularies that are maintained at a central terminology service and are available for downloading into local LIMS (<http://vtsl.vetmed.vt.edu/nahln/main.cfm>). Example data are provided along with the corresponding XML tags that encompass the data. A detailed XML example of a fully populated message is also provided. A companion overview document, the “Hitchhiker’s Guide to NAHLN Messaging” that provides implementers with a high-level overview of HL7 messaging in the context of the NAHLN is available from the NAHLN documentation site and provides an excellent introduction to this topic.

### Scope

This guide specifically addresses the use of HL7 version 2.6 messages to transmit standardized laboratory results to the NAHLN via the USDA Veterinary Services Laboratory Messaging System (LMS) and the reciprocal transmission of an acknowledgement from the repository to the sending laboratory.

This guide is not intended as a tutorial for the general use of HL7, SNOMED or LOINC, or computer system interfacing in general. The reader is expected to have or acquire a basic understanding of interface concepts, HL7, data extraction, terminology standards and electronic messaging. This guide describes a generalized data exchange protocol applicable for findings produced in a laboratory in support of animal health programs supported by the NAHLN. It is based on HL7 version 2.6, SNOMED-CT and LOINC.

This document is designed to facilitate coordination between submitting laboratories and the NAHLN on the format and content of electronic data exchanges between their computer systems. In the current NAHLN release, this will consist of a single event type consisting of an Unsolicited Population/Location-Based Laboratory Observation Message. This message contains data from the Accession level through completed Results. Later versions of NAHLN will contain conformance profiles that support the submission of orders from a requesting facility (e.g. The NAHLN or a State Diagnostic Laboratory) and the subsequent submission of related laboratory test results from the filling laboratory (e.g. Washington Animal Disease Diagnostic Laboratory or NVSL).

All inter-system messaging will use Health Level Seven (HL7) version 2.6 messages formatted using the v2.xml<sup>1</sup> encoding system. This version of NAHLN is designed to be a forward-compatible implementation, allowing for the addition/subtraction/modification of data from the message as needs are identified without dramatically affected the local implementation. Examples of program specific constraints on the message will be noted in this document. Program-specific constraints for each constrained component are made available in individual program messaging guides, available on the terminology services website.

This document will address only the application layer of the networking system. The larger system-level architecture is under the jurisdiction of the USDA APHIS Marketing and Regulatory Programs Information Technology (MRP IT) Services.

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<sup>1</sup> HL7 Version 2: XML encoding Syntax Release 1, 2003

## How to Read This Document

Typefaces are used to differentiate types of information in this document. Times New Roman 10pt (this text) is used for descriptive and informative general text. Information from the HL7 standards is in Courier New regular and **bold 10pt**. Sample message content in its v2.xml format is in Lucida Console 8pt. Note that many examples are line-wrapped within tags to fit the page. Normally, the closing tag should immediately follow the value text. In some cases, extra white space will make some parsers complain about invalid values.

Example:

```
<xmltag>
  <data>somedata</data>
</xmltag>
```

## Message Structure

Messages are defined in tables following the HL7 standard notation for sequence of segments with optionality noted by square brackets [ ] and repeatability noted by curly brackets { }. Segments are identified by their three letter names. These are defined in similar tables. Data types are defined in place where they are helpful to the general discussion. The tables for Message and Segment definitions have been reduced in complexity by removing Segments or Fields that are not used in the NAHLN Base Schema implementation. This profile is a proper constraint upon the full standard defined OPU\_R25 message. In other words, no required elements have been removed. For forward compatibility issues, consult the HL7 version 2.6 standard for full definitions.

Some fields are indicated as Required or Empty (RE) where they have been identified as containing potentially valuable data for the NAHLN. These fields may be omitted if no data are available. If developing a messaging system designed to be “fully NAHLN Messaging compliant” all Required and Required or Empty fields must be supported if data are present. Fields listed as Optional are included because they may be useful in specific situations but are not widely supported or needed.

This document examines the message structures working from the outside in. First it covers the overall data flow, then the overall message structure, then each segment in detail. The detailed message structure and data type discussions are intended to function as reference material and therefore can be read in any order. They assume a general knowledge of the information included in the introductory material and data flow sections.

Terminology value sets are referenced in the text of the document. The values included in these tables are provided as a service from the NAHLN Terminology Services site located at:

<http://vtsl.vetmed.vt.edu/nahln/main.cfm>.

## Segment Groups

A new concept introduced by the v2.xml standard is the named segment group. A segment group is similar in concept to an X12 Loop. They are used to wrap groups of related segments that may be optional, repeatable or both as a group. These groupings have existed in HL7 2.x all along but have now received names in support of the XML encoding. These groups can be identified in the message definition tables as names in ALL CAPS in the description column. The segment name column will contain [, { or both to indicate optionality, repeatability, or both respectively for the group. When comments are added to the NAHLN usage column of the message definition tables, if in the group name row, they apply to the group as a whole.

Segment groups are used to control the cardinality and association of individual segments. Because the specific contents of each group vary slightly from one message structure to another, they are defined individually in the specific message structure definitions (schemas) and are named as the message structure plus the group name.

## Segments

A segment is a logical grouping of data fields (attributes). Segments within a defined message may be required or optional, may occur only once or be allowed to repeat. Each segment is named and is identified by a unique 3-character code called a segment ID<sup>2</sup>.

## Fields

In HL7 version 2.x messaging, all field content is treated as a string of characters. The interpretation of how to treat these strings is defined by the data type format of the field. Each field is identified by the segment it is in and the position within the segment; e.g., PID.5 is the fifth field of the PID segment. For the purpose of NAHLN messaging, only fields that are supported in the message have detailed information. Whether a field is required, optional, or conditional in a segment is specified in the segment attribute tables.<sup>3</sup> The profile described in this document has constrained all supported fields to be either Required, Required or Empty, Conditional, Optional or Not Supported.

## Data Type Components

Some fields consist of a data type with just a single value represented as text. These fields appear in the XML as a pair of tags with the field name containing the value as what is known in XML as "PCDATA."

```
<single_value_field>value</single_value_field>
```

Other fields are made up of multiple components, each of which has its own pair of tags in the XML formatted message. These components may in turn be made up of subcomponents. When a field is made up of multiple components each of which is used in the NAHLN, the guide includes a table showing the components and their length, usage, etc.

```
<multi_component_field>
  <component1>value1</component1>
  <component2>value2</component2>
</multi_component_field>
```

In some cases a field can have many components in the standard but only one is used in the NAHLN profile. By design, HL7 has put the most commonly used components first. In these cases there will still be a pair of tags defining the single component.

```
<multi_component_field_only_one_used_by_nahln>
  <component1>value</component1>
</multi_component_field_only_one_used_by_nahln>
```

Note that if the field had been designed in XML from scratch, the example above could have been coded the same as the example for single value fields. It contains the additional "component1" tags to be explicit about which of the components allowed by the HL7 data type is actually being provided in our message. This keeps the XML consistent with the schema for the full HL7 standard and allows automated transformation between the XML format and the more widely used ER7 format.

For both singly used components and simple value fields, no component table is included as this essentially duplicates the table showing the field as a whole. The logic is the same for components and subcomponents.

Component details will be discussed when a data type is included in a location where it is commonly used or when the component usage differs from other elements of the same type. In other locations in this guide, you will find only the component table.

---

<sup>2</sup> HL7 Version 2.6, Appendix A.4.

<sup>3</sup> HL7 Version 2.6. See Chapter referred to in abstract message definition



## Value Set Tables

Where values within a given message element are restricted to a specified set, the value set is provided in the form of a “table.” Tables may be predefined by HL7 (“HL7 Tables”) or may be left to definition by the user (“User-Defined Tables”). In some cases, suggested values are provided by the standard for User-Defined Tables. In other cases the User-Defined Table value set shall be defined by the NAHLN Information Technology Committee. Tables may be as simple as a few lines or as complex as the list of all SNOMED codes for species or breeds. Hyperlinks to the NAHLN Terminology Services are provided for each NAHLN utilized value set. The lists available at the NAHLN Terminology Services website (<http://vtsl.vetmed.vt.edu/nahln/main.cfm>) are the officially allowable values. **If this document conflicts with the terminology services, the terminology services set supersedes this document.**

## Message Flow

### General Data Flow

The process covered in this document begins when a participating NAHLN laboratory (filler system) has one or more results completed and ready for submission to the NAHLN repository. The filler system will populate an Unsolicited Population/Location-Based Laboratory Observation Message (OPU\_R25) from their local LIMS, saving copies of all key data and administrative fields locally, if necessary. This message will then be transmitted to the NAHLN using communications protocols defined elsewhere in this document.

“Unsolicited” in the HL7 sense means that the sending system sends the message whenever the trigger event occurs without being queried by the receiving system. In this case the trigger event occurs when results are ready for release to the NAHLN network. The testing that generates this “unsolicited” result message may have been “requested” via manual laboratory order forms or may have resulted from an earlier HL7 order message.

The Laboratory Messaging System (LMS) will receive the message, confirming any security envelopes, sender authentication, etc., as defined in the communications protocols. The LMS will then parse the incoming message structure and accept responsibility for further processing of the contents. The LMS then responds with an Acknowledgment message (ACK) as defined in the HL7 standard (and this document).

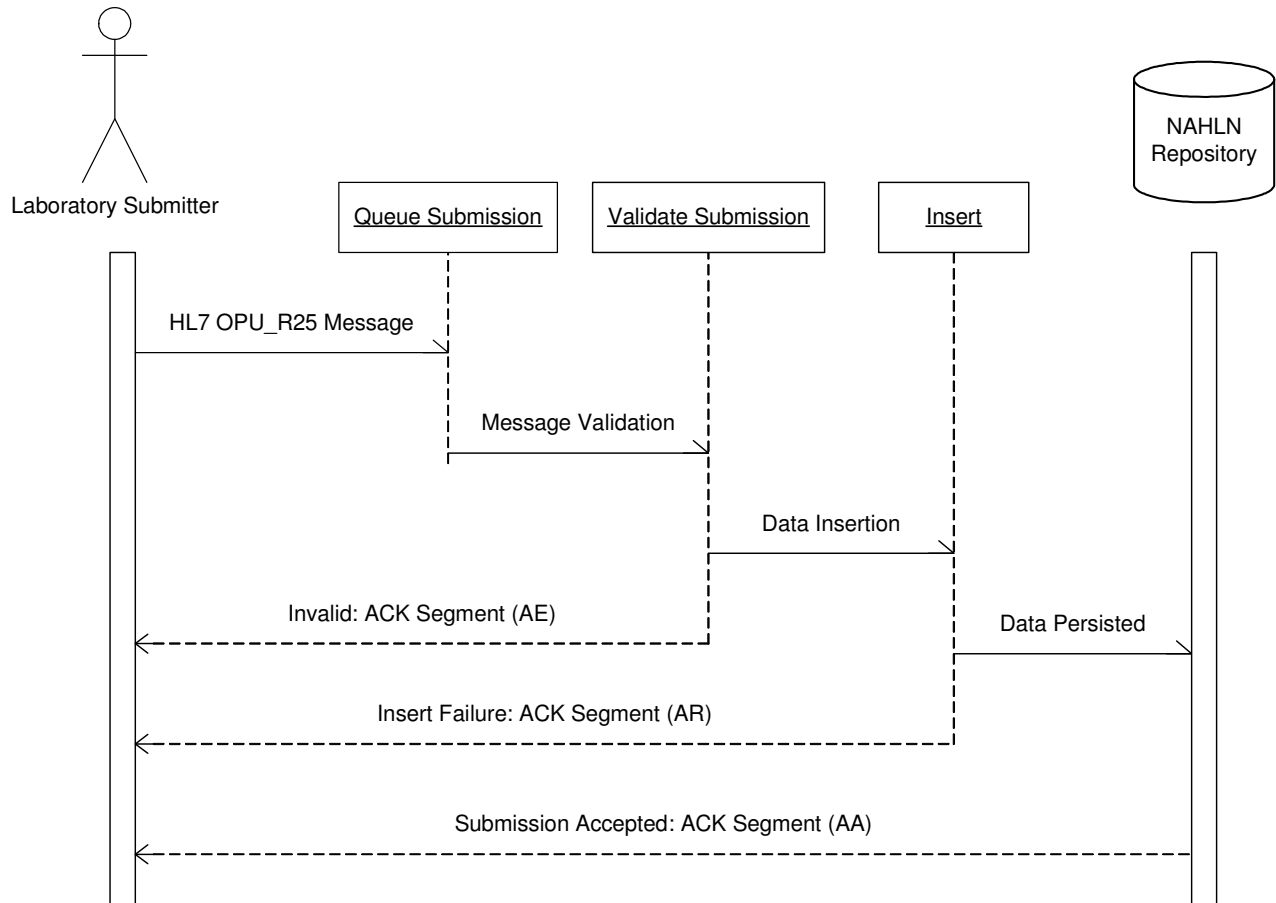
Some messages may be routed via a message router or clearinghouse. In these cases the message may be sent all the way to the NAHLN or other recipient via “push” delivery or retrieved later by a “pull” mechanism. In push delivery, the router returns the Application Acknowledgement message from the NAHLN. In cases where the message is held in the router for later “pull” retrieval, the router itself will return a Commit Acknowledgement. The Commit Acknowledgement indicates that the router has taken responsibility for delivery, but cannot ensure that the NAHLN will be able to use the data as sent. Both forms of acknowledgement are addressed in the later section on Acknowledgment Messages.

Many key data flows occur outside the scope of this guide. Notably, all transactions necessary to manage access control occur via mechanisms defined elsewhere. In some cases, these transactions depend on the content of specific messages defined in this guide. In those cases, the guide will address the access control implications of specific segments and fields, but not the actual access control mechanisms.

The interaction diagram in Figure 2 shows the synchronous acknowledgement interaction. In this version, the original OPU\_R25 message is sent via a one-way message or method call. The sending system then waits for the acknowledgement to arrive. The acknowledgement (ACK) message is sent on that same open connection. Third party routing of the NAHLN messaging architecture supports asynchronous acknowledgement. In this scenario, multiple messages may be sent to the repository (either in batch mode or as a set of individual messages), whereas acknowledgement of the messages will occur as they are processed. This will not require a continuous connection between the transmitting laboratory and the NAHLN repository

Figure 2.

### NAHLN HL7 Solution

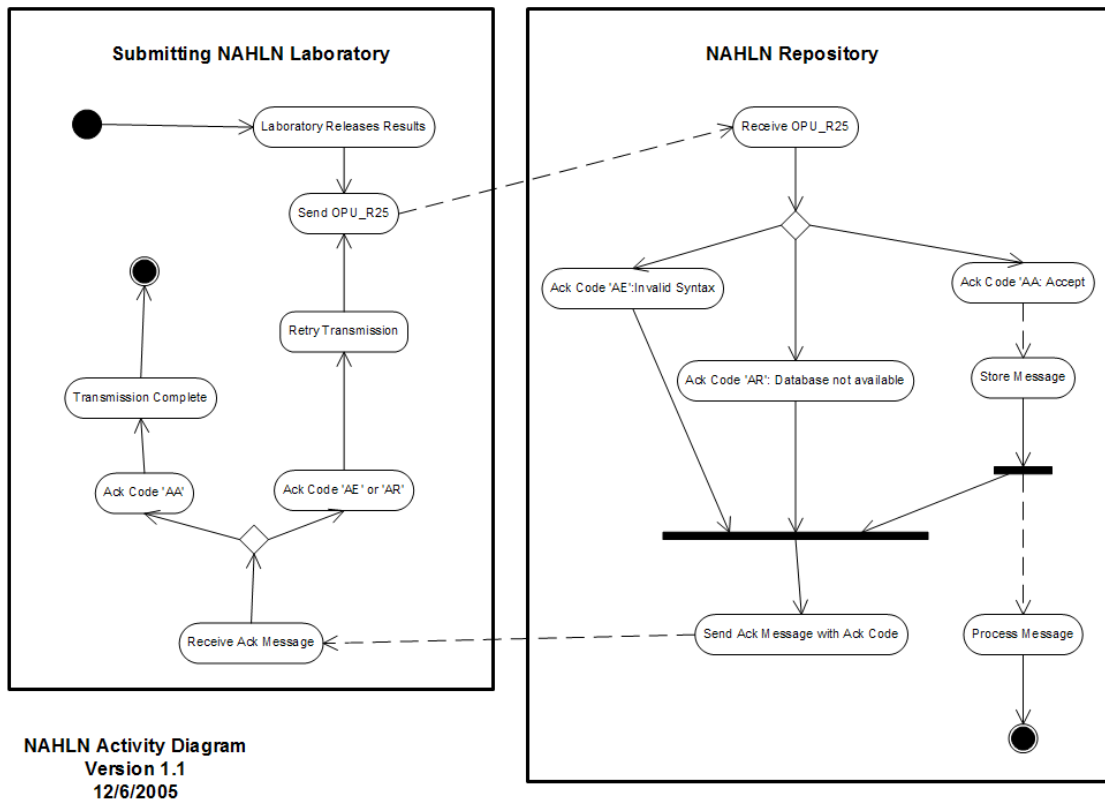


### Exceptional Data Flows

In the event of errors in parsing the message structure, the acknowledgment message will contain enough information to allow debugging of the source system. See discussion of the ERR segment in the ACK message below.

The receiving system is expected to be able to parse any message that conforms to the HL7 v2.xml specification for the message specified. If message components are received that are not specified as required by this guide, they may be ignored by the receiving system. A receiving system may reject a message that fails to provide data for an element designated as required or conditional by this guide, even if the element is optional in the standard. These rules are designed to allow maximum reuse of any existing components while still enforcing essential content requirements.

Figure 3.



### Note on Field Value States<sup>4</sup>

A field may exist in one of three population states in an HL7 message:

**Populated.** (Synonyms: valued, non-blank, not blank, not empty, non-null) The sending system sends a value in the field. For example, if a sending system includes an accession record number, it would be communicated as:

```
<PV1.19>
<CX.1>D0500675</CX.1> (Accession number)
  <CX.4>
    <HD.2>2.16.840.1.113883.3.5.1.2.1</HD.2> (Assigning authority, see below)
    <HD.3>ISO</HD.3> (Assigning authority type, see below)
  </CX.4>
</PV1.19>
```

Note that the field might be populated with a code that means “no information” or “unknown”.

**Not populated.** (Synonyms: unpopulated, not valued, unvalued, blank, empty, not present, missing.) The sending system does not supply a value for the field. The sender might or might not have a value for the field. In the absence of a Conformance Profile governing the implementation, no conclusion regarding the absence of an element value can be reached. However, if there is a Conformance Message Profile in effect, then special rules apply. In this case the tags may be omitted.

<sup>4</sup> HL7 Version 2.6 Chapter 2 Section 2.5.3

**Null.** Any existing value for the corresponding data base element in the receiving application should be deleted. This is symbolically communicated as two double-quotes between the XML tags (i.e., <tag>""</tag>). Employing consecutive double quote characters as the only content of a field for other purposes is prohibited.

## Note on Identifiers and Their Assigning Authorities

A key to making data universally useful is for identifiers to be universally unique. With multiple agencies issuing identifiers for various entities and objects, the only way to ensure this uniqueness is to include information about the issuer of each identifier, i.e.; its “assigning authority.” Of course, the identifiers for these assigning authorities must be universally unique. This can become an infinite recursion. To avoid this, HL7 has recognized a list of “universal identifier types” that are intrinsically universally unique. The universal identifier type used by the NAHLN is the International Standards Organization (ISO) Object Identifier (OID) (<http://www.alvestrand.no/objectid/top.html>). The vast majority of OIDs used in the NAHLN can be found on the AAVLD OID registry at: [http://vdpambi.vdl.iastate.edu/aavld\\_oid](http://vdpambi.vdl.iastate.edu/aavld_oid).

Identifier-Assigning Authority pairs appear in three slightly different forms in NAHLN HL7 messages:

- 1) Most frequently, an identifier field of type ID<sup>5</sup> (identifier) is associated with a second field of type HD<sup>6</sup> (hierarchical designator) in which the second component (HD.2) contains the identifier for the assigning authority.
- 2) In other cases, related historically to HL7 limitations of nesting of fields in fields, the identifier and assigning authority are combined in a single element of type EI<sup>7</sup> (Entity Identifier). The first component of an EI (EI.1) is identical in meaning to the ID identifier field and the last three components (EI.2, EI.3, and EI.4) are identical to the three fields of the HD for assigning authority. In these cases, the NAHLN uses EI.1 for the ID, EI.3 for the OID of the assigning authority, and EI.4 is always “ISO.”
- 3) Lastly, in a few cases the HD stands on its own as a hierarchical identifier. In these cases HD.1 is the identifier and HD.2 is the universal ID of the assigning authority. When this case is true for NAHLN messages, the identifier will always be an Animal Disease Traceability (ADT) Premises (or Non-Producer Participant) ID and the Assigning Authority will always be the OID for the ADT Premises ID Allocator.

Whenever practicable, the assigning authority will be identified by an OID and the type identified as “ISO”, the HL7 designation for ISO OIDs. In these cases, HD.1 is empty and the OID is in HD.2 with “ISO” in HD.3. For the current NAHLN release, this is the only supported structure.

Member laboratories are both identified entities in the sense of sending and receiving facilities and assigning authorities of identifiers used by others. As assigning authorities, laboratories are identified by their root OIDs. With regard to identified entities within the NAHLN, laboratories are identified by their ADT Premises or Non-Producer Participant IDs. This adds flexibility in the sense that one laboratory may issue identifiers for different types of entities using different identifier systems. All that is needed to make this universally workable is for the laboratory to assign a unique OID to each identifier system under their root OID. An example OID tree is included in [Appendix C](#). Alternatively, to simplify OID management, since the location of an identifier within the message provides context, a laboratory’s root OID may be used in cases where all IDs are assigned by the same “system”. If a laboratory makes a change such as implementing a new LIMS that could

### Don't Have an ADT Number?

In order to send messages to the NAHLN, each “sending facility” is required to obtain an ADT ID. For each state, this is assigned by the state Premises ID allocator. Contact your state veterinarian’s office for information on obtaining this ID for your laboratory.

<sup>5</sup> HL7 version 2.6 Chapter 2.A.35

<sup>6</sup> HL7 version 2.6 Chapter 2.A.33

<sup>7</sup> HL7 version 2.6 Chapter 2.A.25

possibly reuse existing identifiers, it *must* issue a new OID for that system and use that new OID as the root for all identifiers issued under the new system.

## Note on Coded Entries

Many fields in the HL7 messages are sent as codes from a specified coding system. Starting with version 2.6 of HL7, each coded entry field specifies a coding strength. Each coded entry element includes three essential components. The first is the code. The second is the text representation of that value as defined by the coding system. For example, if the code is a LOINC code, the text is the LOINC common long name (preferred), LOINC short name or LOINC display name. The third element is an abbreviation or OID of the coding system. The NAHLN approved coding for each coded field is specified in this guide.

### Coding Strength

Some fields are coded, but do allow exceptions in the case that something must be sent that cannot be coded in the restricted value set specified. These use the Coded With Exceptions (CWE) data type. Most coded entries in the NAHLN results message are of this type. In the vast majority of cases these should be sent properly coded using the value sets provided by the NAHLN terminology services. In the event of a new value not yet included in the NAHLN terminology subset, or if the local code cannot be confidently mapped to the standard system, the alternate coding system and/or original text may be sent without the primary code (in components 4-6 and 9 respectively), without the message being rejected. Once a code is assigned, the database can be updated, using the new mapping. These should be very rare events especially after initial system deployment.

A few fields use coded values where all possible values have been supplied in the subsets provided by the NAHLN. For these fields no value other than those specified codes makes sense or can be used by the NAHLN. These fields use the Coded No Exceptions (CNE) data type and only the first three components are allowed. Any attempt to send codes either not in the NAHLN terminology subset for the field or as alternative codes will result in the message being rejected.

XML encoding of the CNE data type is problematic. CNE is intended to be a proper constraint on the CWE datatype. Any element that was valid as CNE would also be valid as CWE; though not visa-versa. But in xml, the tag name matters. <CNE> cannot be simply substituted for <CWE> as a more constrained version of the same thing. For this reason, the NAHLN encodes all coded elements with <CWE> tags even when enforcing CNE code strength.

### Alternative Codes

For coded concepts with a coding strength of CWE, if a coded concept is required that does not exist in the NAHLN approved coding system, but exists in some other standard coding system, the alternate code, text, and system can be sent in the fourth through sixth components of the data type. Finally, if the required concept does not exist as a coded value in either the NAHLN approved coding system, or an alternative coding system (including local codes), the original text value should be sent in the Original Text component (ninth). It is essential to note that all these representations—the code with its text, the alternate code with its text, and the original text—must represent exactly the same concept. The only reason for sending alternate codes or original text is to facilitate mapping the original concept and/or verification of mapping that has already been done.

## Note on Data Lengths

The definition of each of the segments includes a maximum data length for each field. The total length of the data in each of the components of the field should be no more than these limits. However, these are not consistently enforced by any of the typical pieces of the messaging infrastructure. NAHLN will check all buffer lengths prior to any action that depends on them. If a data element has exceeded its maximum number of characters, a corresponding message will be returned in the ACK.

### Note on Optionality and Repeatability

In the optionality column of the tables that define each segment group, segment and field, we have included the optionality for NAHLN usage. These codes are a variation on the optionality settings used in HL7 conformance profiles. Values include:

R	Required	<p>A sending application <b>shall</b> populate all “R” elements with a non-empty value. The receiving application shall process (save/print/archive/etc.) the information conveyed by required elements. The receiving application must raise an error due to the absence of a required element.</p> <p>In a few cases there may be supplied null values. These are cases where requiredness is inherited from the standard but in NAHLN application values may not exist.</p>
RE	Required or Empty	<p>An “RE” element <b>may be</b> missing from the message, but should be sent by the sending application if there is relevant data.</p> <p>Receiving applications will be expected to process (save/print/archive/etc.) 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>
C	Conditional	<p>This usage has an associated condition predicate.</p> <p><b>When the predicate is satisfied:</b></p> <p>The sending application must always send the element. The receiving application must process data in the element. It should raise an error if the element is not present.</p> <p><b>When the predicate is NOT satisfied:</b></p> <p>The sending application must NOT send the element. The 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 or Empty	<p>This usage has an associated condition predicate.</p> <p><b>When the predicate is satisfied:</b></p> <p>If the sending application contains the required values for the element, then the application should send the element. If the sending application does not contain the values required for this element, then the element shall be omitted.</p> <p>If the element is present, the receiving application</p>

		<p>shall process (display/print/archive/etc.) 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>When the predicate is not satisfied:</b></p> <p>The sending application shall not populate the element.</p> <p>The receiving application may raise an application error if the element is present.</p>
O	Optional	<p>The field is not required to be supported by the receiver of the message. If sent, the receiver may ignore the data, but may not send a reject acknowledgement to the sender.</p> <p><b>Optional fields are retained in the profile for compatibility with systems that may use them for their own purposes but are not required or expected by any known NAHLN participant.</b></p>
D	Deprecated	<p><b>This field is no longer used and will be dropped from some future version of the profile.</b></p>

Some fields are allowed to repeat in the HL7 standard message structure. Some of these will be represented in NAHLN messages in a form that allows multiple values. In other cases, only the first value will be retained. If the repeatability column of the segment table is blank, the field may not repeat and only a single value may be sent. Other values include:

**Y Yes** Repeatable in the standard and multiples will be retained by NAHLN

**N No** Repeatable in the standard but repeats are not allowed in NAHLN usage. Only the first value will be retained. Additional values if sent will be discarded.

The number of allowable repeats in the RP/# column indicates the number usable by the NAHLN and may be smaller than the standard. Repeats beyond this limit will be discarded. For example: N would indicate that only one value will be retained. Y/3 would indicate that up to three values will be retained.

## Unsolicited Population/Location-Based Laboratory Observation Message (OPU\_R25)

This message and event type are designed to facilitate communication of location-based laboratory results that are associated with a specimen. As the NAHLN refines the set of tests for which data are collected for each program, the use of these segments will be defined more precisely in usage note areas of this guide.

**NAHLN Constrained OPU\_R25 Abstract Message Structure**

<u>OPU^R25^OPU_R25</u>	<u>Unsolicited Population/Location-Based Observation Message</u>	<u>HL7 Chapter</u>
MSH	Message Header	2
PV1	Patient Visit	3
[[{OBX}]	Observation on the Visit	7
{ROL}	Role	15
{	--- ACCESSION_DETAIL begin	
{NK1}	Next of Kin	3
[	--- PATIENT begin	
PID	Patient	3
[[{	--- PATIENT_OBSERVATION begin	
OBX	Observations on Patient	7
]]	--- PATIENT_OBSERVATION end	
]	--- PATIENT end	
{	--- SPECIMEN begin	
SPM	Specimen	7
[[{	--- SPECIMEN_OBSERVATION begin	
OBX	Observations on Specimen	
]]	--- SPECIMEN_OBSERVATION end	
{	--- ORDER begin	
OBR	Observation Order	7
[ORC]	Common Order	4
{	--- RESULT begin	
OBX	Observation Result	7
}	--- RESULT end	
}	--- ORDER end	
}	--- SPECIMEN end	
}	--- ACCESSION_DETAIL end	

The concept of a patient VISIT in the NAHLN implementation is a variation from the standard HL7 interpretation. Because this message originates at the laboratory-level, rather than the clinic-level, the concept of visit takes on a slightly different meaning. Most veterinary diagnostic laboratories have the concept of an accession (sometimes called "case"), which is a logical grouping of animal and or non-animal specimens and their associated orders for analysis listed under a single identifier. This accession (case) number is used to reference a group of laboratory events that take place in the scope of a laboratory "episode of care." In the NAHLN, a visit refers to a single laboratory submission event (an accession). Technically, the message is constrained by population or location. This fits most, but not all, laboratories' definition of an accession as covering one farm or



one flock on a farm. For those that allow multiple locations on one accession, messages need to be one per location.<sup>8</sup>

The OPU\_R25 message structure allows only one “patient visit” with its associated roles per message. In most laboratories’ usage this means one accession from one submitter per message. Specimens from any number of “owners” of any number of “patients” may be included in one message. An entire accession may be included in a single message or the accession may be repeated in a number of messages each containing a subset of the results for that accession.

The message as described in the table above provides results of one test or set of tests assigned under a single accession. These tests can be associated with specimens that may or may not be associated with an animal (patient). In NAHLN usage, “patient” may refer to a single animal or to a group of animals such as a herd or flock that are being studied as a single entity. The tests for a patient (or patient group) pertain to one “patient visit” or encounter. If laboratory analysis results would be logically interpreted as indicative of the state of health or disease of only a single animal, they should be reported individually. If they are interpreted as indicative of disease in the entire population, they should be reported by group. In each of these cases, the PID segment is used to provide the taxon (commonly referred to as “species” and/or breed), if applicable, and individual or group identifiers. Multiple taxons<sup>9</sup> may be transmitted in a single message, however, if specimens from multiple taxons are sent, they must be put under the separate ACCESSION DETAIL groups each with a distinct PATIENT group with a PID segment representing the taxon of origin.

Mixed taxa within a single PID segment are not allowed.

The message can also be used to transmit data concerning environmental specimens in which there is no associated animal source. In this case the PID segment is not required. Premises ID and state of origin are carried in the ROL segment immediately preceding the accession group.

Each specimen is contained within a SPECIMEN group. Each specimen may, in turn, have one or more orders. An order refers to a test or set of tests that would be requested individually or together as a battery or panel (see sidebar) and logically interpreted as a group and would therefore be reported as such. Each order, therefore, has one or more associated observations (results). Each individual result must be reported in its own observation result segment.

#### Panel or Protocol?

These two terms are often used interchangeably, but for the purposes of the NAHLN we will adhere to the following definitions:

**Panel:** A convenient method to order a set of analyses on a specimen. This set of tests must all be resulted or cancelled for the panel to be complete.

**Protocol:** A convenient way to order a sequential series of analyses. Assays are performed in order based on the result of the first and subsequent analyses. Similar to a reflex order.

For example, a Bovine Tuberculosis Gamma Interferon Assay would be represented by one order followed by a row for each individual observation such as Bovine - control value, Bovine – avian value, etc. Each observation is uniquely identified by a LOINC code (see details of the OBX segment below) identifying the specific observation, and either a numeric value or a coded value using the SNOMED-CT reference terminology.

For each Accession, State of origin is always required for access control purposes. Because of this requirement the Premises of Origin segment (ROL with role code of "PREM") is required. Other ROL segments will also be used for submitter, collector, referring laboratory, etc. Uses of this structure outside the NAHLN/LMS *may* relax this constraint if for some reason the state of origin is not important.

<sup>8</sup> This also differs from the usual use of "accession" in medical laboratories where the term refers to one submitted specimen.

<sup>9</sup> Correct plural “taxa.” But that seems to not make the point.

## Detailed Message Walk-Through

In the following sections, specific details of the appropriate use of each segment and field in the NAHLN Result Base message will be discussed.

### Message Header Segment (MSH)

The message header segment contains the detailed information concerning the intent, source, timing, destination and identity of messages. The fields used are all either constants or system-generated, such as sequence numbers or time stamps. Thus, laboratory users need not worry about any of these except during interface set-up, mapping, and debugging.

### MSH Segment Structure

The following table defines the structure of the MSH segment. The table includes the field number (SEQ), field length (LEN), data type (DT), optionality as defined in the NAHLN (OPT), repeatability or number allowed (RP/#), source table if the field is a coded value (TBL), and element name. Only those fields used in the NAHLN message are shown.

**NAHLN Supported Fields for the MSH Segment**

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
1	1	ST	R			Field Separator
2	4	ST	R			Encoding Characters
3	227	HD	RE		0361	Sending Application
4	227	HD	R		0362	Sending Facility
5	227	HD	C		0361	Receiving Application
6	227	HD	C		0362	Receiving Facility
7	24	DTM	R			Date/Time of Message
9	15	MSG	R			Message Type
10	199	ST	R			Message Control ID
11	3	PT	R			Processing ID
12	60	VID	R			Version ID
21	427	EI	R	Y		Message Profile Identifier
22	567	XON	O			Sending Responsible Organization

The following sections describe in greater detail each of the elements that are in use within the MSH segment. The description provided in this document represents the NAHLN-specific definition and should be used to determine how each field should be populated for a particular laboratory.

### MSH.1 and MSH.2 - Field Separator and Encoding Characters (ST) - Required

The first two named fields of the MSH segment define delimiters for the rest of the message. These fields are used by the ASCII format ER7 encoding but are not required in XML encoding. They are included here for conformance with the ER7

**Note:** To conform to the proper usage of special characters in XML, the ampersand in the MSH.2 field is represented as &amp ; .

encoding in order to allow transformation between XML and ER7. The MSH.1 should be defaulted to "|" and MSH.2 should be defaulted to "^~\&"

Example:

```
<MSH.1>|</MSH.1>
<MSH.2>^~\&amp;</MSH.2>
```

### MSH.3 - Sending Application (HD) - Required Or Empty

This field provides the identifier of the sending application when the sending facility may have more than one application sending messages. The sending application is encoded as a hierarchical designator (HD) element. This is one of four fields (MSH.3, MSH.4, MSH.5 and MSH.6) where the use of the HD data type conforms to the first pattern described above.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	R	0300	Namespace ID	The name of the application as assigned by the sender.
2	999	ST	R		Universal ID	The ID of the code system from which the namespace ID originates. For the NAHLN this will be either the laboratory's root OID or an OID for its internal application ID system.
3	6	ID	R	0301	Universal ID Type	The type of the universal ID. For the NAHLN this will always be ISO.

Example:

```
<MSH.3>
  <HD.1>STRLIMS</HD.1>                                <!--Example application name-->
  <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>                <!--Example root OID of Laboratory
                                                           that assigned the above name-->
  <HD.3>ISO</HD.3>                                       <!--Default ID Type for OIDs-->
</MSH.3>
```

### MSH.4 - Sending Facility (HD) - Required

This field provides the identifier of the sending facility or laboratory. The sending facility is encoded as a hierarchical designator (HD) element. For this element, the laboratory ADT ID must be used as the namespace ID.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	R	0300	Namespace ID	Unique identifier as assigned by the organization represented by the universal ID. For the NAHLN this shall be the ADT Premises ID or Non-Producer Participant ID.
2	999	ST	R		Universal ID	The code system from which the namespace id originates. For the NAHLN this will be the OID for the ADT Premises ID system.
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. For the NAHLN this will always be ISO.

Example:

```
<MSH.4>
  <HD.1>0031s80</HD.1>           <!--Example ADT Premises ID-->
  <HD.2>2.16.840.1.113883.3.5.6.1.4</HD.2> <!--OID for ADT Premises ID System-->
  <HD.3>ISO</HD.3>               <!--Default ID Type for OIDs-->
</MSH.4>
```

### MSH.5 - Receiving Application (HD) - Conditional

This field provides the identifier of the receiving application when messages are sent intra- or inter-facility. The receiving application is encoded as a hierarchical designator (HD) element. Either the receiving application or the receiving facility or both shall be supplied depending on whether the message is intra- or inter- facility.

**Condition:** This field shall be populated if MSH.6 (Receiving Facility) is not valued.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	R	0300	Namespace ID	The name of the application as assigned by the assigning authority.
2	999	ST	R		Universal ID	The ID of the code system from which the namespace ID originates. For the NAHLN this may be the OID for Repositories or Routes. (2.16.840.1.113883.3.5.1.8.1)
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. For the NAHLN this will always be ISO.

Example:

```

<MSH.4>
  <HD.1>NAHLN REPOSITORY</HD.1>          <!--Example application name-->
  <HD.2>2.16.840.1.113883.3.5.1.8.1</HD.2> <!--Example Root OID of
                                              application owner-->
  <HD.3>ISO</HD.3>                        <!--Default ID Type for OIDs-->
</MSH.4>
    
```

### MSH.6 - Receiving Facility (HD) - Conditional

This field provides the identifier of the receiving facility and for the purposes of NAHLN Result messaging refers to the NAHLN result repository system. The receiving facility is encoded as a hierarchical designator (HD) element. The receiving application or the receiving facility or both shall be supplied depending on whether the message is intra- or inter- facility and whether, if inter-facility, the receiving facility has multiple systems involved in messaging.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	R	0300	Namespace ID	Facility unique identifier as assigned by the organization represented by the universal ID. For the NAHLN this shall be the NAIS Premises ID or Non-Producer Participant ID.
2	999	ST	R		Universal ID	The code system from which the namespace id originates. For the NAHLN this will be the OID for the NAIS Premises ID system.
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. For the NAHLN this will always be ISO.

**Condition:** This field shall be populated if MSH.5 (Receiving Application) is not valued.

An example of MSH.6 is shown below:

```

<MSH.6>
  <HD.1>987JF20</HD.1>          <!--NAIS Premises ID for NAHLN Repository-->
  <HD.2>2.16.840.1.113883.3.5.6.1.4</HD.2> <!--OID Root for NAIS Premises ID System-->
  <HD.3>ISO</HD.3>            <!--Default ID Type for OIDs-->
</MSH.6>
    
```

### MSH.7 - Date/Time of Message (DTM) - Required

The local time Date/Time of the message is sent as a timestamp (DTM) data type using the ISO 8824-1987 format:

```
(YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]][+/-ZZZZ].
```

This should be a System-generated date and time to the second that the message was created. It is not clinically relevant time, but essential for system analysis, tuning, etc.

Note: At a minimum, the DTM data type must be populated with a four digit year; however, it is recommended to provide the most detailed precision possible from the laboratory's system.

The number of places included indicates the precision. Participating systems should use the Network Time Protocol (NTP) or other reliable mechanism to maintain accurate system time and provide accurate timestamps in order to maintain a proper sequence of events in all connected systems. We strongly encourage use of the time zone +/-ZZZZ (as HHMM) element to simplify time calculations. Without this, the default is to use the time zone of the sender. Example:

```
<MSH.7>20081219081023-0800</MSH.7>           <!--Example Date/Time of Message-->
```

## MSH.9 - Message Type (MSG) - Required

This field identifies the specific message type and structure. For the NAHLN, all components of this field are required and may be defaulted as described in the component table below.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	3	ID	R	0076	Message Code	This shall be defaulted to "OPU".
2	3	ID	R	0003	Trigger Event	Specimen-based observation. This shall be defaulted to "R25".
3	7	ID	R	0354	Message Structure	This is the message structure and shall be defaulted to "OPU_R25".

Example:

```
<MSH.9>
  <MSG.1>OPU</MSG.1>           <!--HL7 Message Type-->
  <MSG.2>R25</MSG.2>         <!--HL7 Event Type-->
  <MSG.3>OPU_R25</MSG.3>     <!--HL7 Message Structure-->
</MSH.9>
```

## MSH.10 - Message Control ID (ST) - Required

The message control ID is a system-generated unique identifier assigned by the sending system. The system generating these shall ensure that they are unique for the full life of the program. Other than that, there are no requirements for internal structure of the identifier. Message Control ID is of no interest to human users of the system. It is very important to the various software processes to keep track of which messages have been sent, received, accepted, etc.

Example:

```
<MSH.10>1003456</MSH.10>     <!--Example Message Control ID-->
```

## MSH.11 - Processing ID (PT) - Required

This field specifies whether this is a production, training, or debugging message. Only the first component of this data type is supported. The values present in this field can either be:

- P Production: Used only for actual production data to the main NAHLN Result service
- D Debugging: Used during lab message development, etc. except for message validation and acknowledgement from the NAHLN Result Test service, these are ignored on the receiving end.

- **T Training:** Used when testing lab messaging for a specific test or testing program. In addition to message validation and acknowledgement from the NAHLN Result Test service, these messages will be retained and reviewed by NAHLN staff.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	1	ID	R	0103	Processing ID	Specifies whether this is a production, test, or debugging message.

In practice, this field is not used to divert messages in testing and debugging. But good practice would indicate proper usage for future reference.

Example:

```
<MSH.11>
  <PT.1>P</PT.1>                                <!--Example Message Processing ID-->
</MSH.11>
```

### MSH.12 - Version ID (VID) - Required

The version ID of all messages covered by this guide will be 2.6. All messages shall contain this value to ensure forward compatibility with future revisions that may move to later versions. The data type is VID but only the first component of the data type is supported by the NAHLN.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	5	ID	R	0104	Version ID	HL7 version of this message. For NAHLN 2.0, "2.6" should be sent. This field is present for forward compatibility with later versions.

Example:

```
<MSH.12><VID.1>2.6</VID.1></MSH.12>
```

### MSH.21 - Message Profile Identifier (EI) - Required

A message profile is the set of rules about which elements of an HL7 message are being used, required, etc., in a given implementation. As the NAHLN messaging implementation evolves there will be inevitable delays between new versions of the message profile and all labs' implementation of new profiles. The Message Profile Identifier allows the sender to indicate which specific version of the profile was used in validating the message to be sent. The receiving system can use this information to more correctly apply validation rules. The most current version of message profiles supported by the NAHLN may be found at <http://vtsl.vetmed.vt.edu/nahln/main.cfm> under the resources button.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Profile Identifier.
3	199	ST	RE		Universal ID	OID for NAHLN message profiles.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
4	6	ID	RE	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

If a message has been built upon a more specific schema such as those for specific surveillance programs, the name of the appropriate schema—minus the .xsd—should be provided as the Profile Identifier.

Example:

```
<MSH.21>
  <EI.1>NAHLNResultBasev1_0_9_5</EI.1> <!--Example name of the profile used -->
  <EI.3>2.16.840.1.113883.3.5.9</EI.3> <!--The AAVLD OID for message profiles-->
  <EI.4>ISO</EI.4>
</MSH.21>
```

### MSH.22 - Sending Responsible Organization (XON) - Optional

This field is currently only used by the Swine Health Information Center as a way to send results of testing performed at a different laboratory. It contains the name and optionally the unique identifier of the laboratory that actually conducted the reported results.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	50	ST	R		Organization Name	Profile Identifier.
3	227	HD	RE		Assigning Authority	OID for Assigner of Identifier below.
4	20	ST	RE	0301	Organization Identifier	String identifier

Example:

```
<MSH.22>
  <XON.1>Referral Laboratory Name</XON.1>
  <XON.6>
    <HD.2>2.16.840.1.113883.3.5.9</HD.2>
    <HD.3>ISO</HD.3>
  </XON.6>
  <XON.10>ISO</XON.10>
</MSH.22>
```

### Patient Visit Segment (PV1)

In the traditional usage, this segment would contain the patient’s Hospital Visit Number. In the case of NAHLN, the concept of a visit is represented by the laboratory Accession Number. Only three fields of this segment are utilized in the NAHLN profile.

#### NAHLN Supported Fields for the PV1 Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	1	IS	R		0004	Patient Class



SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
7	250	XCN	RE	Y	0010	Case Coordinator
19	250	CX	R			Accession Number

An example of the NAHLN Patient Visit segment profile follows:

```

<PV1>
  <PV1.2>C</PV1.2>
  <PV1.7>
    <XCN.1>VET001</XCN.1>
    <XCN.2>
      <FN.1>Jones</FN.1>
    </XCN.2>
    <XCN.3>Joe</XCN.3>
    <XCN.4>B.</XCN.4>
    <XCN.9>
      <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
      <HD.3>ISO</HD.3>
    </XCN.9>
  </PV1.7>
  <PV1.19>
    <CX.1>D0800675</CX.1>
    <CX.4>
      <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
      <HD.3>ISO</HD.3>
    </CX.4>
  </PV1.19>
</PV1>

```

### PV1.2 - Patient Class (IS) - Required

Patient Class is required for conformance with HL7. This field is always applicable; therefore, Not Applicable (N) is an unacceptable value. The value for this field shall be defaulted to C (Commercial Laboratory Testing).

Example:

```
<PV1.2>C</PV1.2>
```

### PV1.7 - Attending Doctor (XCN) - Required or Empty

This field contains identifying information about the diagnostician responsible for the Accession, otherwise known as the Case Coordinator. Only one subcomponent of this field is mandatory if the field is valued (family name). Unless required by a specific program, this field can be left out of NAHLN result messages.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	RE		ID Number	ID Number for the responsible diagnostician.
2	194	FN	R		Family Name	Last name of the responsible diagnostician.
3	30	ST	RE		Given Name	First name of the responsible diagnostician.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial of the responsible diagnostician.
5	20	ST	RE		Suffix (e.g., JR or III)	Jr, III, etc.
9	227	HD	C	0363	Assigning Authority	Authority that assigned the responsible diagnostician's ID number.  <b>Conditionality:</b> This field must be valued if ID Number is provided.

An example of the PV1.7 (Attending Doctor) XML is provided below:

```
<PV1.7>
<XCN.1>VET001</XCN.1>           <!--Example ID for Responsible Diagnostician-->
  <XCN.2>
    <FN.1>Jones</FN.1>           <!--Example Diagnostician Last Name-->
  </XCN.2>
  <XCN.3>Joe</XCN.3>             <!--Example Diagnostician First Name-->
  <XCN.4>B.</XCN.4>             <--Example Diagnostician Middle Initial-->
  <XCN.9>
    <HD.2>2.16.840.1.113883.3.5.1.2</HD.2> <!--Example OID for ID Assigning Authority-->
    <HD.3>ISO</HD.3>
  </XCN.9>
</PV1.7>
```

**PV1.7.1 ID – Number (ST) - Required or Empty**

This component contains the ID number that can be used to identify this person.

**PV1.7.2 – Family Name (FN) - Required (If PV1.7 is sent)**

If the PV1.7 field is included in the message, this field shall be populated. The Surname component is required and contains the last name of the person.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	50	ST	R		Surname	Last name of person

***PV1.7.2.1 – surname - Required***

This sub-component is the only required sub-component of PV1.7.2. It contains the last name of the person. The last name shall always be sent if PV1.7 is sent in the message.

**PV1.7.3 - Given Name (ST) - Required or Empty**

This component contains the first name of the person.

**PV1.7.4 - Middle Name or Initial (ST) - Required or Empty**

This component contains the middle name or initial of the person.

**PV1.7.5 – Suffix (ST) – Required or Empty**

This component contains any name suffix such as "junior" or "third". It does not include educational degrees.

**PV1.7.9 - Assigning Authority (HD) - Conditional**

This component provides information regarding the Authority that assigned the attending doctor's ID number (PV1.7.1). The Assigning Authority is encoded as a hierarchical designator (HD) element. The use of the HD data type in this instance conforms to the more usual format in which HD.1 or HD.2 and .3 may be used to convey the assigning authority identification. In the NAHLN OIDs are used for assigning authority IDs, thus HD.2 and .3 will always be used. The assigning authority for the responsible diagnostician will essentially always be the laboratory. This should be the lab's OID or a leaf off of the lab's OID specific to the system that assigns the diagnostician's ID.

**Condition:** This field must be valued if PV1.7.1 is valued.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	999	ST	R		Universal ID	OID for the organization that assigned the person's ID.
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This component is defaulted to ISO.

**PV1.19 - Visit Number (CX) - Required**

The visit number field will be used to hold the Laboratory Accession Number and its corresponding Assigning Authority. The laboratory's assigned Accession Number is provided in the first component of the CX data type, CX.1. The Accession Number becomes globally unique when combined with the identifier of the assigning laboratory supplied in CX.4 (Assigning Authority). For each lab, this will be a constant value of the laboratory's OID or a leaf off of the lab's OID for accession numbers.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	R		ID Number	Accession number assigned by the sending facility.
4	227	HD	R	0363	Assigning Authority	This is the universal ID of the sending facility. The value shall be the ISO OID for the sending facility.

An example of the PV1.19 (Visit number) XML is shown below:

```

<PV1.19>
  <CX.1>D0800675</CX.1>                                <!--Example Accession Number-->
  <CX.4>
    <HD.2>2.16.840.1.113883.3.5.1.2</HD.2> <!--Example Lab OID as assigning authority-->
    <HD.3>ISO</HD.3>
  </CX.4>
</PV1.19>
    
```

**PV1.19.1 – ID (ST) - Required**

This component contains the Accession Number assigned by sending laboratory.

**PV1.19.4 - Assigning Authority (HD) - Required**

This component provides information regarding the authority that assigned the Accession Number (in this case the Laboratory). The Assigning Authority is encoded as a hierarchical designator (HD) element. For testing laboratories, component 2 may be defaulted to the organization's root OID and component 3 to "ISO".

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	999	ST	R		Universal ID	OID for the organization that assigned the Visit Number.
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

**Visit Observation/Result Segment (OBX) *DEPRECATED AS REASON FOR TESTS***

This segment represents a set of observations related to the Accession. It was formerly used to carry the reason for the visit. It can be used to carry related clinical observations, etc., by agreement between the parties sending and receiving.

*Note: The Reason for Submission (Visit) information that was formerly sent as an Observation on the Visit is now to be sent in each OBR.31 as part of the individual orders that make up the accession.*

**Role Segment (ROL)**

More recent HL7 standards such as Fast Healthcare Information Resources (FHIR) introduce the concept of "slicing" to standard profiles. Slices impose different requirements on the same resource (segment) depending on its specific usage. The various uses of the ROL segment in the NAHLN Result Message can be thought of as slices. The v2.xml schema and schema validation do not allow the schema to enforce these use-specific requirements. They should be spelled out in any program-specific guides that depend on them.

The role segment represents:

- a) the person(s) or organization submitting the laboratory request,
- b) the premises from where the specimens submitted originated and
- c) other interested parties (not currently supported by the NAHLN repository).

The roles recognized by NAHLN are provided by the NAHLN Terminology Services (See ROL.3). The ROL segment is repeatable and hence can represent any or all of the roles associated with the submission. The ROL segment is not required by the schema however only rarely is a premises ROL with a minimum of source state required. In the case of the PREM role the minimum information required is the source state (ROL.11/XAD.4). For other roles more complete contact information is required.

**NAHLN Supported Fields for the ROL Segment**

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
1	60	EI	RE			Role Instance ID
2	2	ID	R		0287	Action Code

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	250	CWE	R		0443	Role-ROL
4	250	XCN	R			Role Person
11	250	XAD	RE			Office/Home Address
12	250	XTN	RE	Y		Phone
13	1230	PL	CE			Person or Premises Location

The following is an example ROL segment:

```

<ROL>
  <ROL.1>
    <EI.1>232345</EI.1>          <!--Example Role instance ID-->
    <EI.3>2.16.840.1.113883.3.5.6.2</EI.3> <!--Example OID for Role Instance assigning
authority-->
    <EI.4>ISO</EI.4>
  </ROL.1>
  <ROL.2>UC</ROL.2>             <!--Default Role Action Code-->
  <ROL.3>
    <CWE.1>SUB</CWE.1>         <!--Example Role Code-->
    <CWE.2>Submitter</CWE.2>   <!--Example Role Description-->
    <CWE.3>HL70443</CWE.3>     <!--HL7 User Defined Table ID-->
  </ROL.3>
  <ROL.4>
    <XCN.1>GIB001</XCN.1>      <!--Example Role Person Identifier-->
    <XCN.2>
      <FN.1>Gibson</FN.1>      <!--Example Role Person Last Name-->
    </XCN.2>
    <XCN.3>Henry</XCN.3>       <!--Example Role Person First Name-->
    <XCN.4>T.</XCN.4>          <!--Example Role Person Middle Initial-->
    <XCN.5>Jr.</XCN.5>        <!--Example Role Person Name Suffix-->
    <XCN.9>
      <HD.2>2.16.840.1.113883.3.5.1.2.2</HD.2> <!--Example Person ID assigning Authority-->
      <HD.3>ISO</HD.3>
    </XCN.9>
  </ROL.4>
  <ROL.11>
    <XAD.1>
      <SAD.1>1234 Elm Street</SAD.1> <!--Example Role Person Street Address-->
    </XAD.1>
    <XAD.3>Anytown</XAD.3>     <!--Example Role Person City-->
    <XAD.4>CA</XAD.4>         <!--Example Role Person State-->
    <XAD.5>99999-9999</XAD.5> <!--Example Role Person Zipcode-->
  </ROL.11>
  <ROL.12>
    <XTN.2>WPN</XTN.2>        <!--Example Role Person Phone Use Code-->
    <XTN.3>PH</XTN.3>         <!--Role Person Phone Equipment Type Code-->
    <XTN.6>888</XTN.6>        <!--Example Area Code-->
    <XTN.7>5552323</XTN.7>    <!--Example Phone Number-->
    <XTN.8>4232</XTN.8>      <!--Example Phone Number Extension-->
  </ROL.12>
</ROL>

```

An example of the ROL segment being used to represent a premises is included in the example message (Appendix B)

## ROL.1 - Role Instance ID (EI) - Required or Empty

This field represents the ID of the person in this role. So if the role were gym member, it would be the person's membership card number, *not* their driver's license or ssn. Those go into the ROL.4 field as *person* identifiers. This is likely to be a very seldom used field.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Identifier assigned by the organization/entity. For the NAHLN this is the identifier that indicates this person is authorized in the stated role.
3	199	ST	R		Universal ID	The code system from which the namespace id originates. This is usually the OID assigned for the name of the code system or the program.
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID).

## ROL.2 - Action Code (ID) - Required

ROL.2 is a required field in HL7 version 2.6. Since NAHLN result messages are not being used to add or update Role information, this field value may be defaulted to UC (Unchanged).

Example:

```
<ROL.2>UC</ROL.2>
```

## ROL.3 - Role-ROL (CNE) - Required

The Role-ROL field is a coded entry that contains the functional designation for the role that is being sent. For NAHLN result messaging, if the ROL segment is sent, at least one segment with the role of Premises of origin (PREM) is required. Additional codes (e.g. Submitter, Collector, or Referring Laboratory) may be found at the NAHLN Terminology Services:

ROL.3 is a required field when the segment is sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	Identifier for the type of role.
2	199	ST	RE		Text	Text describing the role type.
3	20	ID	R	0396	Name of Coding System	In this instance, HL70443 or L.

Example:

```
<ROL.3>
  <CWE.1>SUB</CWE.1>
  <CWE.2>Submitter</CWE.2>
  <CWE.3>HL70443</CWE.3>
</ROL.3>
```

**USER Table 0443**

PREM	Source Premises
SUB	Submitting Party
COL	Specimen Collector
LAB	Referring Laboratory
DIST	Additional Report Distribution
PAY	Additional Payor Information
AT	Attending Veterinarian
PAR	Parent Company

**ROL.4 - Role Person (XCN) - Required**

This field contains identifying information about the party (person or organization) filling this role. It may contain the name of the party along with an ID and corresponding Assigning Authority. Only a single name assigned to a given role may be included however for some roles there may be multiple ROL segments of the same type. This would mainly apply to DIST or PAY. NOTE: For the PREM role, there is no "person" involved. The NAHLN has pre-adopted the concept from later versions of HL7 of participant that can be a person or other entity such as a farm. To comply with the 2.6 schema when no actual person is involved, the ROL.4 can consist of only the XCN.1/FN.1 component with a "flavor of null" ideally "NA".

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	RE		ID Number	ID Number for the person with this role, as assigned by the organization represented by the universal ID of the assigning authority.
2	194	FN	R		Family Name	Last name of person.
3	30	ST	RE		Given Name	First name of person.
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial of the person
5	20	ST	RE		Suffix (e.g., JR or III)	Additional suffix for name (e.g. Jr., III)
9	227	HD	C	0363	Assigning Authority	Authority that assigned that Role's ID number.  <b>Conditionality:</b> This component must be valued if the ID is provided.

An example of the ROL.4 (Role Person) XML is provided below:

```

<ROL.4>
  <XCN.1>GTB001</XCN.1>
  <XCN.2>
    <FN.1>Gibson</FN.1>
  </XCN.2>
  <XCN.3>Henry</XCN.3>
  <XCN.4>T.</XCN.4>
  <XCN.5>Jr.</XCN.5>
  <XCN.9>
    <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
    <HD.3>ISO</HD.3>
  </XCN.9>
</ROL.4>
    
```

**ROL.4.1 ID – Number (ST) - Required or Empty**

This component contains the Identifier that can be used to identify this person. This component may be left out of the message if the data are not available,

**ROL.4.2 – Family Name (FN) - Required**

The Family Name component holds the last name of the person. This component shall be populated whenever the ROL segment is sent.

**ROL.4.2.1 – surname - Required**

This sub-component contains the last name of the person. It must be valued if the ROL segment is sent. If the name is not available, then the value “Not Provided” shall be sent if the role is filled by a person or “NA” in the case of a premises role.

**ROL.4.3 - Given Name – Required or Empty**

This component contains the first name of the person. This component may be left out of the message if the data are not available,

**ROL.4.4 - Middle Name – Required or Empty**

This component contains the middle name of the person. This component may be left out of the message if the data are not available,

**ROL.4.5 - Name Suffix – Required or Empty**

This component contains the any string that is placed after the name of the person. This component may be left out of the message if the data are not available,

**ROL.4.9 - Assigning Authority (HD) - Conditional**

This component uniquely identifies the Authority that assigned that person's Identifier (ROL.4.1). The Assigning Authority is encoded as a hierarchical designator (HD) element. This component may be left out of the message if ROL.4.1 is not valued,

**Condition:** A value for Assigning Authority shall be sent if ROL.4.1 is valued.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	999	ST	R		Universal ID	OID for the organization that assigned the person's ID.



SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
3	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. For OIDs this defaults to ISO

## ROL.11 - Office/Home Address (XAD) - Required or Empty

This field contains the address for person or premises in the role.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	184	SAD	RE		Street Address	Fully qualified street name. I.e., 123 Magnolia Street
2	120	ST	RE		Other Designation	An additional address qualifier. E.g. Suite 111
3	50	ST	RE		City	City
4	50	ST	RE		State or Province	State
5	12	ST	RE		Zip or Postal Code	Zip Code
8	50	ST	RE		Other Geographic Designation	This field may carry spatial attributes such as latitude and longitude

Example:

```
<ROL.11>
  <XAD.1>
    <SAD.1>1234 Elm Street</SAD.1>
    <SAD.3>Apt 2A</SAD.3>
  </XAD.1>
  <XAD.2>Suite 111</XAD.2>
  <XAD.3>Anytown</XAD.3>
  <XAD.4>CA</XAD.4>
  <XAD.5>99999-9999</XAD.5>
</ROL.11>
```

### ROL.11.1 Street Address (SAD) – Required or Empty

This field contains the street address and dwelling number for the person or organization represented in this ROL segment. For NAHLN usage component 2 is ignored and only components 1 and 3 are supported. If the address does not contain an apartment or dwelling number, component 3 may be left out of the message. It is acceptable, if not preferable, to put the entire delivery street address in SAD.1 rather than splitting apartment number off into SAD.3. NOTE: Within XAD.1 SAD.1 is Required. If no Street Address exists, the entire XAD.1 may be omitted but not just SAD.1.

#### ROL.11.1.1 Street or Mailing Address (ST) – Required

This component contains the street number and name of the address. It must contain sufficient information to allow geocoding of physical addresses or delivery to PO boxes.

**ROL.11.1.3 Dwelling Number (ST) – Required or Empty**

This component contains additional address designations such as apartment number.

**ROL.11.2 Other Designation (ST) – Required or Empty**

This component contains the second line of address. In US usage, it qualifies address. For example: Fourth Floor. It includes only information *not* needed for geocoding of addresses.

**ROL.11.3 City (ST) – Required or Empty**

This component contains the city of residence associated with the address.

**ROL.11.4 State or Province (ST) – Required**

This component contains the state associated with the address. For the NAHLN the two-letter state codes will be used.

**ROL.11.5 Zip or Postal Code (ST) – Required or Empty**

This component contains the official zip or postal code associated with the address. A minimum of the 5-digit zip code is required.

**ROL.11.8 Other Geographic Designation (ST) – Required or Empty**

This component may contain the GPS or other geographic coordinates associated with the address.

**ROL.11.9 County/Parish Code (IS) – Required or Empty**

A code that represents the county in which the specified address resides.

Allowable code values: codes defined by government (such as FIPS codes <http://www.census.gov/geo/www/fips/fips.html>).

**ROL.12 - Phone (XTN) - Required or Empty**

This component provides the telecommunications contact information for the person or organization in the role. It is repeatable, which means that multiple contact phone numbers or email addresses can be provided for a particular role.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	3	ID	R	0201	Telecommunication Use Code	
3	8	ID	R	0202	Telecommunication Equipment Type	
4	199	ST	RE		Communication Address	
6	5	NM	C		Area/City Code	
7	9	NM	C		Local Number	
8	5	NM	CE		Extension	
9	199	ST	O		Any Text	
10	4	ST	O		Extension Prefix	

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
11	6	ST	O		Speed Dial Code	
12	199	ST	C		Unformatted Telephone number	

An example of ROL.12 (Work Phone):

```
<ROL.12>
  <XTN.2>WPN</XTN.2>
  <XTN.3>PH</XTN.3>
  <XTN.6>888</XTN.6>
  <XTN.7>5552323</XTN.7>
  <XTN.8>4232</XTN.8>
</ROL.12>
```

An example of ROL.12 (Email address):

```
<ROL.12>
  <XTN.2>NET</XTN.2>
  <XTN.3>Internet</XTN.3>
  <XTN.4>hgibson@chickenvet.com</XTN.4>
</ROL.12>
```

**HL7 Table 0201**

ASN	Answering Service Number
BPN	Beeper Number
EMR	Emergency Number
NET	Network (email) Address
ORN	Other Residence Number
PRN	Primary Residence Number
VHN	Vacation Home Number
WPN	Work Number

**HL7 Table 0202**

BP	Beeper
CP	Cellular Phone
FX	Fax
Internet	Internet Address: Use Only If Telecommunication Use Code Is NET
MD	Modem
PH	Telephone
TDD	Telecommunications Device for the Deaf
TTY	Teletypewriter
X.400	X.400 email address: Use Only If Telecommunication Use Code Is NET

### ROL.13 - Person's Location (PL) - Conditional or Empty

This field is used to specify Premises ID or Non-Producer Participant ID for facilities for this role. If ROL.3 has a value indicating it to be the premises (PREM) from which the animal or specimens originated, then this field should be valued.

**Condition:** This field must be valued if ROL.3 is PREM.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
6	20	IS	RE	0305	Person Location Type	The type of location represented by the Role.
9	199	ST	O		Location Description	String description of a location – human readable
10	427	EI	RE		Comprehensive Location Identifier	Location identifier, as assigned by the organization represented by the universal ID.

An example of ROL.13 (Person Location):

```
<ROL.13>
  <PL.6>P</PL.6>
  <PL.9>Second to the last farm on the road</PL.9>
  <PL.10>
    <EI.1>000UDC0</EI.1>
    <EI.3>2.16.840.1.113883.3.5.6.1.1</EI.3>
    <EI.4>ISO</EI.4>
  </PL.10>
</ROL.13>
```

#### ROL.13.6 Person Location Type (IS) – Required or Empty

This field represents the type of **premises** represented in the ROL segment. This is an adaptation of the use of the field as described in the HL7 standard, where the ROL segment is typically used only for persons. The value set is based on the operation type codes described in the USDA National Animal Disease Traceability Program Standards and Technical Reference (<http://www.aphis.usda.gov/traceability>)<sup>10</sup>

**HL7 User Defined Table 0305**

CODE	Description
B	Port of Entry
C	Clinic
E	Exhibition
L	Laboratory
M	Market/Collection Point
N	Non-producer participants
O	Boarding Facility
P	Production Unit
Q	Quarantine Facility

<sup>10</sup> We cannot locate current reference to this list. We will update when available. Previous draft available at: <https://www.aphis.usda.gov/traceability/downloads/archives/nais-descriptive-document-program-standards.pdf>

R	Rendering
S	Slaughter Plant
T	Tagging Site

### ROL.13.9 Location Description (ST) – Required or Empty

This field contains a text-based description of the location. For the purposes of the NAHLN, this description may be used to annotate the location description. For related applications it is a convenient place for human-readable further classification of the source premises.

### ROL.13.10 Comprehensive Location Identifier (EI) – Required or Empty

This field contains the unique identifier for the location. For the purposes of the NAHLN, this identifier is the Animal Disease Traceability Program Premises ID or Location ID. The assigning authority for the identifier is listed in component 3.<sup>11</sup>

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Identifier assigned by the organization/entity. For the NAHLN this is the Premises ID
3	199	ST	R		Universal ID	The code system from which the namespace id originates. This is usually the OID assigned for the name of the code system or the program.
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID).

## ACCESSION DETAIL SEGMENT GROUP

The ACCESSION\_DETAIL group (OPU\_R25.ACCESSION\_DETAIL) contains information relevant to the accession, including information on the Owner, Animal, Specimen, Order, and Results. The ACCESSION\_DETAIL group is required and repeatable. The ACCESSION\_DETAIL group XML start tag is provided below:

```
<OPU_R25.ACCESSION_DETAIL>
```

### Next of Kin/Associated Parties Segment (NK1)

Every group in HL7 must start with a required segment. The Next of Kin segment holds this place in the accession detail group of the NAHLN result message.

The Next of Kin segment (NK1) provides owner or responsible party information for the patient and/or specimen. A responsible party or owner always exists, even if the information is not provided to the sending laboratory; however, there won't necessarily be an animal associated with the specimen (as in the case of environmental

<sup>11</sup> In the case of LIDs, the "assigning authority" is still the ADT program because it controls the uniqueness of issued LIDs through its standards even though it is the states actually assigning the numbers.

specimens). "Owner" in this usage is the person with primary responsibility for the animal(s), herd, or premises that is the focus of the testing. While this segment may repeat in the standard, it is constrained to one in the NAHLN usage. Only the primary contact person should be placed in this segment. Other interested or related parties should be communicated using ROL segments.

#### NAHLN Supported Fields for the NK1 Segment

SEQ	LEN	DT	OPT	R P/#	TBL#	ITEM#	ELEMENT NAME
1	4	SI	R			00190	Set ID - NK1
2	250	XPN	CE		0200	00191	Name
3	705	CWE	C		0063	00192	Relationship
4	250	XAD	O			00193	Address
5	250	XTN	O	Y		00194	Phone Number
6	250	XTN	O	Y		00195	Business Phone Number
13	250	XON	C			00202	Organization Name - NK1
20	705	CWE	O		0296	00118	Primary Language

Below are two examples of the NAHLN constrained NK1 segment:

The first example is when no owner or responsible party is known or sent. The segment is required by the standard as a marker for the start of the group if the message is sent in the old pipe-delimited form. So we send a minimum here:

```
<NK1>
  <NK1.1>1</NK1.1>
</NK1>
```

The second example is a very complete set of information about the owner. Most instances will be something in between in terms of completeness.

```
<NK1>
  <NK1.1>1</NK1.1>
  <NK1.2>
    <XPN.1>
      <FN.1>Smith</FN.1>
    </XPN.1>
    <XPN.2>John</XPN.2>
    <XPN.3>Q.</XPN.3>
    <XPN.4>Jr.</XPN.4>
  </NK1.2>
  <NK1.3>
    <CWE.1>OWN</CWE.1>
    <CWE.2>Owner</CWE.2>
    <CWE.3>HL70063</CWE.3>
  </NK1.3>
  <NK1.4>
    <XAD.1>
      <SAD.1>348735 Laguna P1.</SAD.1>
    </XAD.1>
    <XAD.3>Agtown</XAD.3>
    <XAD.4>CA</XAD.4>
    <XAD.5>95999</XAD.5>
  </NK1.4>
  <NK1.5>
    <XTN.2>PRN</XTN.2>
    <XTN.3>PH</XTN.3>
```

```

    <XTN.6>555</XTN.6>
    <XTN.7>4444444</XTN.7>
  </NK1.5>
  <NK1.6>
    <XTN.2>WPN</XTN.2>
    <XTN.3>PH</XTN.3>
    <XTN.6>555</XTN.6>
    <XTN.7>3333333</XTN.7>
  </NK1.6>
  <NK1.13>
    <XON.1>Fred's Free Range Feasants</XON.1>
  </NK1.13>
  <NK1.20>
    <CWE.1>Eng</CWE.1>
    <CWE.2>English</CWE.2>
    <CWE.3>ISO639</CWE.3>
  </NK1.20>
</NK1>

```

### NK1.1 Set ID - NK1 (SI) - Required

This field is required for HL7 conformance and should be defaulted to 1. In messages with multiple ACCESSION DETAIL groups, this can be used to enumerate the groups by incrementing in each successive NK1. In this usage, it is functioning as the Set ID for the group. This usage is optional and should not be relied upon by receiving systems.

### NK1.2 - Name (XPN) - Conditional or Empty

This field contains the first name, last name, middle initial and suffix of the related party. It is a constrained version of the full XPN data type, which provides additional information about the name type, name validity dates and other administrative attributes of name. For the purposes of the NAHLN, only the first four components of the field are supported. Use is required if further elements are to be included.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	194	FN	R		Family Name	Surname or last name
2	30	ST	RE		Given Name	First name
3	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial
4	20	ST	RE		Suffix (e.g., JR or III)	

#### NK1.2.1 Family Name (FN) Required

This component allows full specification of the surname of the person using the FN complex data type. For the purposes of the NAHLN only the first subcomponent of the data type is required.

##### NK1.2.1.1 Surname (ST) Required

This subcomponent represents the last name of the person.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	50	ST	R		Surname	

### NK1.2.2 Given Name (ST) Required or Empty

First name of person.

### NK1.2.3 Second and Further Given Names or Initials Thereof (ST) Required or Empty

Multiple middle names of the person may be included by separating them with spaces.

### NK1.2.4 Suffix (ST) Required or Empty

Used to specify a name suffix (e.g., Jr. or III) for the person.

## NK1.3 - Relationship (CNE) - Conditional

This field is required to indicate the nature of the relationship between the primary responsible person and the animal(s) or location being tested. Values come from HL7 USER table 0063 as restricted and extended by NAHLN. Its use is required if other elements of NK1 beyond SetID are supplied.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	Code representing the type of relationship (e.g. OWN for owner)
2	199	ST	RE		Text	Text description from table
3	20	ID	R	0396	Name of Coding System	HL7 User defined table HL70063

Example:

```
<NK1.3>
  <CWE.1>OWN</CWE.1>
  <CWE.2>Owner</CWE.2>
  <CWE.3>HL70063</CWE.3>
</NK1.3>
```

### HL7 Table 0063 (limited to NAHLN usage)

ASC	Associate
EMC	Emergency contact
GRD	Guardian
MGR	Manager
OWN	Owner
TRA	Trainer
UNK	Unknown



### NK1.4 - Address (XAD) - Optional

This field contains the address for the responsible party. See discussion of XAD components under ROL.11.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	184	SAD	R		Street Address	Street name, suite number, apt. number
2	120	ST	RE		Other Designation	An additional address qualifier. E.g. Suite 111
3	50	ST	RE		City	City
4	50	ST	RE		State or Province	2 letter state code
5	12	ST	RE		Zip or Postal Code	Zip code
8	50	ST	RE		Other Geographic Designation	This field may carry spatial attributes such as latitude and longitude or PIN
9	20	IS	RE	0289	County/Parish Code	The local jurisdiction at the county level.

Example:

```
<NK1.4>
  <XAD.1>
    <SAD.1>348735 Laguna P1.</SAD.1>
  </XAD.1>
  <XAD.3>Agtown</XAD.3>
  <XAD.4>CA</XAD.4>
  <XAD.5>95999</XAD.5>
</NK1.4>
```

### NK1.5 - Phone Number (XTN) - Optional

Phone Number and/or email address for the related party. This element can repeat to send multiple phone numbers.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	3	ID	R	0201	Telecommunication Use Code	A code that represents a specific use of a telecommunication number
3	8	ID	R	0202	Telecommunication Equipment Type	A code that represents the type of telecommunication equipment
4	199	ST	C		Communication Address	Email address
6	5	NM	C		Area/City Code	Area code
7	9	NM	C		Local Number	Phone number

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
8	5	NM	CE		Extension	Extension
12	199	ST	C		Unformatted Telephone number	An expression of the telephone number as an unparsed string

Example:

```
<NK1.5>
  <XTN.2>PRN</XTN.2>
  <XTN.3>PH</XTN.3>
  <XTN.6>555</XTN.6>
  <XTN.7>4444444</XTN.7>
</NK1.5>
```

### NK1.6 - Business Phone Number (XTN) - Optional

Business Phone Number and email address for the related party. This element can repeat to send multiple phone numbers.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	3	ID	R	0201	Telecommunication Use Code	A code that represents a specific use of a telecommunication number
3	8	ID	R	0202	Telecommunication Equipment Type	A code that represents the type of telecommunication equipment
4	199	ST	C		Communication Address	Email address
6	5	NM	C		Area/City Code	Area code
7	9	NM	C		Local Number	Phone number
8	5	NM	CE		Extension	Extension
12	199	ST	C		Unformatted Telephone number	An expression of the telephone number as an unparsed string

Example business phone number:

```
<NK1.6>
  <XTN.2>WPN</XTN.2>
  <XTN.3>PH</XTN.3>
  <XTN.6>555</XTN.6>
  <XTN.7>3333333</XTN.7>
</NK1.6>
```

Example business email:

```

<NK1.6>
  <XTN.2>NET</XTN.2>
  <XTN.3>Internet</XTN.3>
  <XTN.4>jsmith@busyness.com</XTN.4>
</NK1.6>

```

### NK1.13 - Organization Name (XON) - Conditional

Organization name in for owners or other responsible parties that are, or represent, an organization. If a person name is not supplied in NK1.2, then this field shall be valued. Only the first component of the data type is supported in the NAHLN and must be valued if the Organization Name is supplied.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	50	ST	R		Organization Name	The name of the organization associated with the person named in this segment.

Example:

```

<NK1.13>
  <XON.1>Fred's Free Range Pheasants</XON.1>
</NK1.13>

```

### NK1.20 - Primary Language (CWE) - Optional

This field captures the primary language spoken by the responsible party. The code system used for this field is the ISO 639 language codes. Please note that the HL7 table used for this component is user defined table 0296 which is populated by the ISO 639 table. Either two- or three-letter codes may be sent. The full language reference table is available from the NAHLN central terminology services. If the first three components are not valued, component 9, original text must be valued if this field is sent. Original text may be included as a cross check for the assigned code as well.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Code for language
2	199	ST	RE		Text	Textual from table
3	20	ID	RE	0396	Name of Coding System	Languages will be drawn from the ISO639 standard. Default value will be LISO639.
4	20	ST	CE		Alternate Identifier	Local code or other alternative language code
5	199	ST	CE		Alternate Text	Textual description of the language
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Text used to assign the code

Example:

```
<NK1.20>
  <CWE.1>Eng</CWE.1>
  <CWE.2>English</CWE.2>
  <CWE.3>LISO639</CWE.3>
</NK1.20>
```

Below is a highly abridged subset of the ISO 639 language codes:

ISO 639: 3-letter codes	ISO 639: 2-letter codes	Description
Ara	ar	Arabic
Arc		Aramaic
Arm/hye	hy	Armenian
art		Artificial (Other)
Aze	az	Azerbaijani
Baq/eus	eu	Basque
Bul	bg	Bulgarian
Cai		Central American Indian (Other)
Chi/zh	zh	Chinese
Dut/nla	nl	Dutch
Eng	en	English
Epo	eo	Esperanto
fra/fre	fr	French
Deu/ger	de	German
Heb	he	Hebrew
Ice/isl	is	Icelandic
Ind	id	Indonesian
ira		Iranian (Other)
ita	it	Italian
Jpn	ja	Japanese
Kor	ko	Korean
may/msa	ms	Malay
mul		Multiple languages
Nor	no	Norwegian
Nno		Norwegian (Nynorsk)
Fas/per	fa	Persian
Pol	pl	Polish
Por	pt	Portuguese
Rus	ru	Russian
San	sa	Sanskrit
	sr	Serbian
Som	so	Somali
esl/spa	es	Spanish
Tha	th	Thai
Ukr	uk	Ukrainian
Yid	yi	Yiddish
Zul	zu	Zulu

## PATIENT GROUP

The PATIENT group (OPU\_R25.PATIENT) contains information about an individual animal or a population of animals that are the subject of the observation(s) that immediately follow in the message. The PATIENT group is conditional. If the specimens submitted are not associated with an animal, the Patient group is not sent. It is not repeatable within an accession detail group, although ACCESSION\_DETAIL may repeat. If the PATIENT group is included in the message, the PID segment is Required. Only one animal or animal group shall be sent per accession detail. The general structure of the patient group is described below:

```
[    --- PATIENT begin
        PID - Patient
    [{    --- PATIENT_OBSERVATION begin
            OBX - Observations on Patient
        }]    --- PATIENT_OBSERVATION end
    ]    --- PATIENT end
```

PATIENT groups contain a single PID segment something like that shown here.

Example PID:

```
<PID>
  <PID.3>
    <CX.1>Y_1234</CX.1>          <!--Example Animal ID-->
  </PID.3>
  <PID.5>
    <XPN.1><FN.1>NA</FN.1></XPN.1>
  </PID.5>
  <PID.7>200804</PID.7>          <!--Example Date/Time of Birth-->
  <PID.8>X</PID.8>              <!--Example Gender-->
  <PID.10>
    <CWE.9>white</CWE.9>        <!--Example Color-->
  </PID.10>
  <PID.29>20080814</PID.29>     <!--Example Date/Time of Death-->
  <PID.30>Y</PID.30>           <!--Example Death Indicator-->
  <PID.35>
    <CWE.1>35839008</CWE.1>     <!--Example Species SNOMED Code-->
    <CWE.2>Leghorn chicken </CWE.2> <!--Example SNOMED Preferred Term-->
    <CWE.3>SCT</CWE.3>         <!--Term drawn from SNOMED-CT Code System-->
    <CWE.4>CHI</CWE.4>         <!--Example alternate code-->
    <CWE.5>Chicken</CWE.5>     <!--Example Alternate Description-->
    <CWE.6>NAIS</CWE.6>       <!--Example Code system for Alternate Code-->
  </PID.35>
  <PID.38>
    <CWE.1>LY</CWE.1>          <!--Example Production Class Code-->
    <CWE.2>Layer</CWE.2>      <!--Example Production Class Description-->
    <CWE.3>HL70429</CWE.3>   <!--Production Class code table ID-->
  </PID.38>
</PID>
```

## Patient Identification Segment (PID)

The patient identification segment is used to identify the animal or population source for the specimen for which the results are being reported. Whenever the results reported relate to a specific animal or group, the patient group and PID segment shall be included. The PID contains information relevant to the animal or group so that each field in the PID is interpreted as relating to that unit. For a herd or flock, the Patient Identifier List (PID.3) may contain the ADT Group Identification Number (GIN) or other herd or flock ID. Data such as species, and date of birth may be transmitted using this segment. For animal groups, each field is filled in with as much specificity as appropriate to represent the group as a whole.

The PID segment is not repeatable. It is required within the Patient group.

### NAHLN Supported Fields for the PID Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	250	CX	R	Y		Patient Identifier List
5	250	XPN	R	Y	0200	Patient Name
7	24	DTM	RE			Date/Time of Birth
8	1	IS	RE		0001	Administrative Sex
10	705	CWE	O	Y	0005	Race
11	250	XAD	O			Patient Address
29	24	DTM	CE			Patient Death Date and Time
30	1	ID	R		0136	Patient Death Indicator
31	1	ID	C		0136	Identity Unknown Indicator
35	705	CWE	R		0446	Species Code
37	80	ST	O			Strain
38	705	CWE	R	2	0429	Production Class Code

### PID.3 - Patient Identifier List (CX) - Required

The patient identifier list is a required and repeatable CX (Extended composite ID) field. In NAHLN usage this shall contain either an identifier for an individual animal or an identifier of the group (herd/flock).

If this message pertains to a specific individual animal, the animal's identifier goes here. Any number of identifier systems is acceptable. Refer to the Animal Disease Traceability Program. In general, the most universal identifier available should be the first (or only) identifier.<sup>12</sup> The identifier system is identified in the "Assigning Authority" component. If more than one identifier is provided, each instance refers to the *same* patient or population. It is *not* a list of different patients. If a population is being identified, a herd/flock identifier should be used. Similarly, if this message deals with a group of animals, the appropriate group identifier should be provided rather than a list of individual animal identifiers.

Note: Some surveillance programs do not identify individual animals but simply track specimens on a one-to-one basis with animals. In these cases, the best identifier for the animal will be the specimen ID itself which should be used here. This usage applies *only* if no actual animal or group identifiers are available.

<sup>12</sup> Technically, the order of repeats is meaningless in HL7, however putting the most generally accepted ID first is a useful convention.

The animal ID messaged should be:

1. The official animal identification number and designated as the preferred identifier (placed first in the PID.3 listing)
2. The herd/flock/pen ID if the specimen was pooled from a group of animals.
3. The official program barcode specimen ID if provided without other animal identification.
4. "Not Provided" if unknown
5. "MASK" if the ID is withheld for confidentiality

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	R		ID Number	Identification number/code for patient/subject. (either animal or group)
4	227	HD	R	0363	Assigning Authority	The Authority that assigns this subject's ID number.
5	5	ID	R	0203	Identifier Type Code	Type of identifier, such as Ear Tag, Implant, Back Tag, Official ID, Flock ID, etc.

An example of PID.3 is provided below:

```
<PID.3>
  <CX.1>840212000000023</CX.1>                <-- US Animal Identification Number -->
  <CX.4>
    <HD.2>2.16.840.1.113883.3.5.6.1.2</HD.2> <-- OID for ADT Animal ID system -->
    <HD.3>ISO</HD.3>
  </CX.4>
  <CX.5>E</CX.5>
</PID.3>
```

### **PID.3.1 – ID Number (ST) - Required**

This field contains the identifier for the animal or group. In combination with the assigning authority, it should allow for the unique identification of an animal or animal group. For the NAHLN, the preferred identifiers are the ADT Animal Identification Number (AIN) or the ADT Group/Lot Identification Number (GIN).

### **PID.3.4 - Patient Identifier Assigning Authority (HD) - Required or Empty**

An Assigning Authority component should be provided for any ID, if the information is available. Assigning authorities consist of a NamespaceID, Universal ID and Universal ID type. The Namespace ID should only be used if a Universal ID is not available, such as when the only ID available is a farm ID, etc. If the Universal ID is supplied (usually an OID), the Universal ID Type shall also be valued (this will normally be ISO). This field may be omitted if the source of the identifier is not provided.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	C	0300	Namespace ID	<b>Rarely used in this context.</b> If the entity that assigned the animal ID does not have an OID, but does have an ID assigned under a program such as the ADT program, such as a PIN or LID for farm tags, that ID goes here and the assigner of that ID in HD.2.
2	999	ST	C		Universal ID	OID for the organization that assigned the patient/subject ID. For example, the OID for an NAIS Individual Animal ID.  <b>Conditionality:</b> This field must be valued if a Namespace ID is not provided.
3	6	ID	C	0301	Universal ID Type	The identifier type of the universal ID. For the NAHLN, this should be ISO (ISO OID).  <b>Conditionality:</b> This field must be valued if a Universal ID is provided.

### PID.3.5 - Identifier Type Code (ID) - Required or Empty

This field contains a code representing the type of identifier valued in PID.3.1. The allowed values for this field component may only be drawn from the NAHLN supported values in HL7 table 0203. HL7 Table 0203 has been extended by the NAHLN to support animal specific identification types. This is allowed as long as local extensions do not conflict with existing codes in the table. The NAHLN supported values for this field may be accessed from:

<http://vtsl.vetmed.vt.edu/nahln/main.cfm>

In practice this field is seldom used.

### PID.5 - Patient Name (XPN) - Required

Patient Name is required by the standard if the PID segment is sent in the message. If real data are not available, you may send the term "Not Provided" as a flavor of null for this field. In something of a fluke of the way HL7 works, a full animal name would be provided in the FN.1 component.



Example:

```
<PID.5>
  <XPN.1>
    <FN.1>Not Provided</FN.1>
  </XPN.1>
</PID.5>
```

Example:

```
<PID.5>
  <XPN.1>
    <FN.1>Smar-tee Jones</FN.1>
  </XPN.1>
</PID.5>
```

### PID.7 - Date/Time of Birth (DTM) - Required or Empty

The patient’s Date/Time of birth is sent as a timestamp (DTM) data type using the ISO 8824-1987 format (YYYY[MM[DD[HH[MM[SS.S[S[S[S]]]]]]]]][+/-ZZZZ] Precision is indicated by the number of places included. The precision component is only included in the standard for backward compatibility. The minimum allowable value is year. This field is “Required or Empty” and should be provided if logically and clinically relevant to the results reported. For results from an individual patient this will be the date/time of birth to the precision known. For a homogeneous group specimen (all members of the group are the “same” age) it should contain a date with precision set to encompass the group, thus indicating the age range of the animals affected.

A date of birth example, to the day is shown below:

```
<PID.7>20080814</PID.7>
```

### PID.8 - Administrative Sex (IS) - Required or Empty

This field contains the gender code for the animal or all animals in the group represented if applicable. Gender codes used are from the NAIS. Use the codes defined in the user defined table 0001.

```
<PID.8>M</PID.8>
```

#### HL7 User defined Table 001 – Administrative Sex

F	Female
S	neutered female (spayed)
M	Male
C	neutered male (castrated)
U	gender unknown
X	Multiple genders

### PID.10 - Race (CWE) - Optional

This field is normally used to transmit the race or ethnicity of a person. For the NAHLN we have co-opted the field to convey the coloring and markings of the animal. A comprehensive standard table of markings and colors has not been developed so laboratories may send either local codes (components 4-6) or original text (component 9). This field may repeat

SEQ	LEN	DT	TBL#	OPT	Component NAME	Description
-----	-----	----	------	-----	----------------	-------------

SEQ	LEN	DT	TBL#	OPT	Component NAME	Description
1	20	ST		RE	Identifier	Code for color and/or markings
2	199	ST		RE	Text	Text description
3	20	ID		RE	Name of Coding System	There is no standard code for this field.
4	20	IS		CE	Alternate Identifier	Local code or other alternative color and/or markings code
5	199	ST		CE	Alternate Text	Textual description of the color or marking
6	20	ID	0396	CE	Name of Alternate Coding System	L for local code
9	199	ST		C	Original text	Text used to assign the code

### PID.11 - Patient Address (XAD) - Deprecated

It is generally preferred for this information to be communicated at the accession level via a PREM ROL segment.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	184	SAD	RE		Street Address	Fully qualified street name. I.e., 123 Magnolia Street
2	120	ST	RE		Other Designation	An additional address qualifier. E.g. Suite 111
3	50	ST	RE		City	City
4	50	ST	RE		State or Province	State
5	12	ST	RE		Zip or Postal Code	Zip Code
8	50	ST	RE		Other Geographic Designation	This field may carry spatial attributes such as latitude and longitude
9	20	IS	RE	0289	County/Parish Code	The local jurisdiction at the county level.

### PID.29 - Patient Death Date Time (DTM) - Conditional or Empty

This field contains the date of death for necropsy cases—except those on animal sacrificed for necropsy—or other cases where animal has died. It follows the same date time format as other date fields.

<PID.29>200812051025-0800</PID.29>

If PID.30 (Patient Death Indicator) is valued with a “Y” this field may be valued with the date/time of death if available. The minimal value for this field would include the date of death.

### PID.30 - Patient Death Indicator (ID) - Required or Empty

This is a simple Y/N to indicate death. Cases in which one or more animals are sacrificed for necropsy or sampling takes place at slaughter are *not* considered to be patient death. If PID.29 is valued, this field must be either populated with “Y” or not sent.

Example:

<PID.30>Y</PID.30>

### PID.31 - Identity Unknown Indicator (ID) - Conditional

This is a simple Y/N to indicate that the animal source of the specimen cannot be identified. This value shall be sent if the animal had no demonstrable identifiers associated with it (example, wild birds for AI surveillance)). This field adds the information that even the lab cannot identify the source animal or farm such as in anonymous test streams.

Example:

<PID.31>Y</PID.31>

### PID.35 - Species (CWE) - Required

This field contains the code value and description for an animal or animal group’s species. Species is sent as a CWE data type. The following table describes the usage of this field. Species is a Required field if the PID segment is sent. The coding system for the first identifier is to be SNOMED-CT.

In cases where the specific species is not known, the lowest level of taxonomy should be sent. For example, if specimens from a parrot species are submitted without more identifying information, the proper code to send would be: 28631000009108, Parrot.

Animal taxonomy codes can be found at

<http://vtsl.vetmed.vt.edu/nahtmln/main.cfm?page=subset&subset=species>

**NOTE:** The HL7 standard supports two fields to represent species and breeds in the result message. This structure was created to support the most common way existing veterinary LIMS capture taxonomy. However, in version 3 of HL7 it has been recognized that breed is a continuum with species in the taxonomic tree and only requires a single field to fully represent the taxonomy of an organism (this is currently the way SNOMED handles breeds as well). Thus for the purposes of the NAHLN, a laboratory must transmit animal taxonomy by putting the most granular taxonomy known in the species field, up to and including breed, but not strain. The second set of components (CWE.4-CWE.6) may be used if the taxonomy of the animal is not represented in the NAHLN reference tables for species or breed. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Taxonomy list contains an adequate representation of the Taxonomy then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	SNOMED-CT code for taxonomy
2	199	ST	RE		Text	Textual description of the taxonomy
3	20	ID	RE	0396	Name of Coding System	Always SCT for SNOMED
4	20	ST	CE		Alternate Identifier	Local code or other alternative taxonomy code (e.g.NAIS three character species code)
5	199	ST	CE		Alternate Text	Textual description of the species
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code or NAIS for NAIS Species codes
9	199	ST	C		Original Text	The original text string submitted on the form

Example:

```
<PID.35>
  <CWE.1>47290002</CWE.1>
  <CWE.2>Gallus gallus</CWE.2>
  <CWE.3>SCT</CWE.3>
  <CWE.4>CHI</CWE.4>
  <CWE.5>Chicken</CWE.5>
  <CWE.6>ADT</CWE.6>
  <CWE.9>wild chicken in backyard</CWE.9>
</PID.35>
```

Or more commonly

```
<PID.35>
  <CWE.1>47290002</CWE.1>
  <CWE.2>Gallus gallus</CWE.2>
  <CWE.3>SCT</CWE.3>
</PID.35>
```

\*(Note: Code used from SNOMED CT is the ConceptID, not the Legacy Code)

### PID.37 - Strain (ST) - Optional

The PID.37 is a free text field that allows additional taxonomic information (strain or variant) to be included.

Example:

```
<PID.37>DXL</PID.37>
```

### PID.38 - Production Class Code (CWE) - Required or Empty

Production class indicates the general category of use of the animal or group being tested. The production class is provided as a coded element (CWE) data field and is required or may be empty. The user-defined table 0429

contains the Production Class codes. The supported codes for the NAHLN may be downloaded from the NAHLN terminology site at: <http://vtsl.vetmed.vt.edu/nahln/>

The following table describes each component of the coded entry for Production Class.

The conditionality of this field is the same as that for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the production class of the animal is not represented in the NAHLN reference tables for breed. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Production Class list contains an adequate representation of the Production Class then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	HL7 code for Production Class
2	199	ST	RE		Text	Textual description of the Production Class
3	20	ID	RE	0396	Name of Coding System	In this case, field should be hard-coded to HL70429
4	20	ST	CE		Alternate Identifier	Local code or other alternative production class code
5	199	ST	CE		Alternate Text	Textual description of the production class
6	20	ID	CE	0396	Name of Alternate Coding System	L for local coding system
9	199	ST	C		Original Text	The original text string submitted on the form

Example:

```
<PID.38>
  <CWE.1>LY</CWE.1>
  <CWE.2>Layer</CWE.2>
  <CWE.3>HL70429</CWE.3>
</PID.38>
```

Production class codes can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=production\\_class](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=production_class)

**Program specific implementation note:**

**WS-AI Program:** The only accepted value for this field is "WI", wildlife.

## PATIENT\_OBSERVATION GROUP

The PATIENT\_OBSERVATION GROUP can be used to transmit additional information about the patient that is not properly coded into an element of the PID segment. Remember that we have defined "patient" as the animal or group of animals represented by the specimen(s) included. Thus, these observations are on that animal or group. Examples include age when estimated such that a birth date cannot be accurately assigned or any other attribute other than actual laboratory results. It is not proper to use this group for conveying medical history, but

in some cases the NAHLN may assign very specific observations on the patient that might be construed to be clinical history. If the patient segment represents a group, this observation must be the same for all members of the group. If two different values exist and the observation is important enough to transmit, the groups should be divided into two distinct Accession Details.

### Patient Observation/Result Segment (OBX)

This segment represents a set of observations related to the patient other than laboratory observations. Specific observations supported for each test type will be listed in the instructions for that testing program. Any other OBX segments sent at this level in the message will be ignored. This segment may repeat.

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	3	ID	R		0125	Value Type
3	705	CWE	R		9999	Observation Identifier
5	99999	varies	R	Y		Observation Value
6	705	CWE	C		Units	Units
11	1	ID	R		<b>0085</b>	Observation Result Status
14	24	DTM	RE		00582	Date/Time of Observation

The following are examples of PATIENT\_OBSERVATION groups:

```
<OPU_R25.PATIENT_OBSERVATION>
```

```
<OBX>
```

```
<OBX.2>ST</OBX.2>
```

```
<OBX.3>
```

```
<CWE.1>10164-2</CWE.1>
```

```
<CWE.2>History of present illness Narrative</CWE.2>
```

```
<CWE.3>LN</CWE.3>
```

```
</OBX.3>
```

```
<OBX.5>Flock has sudden increase in mortality </OBX.5>
```

```
<OBX.11>F</OBX.11>
```

```
</OBX>
```

```
</OPU_R25.PATIENT_OBSERVATION>
```

```
<OPU_R25.PATIENT_OBSERVATION>
```

```
<OBX>
```

```
<OBX.2>ST</OBX.2>
```

```
<OBX.3>
```

```
<CWE.1>46251-5</CWE.1>
```

```
<CWE.2>Age Group</CWE.2>
```

```
<CWE.3>LN</CWE.3>
```

```
</OBX.3>
```

```
<OBX.5>
```

```
<CWE.1>28911000009108</CWE.1>
```

```
<CWE.2>Suckling pig for meat production (organism)</CWE.2>
```

```
<CWE.3>SCT</CWE.3>
```

```
</OBX.5>
```

```
<OBX.11>F</OBX.11>
```

```
</OBX>
```

```
</OPU_R25.PATIENT_OBSERVATION>
```

## OBX.2 - Value Type (ID) - Required

This field contains the identifier of the HL7 data type contained in the Observation Value (OBX.5) field. These two fields (OBX.2 and OBX.5) combined allow for flexibility in reporting a range of different types of observations. The receiving application shall read this field in order to parse the OBX.5 value correctly. The data type will be determined by the NAHLN IT Core Committee for each patient observation type required.

## OBX.3 - Observation Identifier (CNE) - Required

Observation Identifier is a field of CNE data type that unambiguously identifies the specific observation represented by this segment. For the NAHLN, only LOINC codes approved by the NAHLN IT CORE COMMITTEE may be transmitted. The first component contains the LOINC code, the second contains the LOINC Short name for the code, and the third is the string "LN" to identify the coding system as LOINC. Only the first three components of the CNE data type are supported in the NAHLN message and all are required. This is an example where CNE encoding strength is sent as XML tag CWE.

SEQ	Component NAME	LEN	DT	TBL#	OPT	Description
1	Identifier	20	ST		R	The LOINC code of the specific observation. This code will be established by the NAHLN Technical Committee for each observation required for specific tests or programs supported
2	Text	199	ST		RE	LOINC Long Common Name
3	name of coding system	20	ID	0396	R	The coding system from which the observation identifier originated. The value for this field shall be LN.

Note: See instructions for specific disease testing program for values of patient observations required by that program.

## OBX.5 - Observation Value (VARIES) - Required

The Observation Value field will depend upon the type of observation being transmitted. This will be established on a test-by-test or program-by-program basis.

## OBX.6 - Units (CNE) - Conditional

This field represents the unit of value for the data entered in OBX.5, if needed. The OBX.6 is conditional field as any OBX segment with a value of NM in OBX.2 shall have units associated with it, but no other value for OBX.2 requires units. Units are to be supplied as a coded entry (CNE) data type. The default coding system consists of the ISO abbreviation for a single case unit (ISO 2955-83) plus extensions that do not collide with ISO abbreviations. We designate this coding system as ISO+.<sup>13</sup> The ISO+ abbreviations are the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations need to be sent. The

<sup>13</sup> Both the ISO unit's abbreviations and the extensions are defined in the HL7 standard Section 7.4.2.6.2, "ISO and ANSI customary units abbreviations." HL7 Messaging Standard Version 2.5, 2003

Uniform Code for Units of Measure (UCUM)<sup>14</sup> system of units is rapidly overtaking ISO+ and may at some point replace it in the NAHLN standard.

SEQ	Component NAME	LEN	DT	TBL#	OPT	Description
1	Identifier	20	ST		R	Units abbreviated in ISO or ANSI standard abbreviation or Uniform Code for Units of Measure (UCIM) code.
2	Text	199	ST		RE	Textual description
3	Name of Coding System	20	ID	0396	R	Either ISO for metric units or ANS+ for "English" units, or UCUM for more current units.

An example of OBX.6 is shown below:

```
<OBX.6>
  <CWE.1>G</CWE.1>
  <CWE.2>gram</CWE.2>
  <CWE.3>ISO</CWE.3>
</OBX.6>
```

### OBX.11 - Observation Result Status (ID) - Required

As the observation result is assigned at the time the accession is received this observation status is always a final observation. The value is fixed as "F."

### OBX-14 Date/Time of the Observation (DTM) - Required or Empty

This field represents the physiologically relevant date-time or the closest approximation to that date-time. In the case of observations about the patient such as categorical age, it is the date when that assessment was made or applies.

## SPECIMEN GROUP

The SPECIMEN group (OPU\_R25.SPECIMEN) is required and repeatable and contains a specimen, any observations directly on the specimen and all the orders and observations pertaining to it. It contains a required Specimen Segment (SPM) followed by a required ORDER group. One or more ORDER groups can be associated with a single specimen segment.

Specimen Group Abstract Message Structure

Segment	Description	HL7 Chapter
{	--- SPECIMEN begin	
SPM	Specimen	7
[{	--- SPECIMEN_OBSERVATION begin	

<sup>14</sup> <https://ucum.nlm.nih.gov/>



OBX	Observations on Specimen	
}}	--- SPECIMEN_OBSERVATION end	
{	--- ORDER begin	
OBR	Observation Order	7
ORC	Common Order	4
{	--- RESULT begin	
OBX	Observation Result	7
}	--- RESULT end	
}	--- ORDER end	
}	--- SPECIMEN end	

### Specimen Segment (SPM)

The Specimen Segment (SPM) is Required and is used to collect information on the specimen tested. It includes the type of specimen, collection details, and number of specimens if pooled. This segment is not repeatable within the Specimen Group; however, multiple specimen groups are allowed per PID or Accession group (when there is no PID).

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
2	855	EIP	R			01755	Specimen ID
3	855	EIP	RE	Y		01756	Specimen Parent IDs
4	705	CWE	R			01900	Specimen Type
6	705	CWE	RE	Y		01758	Specimen Additives
8	705	CWE	RE			01901	Specimen Source Site
11	705	CWE	R		0369	01762	Specimen Role
13	6	NM	C			01763	Grouped Specimen Count
14	250	ST	RE			01764	Specimen Description
17	49	DR	RE			01765	Specimen Collection Date/Time
18	24	DTM	R			00248	Specimen Received Date/Time
21	705	CWE	O	Y	0490	01767	Specimen Reject Reason
22	705	CWE	O		0491	01768	Specimen Quality
23	705	CWE	RE		0492	01769	Specimen Appropriateness
24	705	CWE	RE	Y	0493	01770	Specimen Condition
26	4	NM	O			01772	Number of Specimen Containers
27	705	CWE	O		9999	01773	Container Type
28	705	CWE	O		0544	01774	Container Condition

The following sections described the fields within the SPM.

## SPM.2 - Specimen ID (EIP) - Required

The Specimen ID is an EIP data type that contains the identifier assigned to the specimen by the sending facility (specimen collector) and the testing laboratory. This field is Required. The identifiers are used to track the specimen and associate it with corresponding Orders.

An example of SPM.2 is shown below:

```
<SPM.2>
  <EIP.1>
    <EI.1>AHM2005000012</EI.1>          <!--Placer assigned Specimen ID-->
    <EI.3>2.16.840.1.113883.3.5.8.1.3</EI.3> <!--OID for placer if EI.1 is unique-->
    <EI.4>ISO</EI.4>
  </EIP.1>
  <EIP.2>
    <EI.1>D0850123.001</EI.1>          <!--Filler assigned Specimen ID-->
    <EI.3>2.16.840.1.113883.3.5.1.2</EI.3> <!--OID for filler-->
    <EI.4>ISO</EI.4>
  </EIP.2>
</SPM.2>
```

### SPM.2.1 - Placer Assigned Identifier (EI) – Required

The Placer Assigned Identifier is an EI data type that contains the identifier assigned to the specimen by the facility requesting the tests. The Placer Assigned Identifier is not required, but whatever specimen identifier was assigned by the submitter to the specimen shall be sent. This identifier will often be in the form of a barcode attached to the specimen container.

SPM.2.1 is used to send any identification that came for the specimen often designated by the submitter (placer) and attached to the specimen container. Ideally, SPM.2.1.3 can be populated with an OID to indicate the specimen identifier issuing authority. Otherwise this subcomponent should be not be populated.

Because many submissions come directly from industry veterinarians, rather than program specimen collection activities, they will not come in with globally unique specimen IDs (e.g. barcoded). Instead labs will need to report whatever ID did come on the submission. The placer ID's assigning authority may then be omitted or a text description "Farm ID" or similar if provided by the LIMS can go in SPM.2.1.2 just for human readability in knowing the type of ID.

If the identifier in EI.1 is unique in any namespace then EIP.3 should uniquely identify that namespace. For the NAHLN EI.3 will essentially always be an OID and EI.4 the value "ISO". If the identifier in EI.1 is not unique then EI.3 and EI.4 must be omitted.

In the case of a pooled specimen, aliquot, or cultured isolate where one or more SPM.3 parent specimen IDs are populated with placer specimen ID(s), this component should contain an identifier that would be used to communicate the identity of the specimen *to* the placer. This field is often the only text made available to analysts, etc., scanning results so some readable value must be present. An alternate usage for aliquots, isolates, etc., with a single parent specimen is to repeat the parent's placer specimen ID on this specimen. (It is how the placer would relate the culture, etc., to what it originally submitted.)

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Identifier assigned by the ordering submitter/facility with which specimen comes into the lab.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	20	IS	CE	0363	Namespace ID	<b>Rarely used in this context.</b> Might be the Premises ID of a farm if the specimen came with a farm applied label.
3	199	ST	CE		Universal ID	This is usually the OID assigned of the code system or the program.
4	6	ID	C	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

**Program specific implementation note:**

**WS-AI Program:** The EI.2 field is not supported and the required value for the OID of the assigning authority (EI.3) of the placer ID is 2.16.840.1.113883.3.5.8.4.1. EI.4 may be defaulted to "ISO". EI.3 must be valued. EI.1 is constrained to 20 characters for this program.

**CSF Program:** The EI.2 field is not supported and the required value for the OID of the assigning authority (EI.3) of the placer ID is 2.16.840.1.113883.3.5.8.3. EI.4 may be defaulted to "ISO". EI.3 must be valued.

**SPM.2.2 – Filler Assigned Identifier (EI) - Required**

The Filler Assigned Identifier field contains the identifier assigned to the specimen by the laboratory doing the testing. This field is Required. The identifier submitted to the NAHLN shall be unique for a particular laboratory (or laboratory system). The NAHLN requires that all participating laboratories have a root OID for their organization. For this field either the organizational root OID or a locally assigned sub-OID may be used in component 3. This is the field that will be used to uniquely differentiate specimens. Text namespaces are not supported for Filler Assigned Identifier.

Note: EI.2 field is *never* used in this context because it is safe to assume that any laboratory can obtain an OID for IDs it issues.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Specimen identifier, unique within a namespace.
3	199	ST	R		Universal ID	The OID of the assigning facility. It is the code system from which the namespace id originates.
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. For the NAHLN this shall be defaulted to OID.

### SPM.3 - Specimen Parent IDs (EIP) - Required or Empty

The Specimen Parent IDs is a repeatable EIP data type that contains the identifier(s) of the specimen or specimens that were the source of the specimen identified in SPM.2. This is useful when specimens are divided with portions going to different labs or sections for different types of testing and where the original specimen identity is needed along with identifiers for each specimen.

This field shall also contain the parent specimen IDs of all specimens contributing to a pooled specimen. Unlike other repeatable ID fields where the repeats are only alternative representations of the same entity, with pooled specimens the different IDs actually represent different specimens that contributed to the currently identified specimen.

If no parent specimen exists or is not available to the sending system, this field may be omitted. The format is the same as for SPM.2 of the source specimen.

Detailed descriptions of various uses of Specimen Parent IDs are given in the *Hitchhikers' Guide to NAHLN Messaging* and the *NAHLN/LMS Messaging Design Patterns* guide.

#### SPM.3.1 - Placer Assigned Identifier (EI) – Required or Empty

The Placer Assigned Identifier is an EI data type that contains the identifier assigned to the specimen by the facility requesting the tests. This identifier will often be in the form of a barcode attached to the specimen container. The format is the same as the EIP data type used to represent the Specimen ID in SPM.2.

#### SPM.3.2 – Filler Assigned Identifier (EI) – Required or Empty

The Filler Assigned Identifier is an EI data type that contains the identifier assigned to the specimen by the laboratory doing the testing. The identifier submitted to the NAHLN shall be unique for a particular laboratory (or laboratory system). The format for this field is the same as the EIP.2 for SPM.2.

An example of SPM.3 for a pooled specimen with both placer and filler assigned to three parent specimen IDs is shown below:

```
<SPM.3>
  <EIP.1>
    <EI.1>84032144443112</EI.1>
    <EI.3>2.16.840.1.113883.3.5.8.1.3</EI.3>
    <EI.4>ISO</EI.4>
  </EIP.1>
  <EIP.2>
    <EI.1>D0805432.001</EI.1>
    <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
    <EI.4>ISO</EI.4>
  </EIP.2>
</SPM.3>
<SPM.3>
  <EIP.1>
    <EI.1>84032144443113</EI.1>
    <EI.3>2.16.840.1.113883.3.5.8.1.3</EI.3>
    <EI.4>ISO</EI.4>
  </EIP.1>
  <EIP.2>
    <EI.1>D0805432.002</EI.1>
    <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
    <EI.4>ISO</EI.4>
  </EIP.2>
</SPM.3>
<SPM.3>
  <EIP.1>
```

```

<EI.1>84032144443114</EI.1>
<EI.3>2.16.840.1.113883.3.5.8.1.3</EI.3>
<EI.4>ISO</EI.4>
</EIP.1>
<EIP.2>
  <EI.1>D0805432.003</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
  <EI.4>ISO</EI.4>
</EIP.2>
</SPM.3>

```

## SPM.4 - Specimen Type (CWE) - Required

The Specimen Type field is a coded entry (CWE) that describes the precise nature of the entity that will be the source material for the observation. This field is required. While every effort will be made to provide coded values for specimen types being used in NAHLN agent testing, there may be cases where a coded value specific to a particular specimen type is not immediately available. In these instances, an alternative coded value and description of the specimen may be sent in components 4-6 of the CWE data type. In some cases the precise term is not available in the coded reference system. In these situations, it is allowable to send the original text of the specimen description in the CWE.9 component

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the specimen type is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Specimen Type list contains an adequate representation of the Specimen Type then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Coded type of specimen, if available.
2	199	ST	RE		Text	Open text field describing the specimen type. If coded entry is not available for specimen type, users can fill in just the text field.
3	20	ID	RE	0396	Name of Coding System	Name of coding system used for the identifier given. Can be filled in if available.
4	20	ST	CE		Alternate Identifier	Local code for specimen type
5	199	ST	CE		Alternate Text	Local coding system text for specimen type
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Specimen description as recorded in source system.

An example of coded value for SPM.4 is shown below:

```
<SPM.4>
  <CWE.1>661000009100</CWE.1>
  <CWE.2>Oropharyngeal swab</CWE.2>
  <CWE.3>SCT</CWE.3>
  <CWE.9>OP swabs</CWE.9>
</SPM.4>
```

Specimen type codes can be found at [http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen\\_type](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen_type)

**Program specific implementation note:**

**WS-AI Program:** The CWE.1 field for this program must be valued using one of the following four specimen type SNOMED codes:  
 131000009104 – Cloacal Swab  
 671000009109 –Tracheal swab  
 30931000009104 - Pooled cloacal/oropharyngeal swab  
 661000009100 - Oropharyngeal swab

CWE.3 must be populated with “SCT”.

**CSF Program:** The CWE.1 field for this program must be valued; however, the schema does not restrict the codes used for specimen type, but the allowed specimens are documented in the specific program requirements.

CWE.3 must be populated with “SCT”.

### SPM.6 - Specimen Additives (CWE) - Required or Empty

This field identifies any additives or preservatives introduced to the specimen at the time of collection. These additives may be introduced in order to preserve, maintain or enhance the particular nature or a component of the specimen. Often these additives are in the form of contents of collection tubes, etc., used to contain the specimen submitted to the laboratory. Blood in a “purple top tube” for example, has a specimen type of “blood” and a specimen additive of “EDTA.” Values for this field are drawn from HL7 table 0371- Additive. This field may repeat. Multiple values may be drawn from table 0371 and included in a single repeatable field. Completely correct usage would include additives such as BHI broth or viral transport medium used with swab specimen types however these are often omitted and simply assumed.

The conditionality of the components in this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the additive type is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Additive list contains an adequate representation of the Additive then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Coded type of specimen additives, if available.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	199	ST	RE		Text	Text description of the specimen additive(s). If coded entry is not available for specimen type, users may send just the description.
3	20	ID	RE	0396	Name of Coding System	Name of coding system used for the identifier given. This may be defaulted to HL70371.
4	20	ST	CE		Alternate Identifier	Local code for additive type
5	199	ST	CE		Alternate Text	Local coding system text for additive type
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Additive description as recorded in source system.

An example of SPM.6 is shown below:

```
<SPM.6>
  <CWE.1>VIRTM</CWE.1>
  <CWE.2>viral transport medium</CWE.2>
  <CWE.3>HL70371</CWE.3>
  <CWE.9>VTM</CWE.9>
</SPM.6>
```

Specimen additive codes can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen\\_additive](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen_additive)

## SPM.8 - Specimen Source Site (CWE) - Required or Empty

The Specimen Source Site is a coded entry (CWE) that contains an identifier for the source of the specimen (i.e. the anatomical location, organ or site from which the specimen originated). This field is needed when the SNOMED specimen hierarchy does not contain a pre-coordinated term that adequately describes the specimen. For example, in the case where tonsillar tissue is obtained from a pig by scraping, the source would be 'Tonsillar structure (palatine)' In general this field is only needed when additional information about the region from where the specimen was collected is needed. For environmental specimens this field may supply additional information on where the specimen originated. In cases where the specimen and specimen source are identical, this field need not be populated.

There is no one correct answer to precisely which detail should be provided by a pre-coordinated, more specific specimen type and which with a less specific type plus a specimen source. Many specimen/source combinations could be correctly expressed either way. The NAHLN will try to provide guidance on specific testing protocols. The best guidance currently is to consult with terminologist at the terminology services lab before resorting to use of specimen source site to refine specimen type.

The conditionality of the components in this field is the same as that described for SPM.4 (Specimen Type). The second set of components (CWE.4-CWE.6) may be used if the specimen source site is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type.

If neither the NAHLN reference tables nor the local laboratory Specimen Source list contains an adequate representation of the Specimen Source then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Coded identifier for the source of the specimen, if used.
2	199	ST	RE		Text	Textual description of the specimen source site. Example in standard is "liver."
3	20	ID	RE	0396	Name of Coding System	Name of coding system used, if identifier is filled in.
4	20	ST	CE		Alternate Identifier	Local code for source site
5	199	ST	CE		Alternate Text	Local coding system text for source site
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Source site description as recorded in source system

An example of SPM.8, used in conjunction with SPM.4 is shown below:

```

<SPM.4>
  <CWE.1>128168004</CWE.1>
  <CWE.2>Tissue specimen from liver</CWE.2>
  <CWE.3>SCT</CWE.3>
</SPM.4>
<SPM.8>
  <CWE.1>89255003</CWE.1>
  <CWE.2>right lateral lobe of liver</CWE.2>
  <CWE.3>SCT</CWE.3>
</SPM.8>

```

Specimen source codes can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen\\_source\\_site](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=specimen_source_site)



### SPM.11 - Specimen Role (CNE) - Required

The Specimen Role is a coded entry (CNE) that describes the role this specimen(s) is playing. The User Defined table 0369 contains valid values for this field. This is a required field.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	The coded value representing the role for a specimen.
2	199	ST	RE		Text	Textual description of specimen role.
3	20	ID	R	0396	Name of Coding System	Name of coding system used for specimen role. For the NAHLN this value should be HL70369.

The only values currently used by the NAHLN is "P" "Patient Sample", "G" "Group" and "L" "Pooled".

An example of SPM.11 is shown below:

```
<SPM.11>
  <CWE.1>P</CWE.1>
  <CWE.2>Patient </CWE.2>
  <CWE.3>HL70369</CWE.3>
</SPM.11>
```

**HL7 User Defined Table 0369**

B	Blind Sample
C	Calibrator
E	Electronic QC, used with manufactured reference providing signals that simulate QC results
F	Specimen used for testing proficiency of the organization performing the testing (Filler)
G	Group (where a specimen consists of multiple individual elements that are not individually identified)
L	Pool (aliquots of individual specimens combined to form a single specimen representing all of the components.)
O	Specimen used for testing Operator Proficiency
P	Patient
Q	Control specimen
R	Replicate (of patient specimen as a control)
V	Verifying Calibrator, used for periodic calibration checks

### SPM.13 - Grouped Specimen Count (NM) - Conditional

The Grouped Specimen Count is a numeric value that contains a count of the number of samples submitted together under the same specimen ID. This often occurs when specimens are taken from groups in which the individual animals do not have identifiers. The value of this field represents the number of unique animals

sampled and should not be confused with the number of containers for a particular specimen (SPM.26). In general, grouped specimens are not reported as individual results, but as a distribution of results.

This is also used to convey the number of individual specimens combined into a pooled specimen. If individual parent specimen IDs are included in SPM.3 then this number must agree with the count of parent specimens.

**Conditionality:** If the specimen's role (ROL.11) is "G" for grouped or "L" for pooled, then a numeric value shall be sent in this field.

An example of SPM.13 is shown below:

<SPM.13>5</SPM.13>

**Version Note:** The HL7 version we are implementing, 2.6 had a mistake and limited this field to Grouped, not Pooled specimens. That was corrected in version 2.9. Because this was a correction not a change, we have applied it retroactively to 2.6. The 2.9 standard now reads:

#### 7.4.3.13 SPM-13 Grouped Specimen Count (NM) 01763

**Definition:** This field refers to the number of individual specimens of a particular type represented by this instance of a specimen. The use of this field is restricted to specimens upon which all specimen related attributes are identical. This field would only be valued if SPM-11 Specimen Role has the value "G" or "L".

### SPM.14 - Specimen Description (ST) - Required or Empty

Specimen Description is a free text field that allows users to further describe their specimen. Text should be limited to descriptions specifically about the specimen.

An example of SPM.13 is shown below:

<SPM.14>Textual description of the specimen - up to 250 characters</SPM.14>

### SPM.17 - Specimen Collection Date/Time (DR) - Required or Empty

Specimen Collection Date/Time is a date range data type, which means that it records both the starting and ending dates for an event. For NAHLN, just the range start date/time will be used. This field should contain the time at which collection of the specimen occurred. As noted below for component 1, if this field is sent, the first component shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	24	DTM	R		Range Start Date/Time	Specimen eCollection start date/time in ISO format  YYYYMMDDHHMM MSS[+ -]HHMM

#### SPM.17.1 - Range Start Date/Time (DTM) - Required

The Range Start Date/Time is a DTM data type and is Required if the specimen collection date is sent.

**Note:** While not applicable here, DR.2 would represent the time that collection ended. It is used especially for physiologic studies such as 24-hour urine chemistries.

An example of SPM.17 is shown below:

```
<SPM.17>
  <DR.1>200812050800-0800</DR.1>
</SPM.17>
```

### SPM.18 - Specimen Received Date/Time (DTM) - Required

The Specimen Received Date/Time is the time at which the specimen was received by the laboratory. This field is a date time (DTM) data type and is required. The minimum requirement to be sent is the year, month and day. The time zone offset is strongly encouraged to be included.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
	24	DTM	R		Date/Time	Specimen Received date/time in ISO format  YYYYMMDDHHMM MSS[+ -]HHMM

An example of SPM.18 is shown below:

```
<SPM.18>200812061030-0800</SPM.18>
```

### SPM.21 - Specimen Reject Reason (CWE) - Optional

This field contains the reason a specimen was rejected. This field may repeat. If a specimen is rejected, the reason shall be sent. The HL7 Used Defined Table 0490 contains valid values that may be sent in this coded entry (CWE). The following table describes in detail the data elements within the Specimen Reject Reason field:

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the specimen reject reason is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Specimen Reject Reason list contains an adequate representation of the Specimen Reject Reason, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Identifier for Specimen Reject Reason. (Specimen value QS is for Quantity not sufficient.)
2	199	ST	RE		Text	Text description of Specimen Reject Reason.
3	20	ID	RE	0396	Name of Coding System	Coding system from which identifier for Specimen Reject Reason is drawn. For the NAHLN this will be HL70490

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
4	20	ST	CE		Alternate Identifier	Local code for specimen reject reason
5	199	ST	CE		Alternate Text	Local coding system text for specimen reject reason
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Specimen reject reason description as recorded in source system.

An example of SPM.21 is shown below:

```

<SPM.21>
  <CWE.1>QS</CWE.1>
  <CWE.2>Quantity Not Sufficient</CWE.2>
  <CWE.3>HL70490</CWE.3>
  <CWE.9>Insufficient Sample Provided</CWE.9>
</SPM.21>
    
```

As an HL7 defined table, additional values may be included as they are identified, whereas the existing codes must be used as defined. If a value is not included in the table, the description may be sent in the second component of the CWE.

**HL7 Defined Table 0490**

EX	Expired
IA	Improper Additive
IC	Improper Container
IH	Improper Handling
IS	Improper specimen
QS	Quantity not sufficient
RA	Missing patient ID number
RB	Broken container
RC	Clotting
RD	Missing collection date
RE	Missing patient name
RH	Hemolysis
RI	Identification problem
RM	Labeling
RN	Contamination
RP	Missing phlebotomist ID
RR	Improper storage
RS	Name misspelling
SC	Improper Specimen Condition

## SPM.22 - Specimen Quality (CWE) - Optional

This field contains the value for the quality specimen upon receipt by the lab. The Specimen Quality field is Required or Empty coded entry (CWE).

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the specimen quality is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Specimen Quality list contains an adequate representation of the Specimen Quality, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Specimen Condition Identifier.
2	199	ST	RE		Text	Optional Specimen Condition text.
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign identifier. For the NAHLN this will be HL70491
4	20	ST	CE		Alternate Identifier	Local code for specimen quality
5	199	ST	CE		Alternate Text	Local coding system text for specimen quality
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Specimen quality description as recorded in source system.

**User-defined Table 0491 - Specimen Quality**

Value	Description
E	Excellent
G	Good
F	Fair
P	Poor

An example of SPM.22 is shown below:

```

<SPM.22>
  <CWE.1>E</CWE.1>
  <CWE.2>Excellent</CWE.2>
  <CWE.3>HL70491</CWE.3>
</SPM.22>

```

### SPM.23 - Specimen Appropriateness (CWE) - Required or Empty

This field is a coded entry (CWE) that contains the suitability of the specimen for the particular planned use, as determined by the filler. This field would be relevant for specialized concepts such as “not obex”. This field is Required or Empty. The values for this field are contained within HL7 User Defined Table 0492.

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the specimen appropriateness is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Specimen Appropriateness list contains an adequate representation of the Specimen Appropriateness, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Specimen Appropriateness identifier.
2	199	ST	RE		Text	Optional Specimen Appropriateness text.
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign identifier. For the NAHLN this will be HL70492.
4	20	ST	CE		Alternate Identifier	Local code for specimen appropriateness
5	199	ST	CE		Alternate Text	Local coding system text for specimen appropriateness
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Specimen appropriateness description as recorded in source system.

User-defined Table 0492 - Specimen Appropriateness

Value	Description
P	Preferred
A	Acceptable
I	Inappropriate

An example of SPM.23 is shown below:

```

<SPM.23>
  <CWE.1>A</CWE.1>
  <CWE.2>Appropriate</CWE.2>
  <CWE.3>HL70492</CWE.3>

```

&lt;/SPM.23&gt;

**SPM.24 - Specimen Condition (CWE) - Required or Empty**

This field contains the condition of the specimen upon receipt by the laboratory. The Specimen Condition field is Required or Empty coded entry (CWE). Appropriate values come from HL7 User defined table 0493. The field can repeat for more complicated issues.

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the specimen condition is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Specimen Condition list contains an adequate representation of the Specimen Condition, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Specimen Condition Identifier.
2	199	ST	RE		Text	Optional Specimen Condition text.
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign identifier. For the NAHLN this will be HL70493
4	20	ST	CE		Alternate Identifier	Local code for specimen condition
5	199	ST	CE		Alternate Text	Local coding system text for specimen condition
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Specimen condition description as recorded in source system.

**User-defined Table 0493 - Specimen Condition**

Value	Description
AUT	Autolyzed
CLOT	Clotted
CON	Contaminated
COOL	Cool
FROZ	Frozen
HEM	Hemolyzed
LIVE	Live
ROOM	Room temperature
SNR	Specimen not received
WRM	Warm

An example of SPM.24 is shown below:

```
<SPM.24>
  <CWE.1>COOL</CWE.1>
  <CWE.2>Coo1</CWE.2>
  <CWE.3>HL70493</CWE.3>
</SPM.24>
```

### SPM.26 - Number of Specimen Containers (NM) - Optional

This field represents the number of containers that a specimen is contained in. For example, a single blood collection into multiple red-top tubes (to provide more serum for testing) would have the number of tubes collected listed in this field. In the vast majority of cases specimens will be contained in a single container. This field provides a way to handle multiple containers for the same specimen.

An example of SPM.13 is shown below:

```
<SPM.26>2</SPM.26>
```

### SPM.27 - Container Type (CWE) - Optional

This field contains the type of container used to submit the specimen. The Container Type field is Required or Empty coded entry (CWE). A standard table has not yet been developed for container types. Thus, it is permissible for this release of the NAHLN to value only the CWE.9 component with the original text description of the container.

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the Container Type is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. Because the NAHLN does not have a standard list of container types, in most cases component 9 (original text) will be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Container Type Identifier.
2	199	ST	RE		Text	Optional Specimen Condition text.
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign identifier. There is currently no standard code system for container.
4	20	ST	CE		Alternate Identifier	Local code for container type
5	199	ST	CE		Alternate Text	Local coding system text for container type
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Container type description as recorded in source system.



An example of SPM.27 is shown below:

```
<SPM.27>
  <CWE.9>Snap-cap Tube</CWE.9>
</SPM.27>
```

## SPM.28 - Container Condition (CWE) - Optional

This field contains the condition of container used to submit the specimen upon receipt by the lab. The Container Condition field is Required or Empty coded entry (CWE). A standard table has not yet been developed for container condition. Thus, it is permissible for this release of the NAHLN to value only the CWE.9 component with the original text description of the container condition.

The conditionality of this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the Container Condition is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Container Condition list contains an adequate representation of the Container Condition, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Container Type Identifier.
2	199	ST	RE		Text	Optional Specimen Condition text.
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign identifier. For the NAHLN this will be HL70544
4	20	ST	CE		Alternate Identifier	Local code for container condition
5	199	ST	CE		Alternate Text	Local coding system text for container condition
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Container type description as recorded in source system.

**User-defined Table 0544 – Container Condition**

Value	Description
	No suggested values

An example of SPM.28 is shown below:

```
<SPM.28>
  <CWE.9>Container Leaking</CWE.9>
</SPM.28>
```

## SPECIMEN\_OBSERVATION GROUP

The SPECIMEN\_OBSERVATION GROUP can be used to transmit additional information about the specimen that is not properly represented by the elements of the SPM segment. This is NOT for observations that are part of the laboratory service. For example, noting the condition of the carcass before starting a necropsy is a laboratory observation rather than an observation on the specimen. Examples of observations on the specimen would be the temperature or weight of the specimen at the time it was received.

### Specimen Observation/Result Segment (OBX)

This repeating segment represents a set of observations related to the specimen other than laboratory observations. Specific observation supported for each test type will be listed in the instructions for that testing program. Any other OBX segments sent at this level in the message will be ignored.

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	3	ID	R		0125	Value Type
3	705	CWE	R			Observation Identifier
5	99999	Varies	R			Observation Value
6	705	CWE	C			Units
11	1	ID	R		0085	Observation Result Status
14	24	DTM	RE		00582	Date/Time of Observation

The following is an example specimen related OBX segment. Here to convey the color of a urine specimen

```
<OBX>
  <OBX.2>ST</OBX.2>
  <OBX.3>
    <CWE.1>5778-6</CWE.1>
    <CWE.2>Color of Urine</CWE.2>
    <CWE.3>LN</CWE.3>
  </OBX.3>
  <OBX.5>Light Straw</OBX.5>
  <OBX.11>F</OBX.11>
</OBX>
```

### OBX.2 - Value Type (ID) - Required

This field contains the identifier of the HL7 data type contained in the Observation Value (OBX.5) field. These two fields combined allow for flexibility in reporting a range of different types of observations. The receiving application shall read this field in order to parse the value correctly. The data type will be determined by the NAHLN IT CORE COMMITTEE for each specimen observation type required.

### OBX.3 - Observation Identifier (CNE) - Required

Observation Identifier is a field of CNE data type that unambiguously identifies the specific observation represented by this segment. For the NAHLN, only LOINC codes approved by the NAHLN IT CORE COMMITTEE may be transmitted. The first component contains the LOINC code, the second contains the LOINC Short name for the code, and the third is the string "LN" to identify the coding system as LOINC. Only the first three components of the CNE data type are supported in the NAHLN message.

**HL7 Component Table – CNE Coded No Exceptions**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	The code of the specific observation. This code will be established by the NAHLN Technical Committee for each observation required for specific tests or programs supported
2	199	ST	RE		Text	Textual description of observation type. The LOINC short name or long name may be used in this field
3	20	ID	R	0396	Name of Coding System	The coding system from which the observation identifier originated. The value for this field shall be LN.

**Note:** See instructions for specific disease testing program for values of patient observations required by that program.

### **OBX.5 - Observation Value (VARIES) - Required**

The Observation Value field will depend upon the type of observation being transmitted. This will be established on a test-by-test or program-by-program basis.

### **OBX.6 - Units (CNE) - Conditional**

OBX.6 is a Conditional field - any OBX segment with a value of NM in OBX.2 shall have units associated with it. Units are to be supplied as a coded entry (CNE) data type. The default coding system consists of the ISO abbreviation for a single case unit (ISO 2955-83) plus extensions that do not collide with ISO abbreviations. We designate this coding system as ISO+.<sup>15</sup> The ISO+ abbreviations are the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations need to be sent. The Uniform Code for Units of Measure (UCUM)<sup>16</sup> system of units is rapidly overtaking ISO+ and may at some point replace it in the NAHLN standard.

<sup>15</sup> Both the ISO unit's abbreviations and the extensions are defined in the HL7 standard Section 7.4.2.6.2, "ISO and ANSI customary units abbreviations." HL7 Messaging Standard Version 2.5, 2003

<sup>16</sup> <https://ucum.nlm.nih.gov/>

**HL7 Component Table – CNE Coded No Exceptions**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	Units abbreviated in ISO or ANSI standard abbreviation or Uniform Code for Units of Measure (UCUM) code.
2	199	ST	RE		Text	Textual description
3	20	ID	R	0396	Name of Coding System	Either ISO for metric units or ANS+ for "English" units, or UCUM for more current units.

An example of OBX.6 is shown below:

```
<OBX.6>
  <CWE.1>G</CWE.1>
  <CWE.2>gram</CWE.2>
  <CWE.3>ISO</CWE.3>
</OBX.6>
```

### OBX.11 - Observation Result Status (ID) - Required

As the observation result is assigned at the time the accession is received this observation status is always a final observation. The value is fixed as "F."

### OBX-14 Date/Time of the Observation (DTM) - Required or Empty

This field represents the physiologically relevant date-time or the closest approximation to that date-time. In the case of observations about the specimen, it is the date when that assessment was made or applies.

## ORDER GROUP

The ORDERGROUP (OPU\_R25.ORDER) is used to contain the original order and the set of related results that would be included for a single order, panel, or battery. Information common to the result set is contained in the Observation Order segment (OBR) and Common Order Segment (ORC). The rest of the ORDER group is made up of one or more RESULT groups containing the actual observed or measured results. The ORDER group shall be present and may repeat.

### Observation Order Segment (OBR)

The Observation Order segment can be thought of as a header for a set of related tests or observations. If a set of tests or observations would logically be ordered and/or interpreted together, they should be contained in an ORDER group with a single OBR header.

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	427	EI	RE			Placer Order Number
3	427	EI	R			Filler Order Number
4	705	CWE	R		9999	Universal Service Identifier

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
22	24	DTM	R			Results Rpt/Status Chng - Date/Time
23	504	MOC	RE			Charge to Practice
29	855	EIP	RE			Parent
31	705	CWE	RE			Reason for Study

## OBR.2 - Placer Order Number (EI) - Required or Empty

The Placer Order Number is used in the event of confirmatory testing. In the future this will be used when orders are sent to the fulfilling laboratory from the field. This field contains the unique number that was assigned to the test(s) by the originator of the order (either from the field or from another testing laboratory. When a specimen is sent to another laboratory for confirmatory testing, the specimen's original Filler Order Number becomes the new Placer Order Number. This is an entity identifier (EI) data type and is Required or Empty.

**HL7 Component Table – Entity Identifier**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Order number assigned by the placer or requesting laboratory.
2	20	IS	RE	0363	Namespace ID	Name of the program or the premises id of facility that assigned the entity identifier - Preferred to be the Premises ID assigned by NAIS
3	199	ST	RE		Universal ID	OID for the organization that assigned the entity identifier. For example, the OID for CAHFS order number
4	6	ID	C	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

An example of OBR.2 is shown below:

```
<OBR.2>
  <EI.1>42134213423</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
  <EI.4>ISO</EI.4>
</OBR.2>
```

## OBR.3 - Filler Order Number (EI) - Required

The Filler Order Number is the Order number assigned by the laboratory performing the test(s). This is an entity identifier (EI) data type and is Required. In the case of the Filler Order Number, however, the second component of the EI data type is not supported, thus the OID for the assigning authority (fulfilling laboratory) is mandatory.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	Order number assigned by the fulfilling laboratory represented by the universal ID. This organization should be the organization performing the test.
3	199	ST	R		Universal ID	OID for the organization that assigned the entity identifier. For example, the OID for CAHFS order number
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

An example of OBR.3 is shown below:

```
<OBR.3>
  <EI.1>123421341234</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
  <EI.4>ISO</EI.4>
</OBR.3>
```

### OBR.4 - Universal Service Identifier (CWE) - Required

The Universal Service Identifier is the LOINC code defining the test or panel/battery name as ordered. This is a coded entry (CWE) and is Required. For new tests or panels that do not have an assigned LOINC Code, an alternative or local identifier may be used. If a local code is used it is strongly recommended that the Text field be valued with the laboratory's description of the test (not the local abbreviation).

LOINC has very good coverage of veterinary test *results* and is committed to supporting veterinary medicine with new codes as needed. It is much less complete on *order* codes especially for batteries where the precise sequence of observations is determined at the lab or follows a complex algorithm. As the NAHLN expands more of the *order* codes (Universal Service Identifiers) will be in the form of extension LOINC codes. These look just like ordinary LOINC codes but with a leading X. The check digit is calculated on the digits only.

Note that for LOINC, the text component *shall* be either the LOINC long common name or display name. The display name is now the preferred text because it is somewhat more human readable. If a more recognizable name is to be sent, it should be in CWE.5 or CWE.9.

The conditionality of components in this field is the same as that described for most other CWE coded fields. The second set of components (CWE.4-CWE.6) may be used if the universal service ID is not represented in the NAHLN reference table. The original text description should also be sent in component 9 of the CWE data type. If neither the NAHLN reference tables nor the local laboratory Order Code list contains an adequate representation of the Order Code, then component 9 (original text) shall be sent.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	The LOINC code for this order.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	199	ST	RE		Text	The LOINC Long Common Name for the test or panel ordered.
3	20	ID	RE	0396	Name of Coding System	For the NAHLN, this will be LN for LOINC.
4	20	ST	CE		Alternate Identifier	Local code for universal service ID
5	199	ST	CE		Alternate Text	Local coding system text for universal service ID
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Universal service ID description as recorded in source system.

**Program specific implementation note:**

**WS-AI Program:** The CWE.1 field for this program must be valued using one of the following LOINC codes:

44263-2 - Influenza virus A RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

44264-0 - Influenza virus A H5 RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

44266-5 - Influenza virus A H7 RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

CWE.3 must be populated with "LN".

**CSF Program:** The population of the CWE.1 field for this program is not required; however, the allowed LOINC Code(s) are documented in the specific program requirements.

CWE.3 must be populated with "LN".

An example of OBR.4 is shown below:

```
<OBR.4>
  <CWE.1>44263-2</CWE.1>
  <CWE.2>Influenza virus A RNA [Units/volume] (viral load) in Unspecified specimen by Probe
  and target amplification method</CWE.2>
  <CWE.3>LN</CWE.3>
</OBR.4>
```

An example of OBR.4 with an extension LOINC code is shown below:

```
<OBR.4>
  <CWE.1>X0001-6</CWE.1>
  <CWE.2>IAV-S Surveillance Protocol</CWE.2>
  <CWE.3>LN</CWE.3>
</OBR.4>
```

An example of OBR.4 using a local coding system:

```
<OBR.4>
  <CWE.4>4183</CWE.4>
  <CWE.5>Locally-Developed Nose and Tail PCR</CWE.5>
  <CWE.6>L</CWE.6>
</OBR.4>
```

LOINC Order codes can be found at

[http://vtsl.vetmed.vt.edu/nahtml/main.cfm?page=subset&subset=universal\\_service\\_id](http://vtsl.vetmed.vt.edu/nahtml/main.cfm?page=subset&subset=universal_service_id)

## OBR.22 - Results Rpt/Status Chng - Date/Time (DTM) - Required

This field specifies the date/time when results were released by the laboratory or the status of the order is entered or changed (e.g. partial results for a panel). The nature of the change is defined in *ORC-5-order status*. For this release of the NAHLN, only final or cancelled results will be accepted so this value represents the time the order was completed. If corrections are eventually accepted, this would be the date/time that the correction was completed. This field is Date/Time (DTM), and it is Required.

An example of OBR.22 is shown below:

```
<OBR.22>200812061234-0800</OBR.22>
```

## OBR.23 - Charge to Practice (MOC) - Required or Empty

This field allows for a coded charge code that can be used to hold the program or other account funding the test(s) in this order. It is used by NAHLN to differentiate NAHLN-paid results from others. It can also be used in lieu of a Guarantor to assign bill-to account for the order. Unlike Guarantor, this can be used to split an accession across more than one bill-to.

An example of OBR.23 is shown below:

```
<OBR.23>200812061234-0800
  <MOC.2>
    <CWE.1>B123456</CWE.1>
    <CWE.2>Penny Payor</CWE.2>
    <CWE.3>2.16.840.1.113883.3.5.1.2</CWE.3>
  </MOC.2>
</OBR.23>
```

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Billing Account Identifier.
2	199	ST	RE		Text	Optional Name of Account.
3	20	ID	RE	0396	OID of Coding System	Here we pre-adopt a version 3 usage and identify the code system with an OID



## OBR.29 - Parent (EIP) - Required or Empty

This field relates a child order to its parent order when a parent/child relationship exists. For example, observation requests that are spawned by previous observations (i.e. reflex orders such as virus isolation request following a positive PCR for AI). When valued, this field contains the order ID of the parent order that resulted in the current request identified in OBR.3. This allows for tracking of related orders. This field is not currently utilized in the NAHLN but is provided for future use. While the data type is EIP, only the filler assigned identifier is supported.

**HL7 Component Table - EIP – Entity Identifier Pair**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
2	427	EI	R		Filler Assigned Identifier	

**HL7 Component Table - EI – Entity Identifier**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	O		Entity Identifier	The filler order ID for the parent order
3	199	ST	C		Universal ID	OID for the organization that assigned the entity identifier. For example, the OID for CAHFS order number
4	6	ID	C	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

An example of OBR.29 is shown below:

```
<OBR.29>
  <EIP.2>
    <EI.1>123421341298</EI.1>
    <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
    <EI.4>ISO</EI.4>
  </EIP.2>
</OBR.29>
```

## OBR.31 - Reason for Study (CWE) - Required or Empty

This field indicates the purpose that this test or battery was ordered. It replaces the observation on the visit from previous versions of the message structure. This has two advantages. First, it allows the Order Message to contain the same information in the same place as the result. Also, it allows different reasons for different orders on the same accession. The cost of this is that for accessions with multiple orders, the same information must be repeated. This is functionally CNE for NAHLN usage but is CWE to allow additional reasons in new test programs, lab-to-lab, etc.

The local coding system used by the NAHLN will likely expand from one to two or more character codes to handle more fine-grained reasons why a particular case was selected for sampling under a surveillance program.

**HL7 Component Table – CWE Coded With Exceptions**

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	The code for the reason this test is being ordered.
2	199	ST	RE		Text	Textual description of the reason.
3	20	ID	RE	0396	Name of Coding System	For the NAHLN, this will be L for Local code. "Local" in this case means local to the NAHLN rather than an internationally recognized code system.
4	20	ST	CE		Alternate Identifier	Alternate code for reason. For example, if the LIMS has its own code.
5	199	ST	CE		Alternate Text	Alternate coding system text for the reason
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	May be used to convey the way the reason for testing was entered on submission forms or to provide finer-grained reason than available in the code system.

This is an example of OBR.31 using a local coding system established by the NAHLN:

```
<OBR.4>
  <CWE.1>N</CWE.1>
  <CWE.2>National surveillance</CWE.2>
  <CWE.3>L</CWE.3>
</OBR.4>
```

Reason for study codes can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=reason\\_submission](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=reason_submission)

### Common Order Segment (ORC)

The Common Order segment contains fields that are common to a large variety of orders. These usually relate to administrative data related to the “who, what and when” of orders rather than the specific order details.

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	2	ID	R		0119	00215	Order Control
4	22	EI	R			00218	Placer Group Number
5	2	ID	R		0038	00219	Order Status

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
9	24	DTM	D			00223	Date/Time of Transaction
10	3220	XCN	O	Y		00224	Entered By
11	250	XCN	O	Y		00225	Verified By

**Program specific note:**

This segment is not required in the base schema but is effectively required by all program testing because it carries the testing program OID in ORC.4. If this schema is used in applications that don't need any program grouping, the segment may be omitted.

An example ORC segment:

```

<ORC>
  <ORC.1>SC</ORC.1>
  <ORC.4>
    <EI.1>234454</EI.1>
    <EI.3>2.16.840.1.113883.3.5.8.1.2</EI.3>
    <EI.4>ISO</EI.4>
  </ORC.4>
  <ORC.5>CM</ORC.5>
  <ORC.9>200812061356-0800</ORC.9>
  <ORC.10>
    <XCN.1>CAS002</XCN.1>
    <XCN.9>
      <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
      <HD.3>ISO</HD.3>
    </XCN.9>
  </ORC.10>
  <ORC.11>
    <XCN.1>WIL012</XCN.1>
    <XCN.9>
      <HD.2>2.16.840.1.113883.3.5.1.2.2</HD.2>
      <HD.3>ISO</HD.3>
    </XCN.9>
  </ORC.11>
</ORC>

```

## ORC.1 Order Control (ID) - Required

This field determines the function of the order control segment. These may also be called “trigger events” or changes to the status of the order that result in the need to communicate via a message. The most obvious trigger event is the creation of a “New” order (control code NW). Additional events are listed in HL7 Table 0119 – Order control codes. As of this release of the NAHLN, only new results (NW - New) or changed results (SC – Status Change) and replace order (RO – Replace Order) codes are supported.

The RO value has special meaning. It instructs the receiving system to replace any "order" information--the message contents up to and including the ORC segment--with the contents of this message. This can be used to correct or complete accession information. Commonly, this includes adding the PIN to the PREM ROL segment.

An example ORC.1:

<ORC.1>NW</ORC.1>

### ORC.4 Placer Group Number (EI) - Required or Empty

This field allows an order placing application to group sets of orders together and subsequently identify them. It is often captured by the laboratory as an external reference assigned by the placer to allow them to track their submissions using their own identifier. It is not and should not be the same as the placer order number. This would include identifiers such as FAD Investigation numbers. This field does not repeat so a single submission to the laboratory may only be assigned to a single placer group.

The component usage has two distinct but related patterns. In the original usage EI.1 is an identifier such as an FAD investigation number and EI.3 is an OID for the system of codes used in EI.1. For program testing, the referral number pattern is established by the program so EI.3 is the program OID. The second usage is for cases where no referral number has been assigned. These are grouped only by program. In this case EI.1 is omitted and the OID in EI.3 stands along as the identifier that groups the orders by program.

**Program specific note:**

The ORC.4/EI.3 OID has taken on a critical role as the number of tests using the NAHLN/LMS has grown. This is the key field for determining which secondary systems within the VS information technology infrastructure receive data from the tests under each order.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	RE		Entity Identifier	The placer group number assigned to the order
3	199	ST	R		Universal ID	OID for the organization that assigned the entity identifier. For example, the OID for NVSL
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

Example using a NVSL FAD number as the placer group number:

```
<ORC.4>
  <EI.1>05CA0023</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.7 </EI.3>
  <EI.4>ISO</EI.4>
</ORC.4>
```

**Program Specific Constraints**

**CSF:** This field is required for the CSF program and contains the referral number provided on the CSF submission form. The maximum length for the value of this field is 32 characters

**WS-AI:** This field is required for the WS-AI program and contains the field assigned referral number provided on the submission form by the collector. The maximum length of the value of this field is 32 characters

For all other programs the program OID is required in EI.3 and "ISO" in EI.4

**ORC.5 Order Status (ID) - Required**

This field specifies the current status or the status change value of an order. Refer to *HL7 Table 0038 - Order status* for valid entries. The purpose of this field is to report the status of an order either upon request (solicited), or when the status changes (unsolicited). It does not initiate action. It is assumed that the order status always reflects the status as it is known to the sending application at the time that the message is sent. For the NAHLN, until round trip messaging (orders, referrals and results) is implemented, this value will usually be "CM". Only the filler can originate the value of this field. Only A and CM supported as of this version.

**HL7 Table 0038 - Order status**

Value	Description
A	Some, but not all, results available
CA	Order was canceled
CM	Order is completed
DC	Order was discontinued
ER	Error, order not found
HD	Order is on hold
IP	In process, unspecified
RP	Order has been replaced
SC	In process, scheduled

An example ORC.5:

```
<ORC.5>CM</ORC.5>
```

**ORC.9 Date/Time of Transaction (DTM) - Deprecated**

This field contains the date and time of the event that initiated the messaging transaction. For completed orders, this is the date/time that the results became available to send (the time they were released). This field is not equivalent to MSH-7 Date and Time of Message which reflects the date/time of physical message creation. It is almost always the same as OBR.22 however. Deprecated because virtually always duplicates OBR.22.

Example ORC.9:

```
<ORC.22>200812061356-0800</ORC.22>
```

**ORC.10 Entered By (XCN) - Optional**

This field contains the identity of the person who actually keyed the request into the application. It provides an audit trail in case the request is entered incorrectly and the filler needs to clarify the request. This field is currently not utilized by the NAHLN but is reserved for future use.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	RE		ID Number	The identifier assigned to the person entering the order data
2	194	FN	RE		Family Name	The surname of the data enterer.
3	30	ST	RE		Given Name	The first name of the data enterer
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial of the responsible diagnostician.
5	20	ST	RE		Suffix (e.g., JR or III)	Jr, III, etc.
9	227	HD	C	0363	Assigning Authority	The assigning authority for the identifier in XCN.1

**Conditionality:** The assigning authority (component 4) will be valued when and ID number is provided in component 1.

#### ORC.10.9 Assigning Authority (HD) - Conditional

An Assigning Authority component shall be provided for the ID given. Assigning authorities are provided in the form of an HD data type, and consist of a NamespaceID, Universal ID and Universal ID type.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	RE	0300	Namespace ID	Name of assigning authority.
2	999	ST	RE		Universal ID	OID for the source that assigned the identifier.
3	6	ID	RE	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

#### ORC.11 Verified By (XCN) - Optional

This field contains the identity of the person who verified the accuracy of the entered request. It is used in cases where the request is entered by a technician and needs to be verified by a higher authority (e.g., a nurse). By local agreement, either the ID number or name component may be omitted. This field is currently not utilized by the NAHLN but is reserved for future use.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	RE		ID Number	The identifier of the data verifier
2	194	FN	RE		Family Name	The surname of the data verifier.
3	30	ST	RE		Given Name	The first name fo the data verifier
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial of the responsible diagnostician.
5	20	ST	RE		Suffix (e.g., JR or III)	Jr, III, etc.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
9	227	HD	C	0363	Assigning Authority	The assigning authority for the identifier in XCN.1

**Conditionality:** The assigning authority (component 4) will be valued when and ID number is provided in component 1.

### ORC.11.1 Assigning Authority (HD) - Conditional

An Assigning Authority component shall be provided for the ID given. Assigning authorities are provided in the form of an HD data type, and consist of a NamespaceID, Universal ID and Universal ID type.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	IS	RE	0300	Namespace ID	Name of assigning authority.
2	999	ST	RE		Universal ID	OID for the source that assigned the identifier.
3	6	ID	RE	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

## RESULT GROUP

The RESULT group (OPU\_R25.RESULT) represents a single Observation/Result for a corresponding Test Order. There may be multiple RESULT groups associated with a single OBR segment. The OBX segment is the only member of the Result Group.

Note: When messaging a complete protocol consisting of a number of different “tests”, each test goes in its own RESULT group. The RESULT group may repeat. This collection of RESULT groups is nested inside the single ORDER group. The OBX inside the RESULT group does not repeat. If this does not seem to make sense, reference to the full standard may help. In the full standard each RESULT group consists of an OBX and an optional repeatable Notes segment. Because NAHLN does not support the Notes segment, we are left with a single OBX as the entire group. In the ER7 (pipe-delimited) format repeating RESULT groups without NTE segments would look the same as repeating OBX segments. In the XML translation each OBX is contained in a RESULT group and the group repeats. The group structure is supported to maintain compatibility with the full OPU message structure and the HL7 XML structure.

### Observation/Result Segment (OBX)

The Observation/Result Segment (OBX) is the heart of the NAHLN result message. Each OBX segment represents one atomic (discrete) observation. The segment includes an unambiguous description of the observation and the specific value for that observation. For example, a single Avian Influenza Matrix PCR result. Each OBX contains a Logical Observation Identifier Names and Codes (LOINC)<sup>17</sup> code for the type of measurement along with value consistent with the data type value in OBX.2. The rest of the segment provides additional context for and information about the observation.

<sup>17</sup> Logical Observation Identifiers Names and Codes (LOINC), Regenstrief Institute, [www.regenstrief.org/loinc/loinc.htm](http://www.regenstrief.org/loinc/loinc.htm).

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	3	ID	C		0125	Value Type
3	705	CWE	R		9999	Observation Identifier
4	20	ST	RE			Observation Sub-ID
5	99999	varies	CE			Observation Value
6	705	CWE	C		9999	Units
8	5	IS	CE	Y	0078	Abnormal Flags
11	1	ID	R		0085	Observation Result Status
14	24	DTM	RE			Date/Time of the Observation
16	3220	XCN	RE			Responsible Observer
17	705	CWE	RE		9999	Observation Method
18	427	EI	RE			Equipment Instance Identifier
19	24	DTM	RE			Date/Time of the Analysis
21	427	EI	R			Observation Instance Identifier

**Program specific implementation note:**

**CSF Program:** For this program only a single result OBX per OBR is allowed

**IAV-S Program:** For this program an extension LOINC code for the protocol is used in OBR and as many of the individual tests as are ready to send go in individual RESULT group OBXs following the single OBR.

## OBX.2 - Value Type (ID) - Conditional

This field contains the coded value for the HL7 data type contained in the Observation Value (OBX.5) field. OBX.2 and OBX.5 combined allow for flexibility in reporting a range of different types of observations. The receiving application shall read this field in order to parse the value correctly. For analyses in which the result cannot be determined (OBX.11 = "X") this field is not valued, as there is no data in OBX.5. For programming simplicity, when OBX.11 = "X" this field *may* be populated with the data type that *would have* been sent if the result was not cancelled.

An example of OBX.2 is shown below:

<OBX.2>NM</OBX.2>

The NAHLN accepted values for OBX.2 are listed in the table below. This table comprises a subset of the values in HL7 Table 0125.

**HL7 Table 0125 - Value type**

Value	Description	Comment
CWE	Coded Entry With Exceptions	For coded values, alternate coded values or with original text.
EI	Entity Identifier	For identifying specific instances of things such as genetic sequences.
NM	Numeric	For simple numeric values.
SN	Structured Numeric	For numeric ranges or inequalities.
ST	String Data.	For plain text.



**Program specific implementation note:**

**WS-AI Program:** The tests supported for this program have only numeric result values. Thus the only value supported for OBX.2 is “NM”.

**CSF Program:** The tests supported for this program have only numeric result values. Thus the only value supported for OBX.2 is “NM”.

**OBX.3 - Observation Identifier (CNE) - Required**

The Observation Identifier is a coded entry without exceptions (CNE) that unambiguously identifies the name of the specific observation for this segment. The coded values for this field come from the LOINC code system. The LOINC terminology subset provided by the NAHLN is the sole supported terminology for this field. The first component contains a LOINC code, the second component may contain the LOINC short name for the observation and the third component contains the code “LN” identifying the coding system as LOINC. This is a required field. Only the first three components representing the primary coding system are supported in NAHLN messages. In the unlikely event that no LOINC code can be obtained for an observation identifier, an extension LOINC code will be generated. The only acceptable codes are core LOINC and any extension LOINC codes.

Note that while this field has coding strength of CNE, the XML tag name is still "CWE" as discussed earlier in order to allow for interchangeability with a more relaxed schema of which this is a constraint.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	LOINC code for type of test.
2	199	ST	RE		Text	Textual description
3	20	ID	R	0396	Name of Coding System	Always LN for LOINC

An example of OBX.3 is shown below:

```
<OBX.3>
  <CWE.1>34487-9</CWE.1>
  <CWE.2>Influenza virus A RNA [Presence] in Unspecified specimen by Probe and target
  amplification method</CWE.2>
  <CWE.3>LN</CWE.3>
</OBX.3>
```

LOINC codes for results can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation\\_id](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation_id)

or in the individual program messaging guides provided by the NAHLN and available on the same website.

**Program specific implementation note:**

**WS-AI Program:** The CWE.1 field for this program must be valued using one of the following LOINC codes:

44263-2 - Influenza virus A RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

44264-0 - Influenza virus A H5 RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

44266-5 - Influenza virus A H7 RNA [Units/volume] (viral load) in Unspecified specimen by Probe and target amplification method

CWE.3 must be populated with "LN".

**CSF Program:** The population of the CWE.1 field for this program is not required; however, the allowed LOINC Code(s) are documented in the specific program requirements.

CWE.3 must be populated with "LN".

**OBX.4 Observation Sub-ID (ST) - Required or Empty**

This field is used to distinguish between multiple OBX segments with the same observation ID organized under one OBR. For example, a bacterial identification panel that involves a series of specific tests that lead to a final interpretation of the ID of the organism or a pathology report that includes both a gross and microscopic impression. By putting a 1 in the Sub-ID of the first of these OBX segments, 2 in the second, and 3 in the third, we can uniquely identify each OBX segment for editing or replacement.

Decimal delimited forms can be used to relate observations such as a microorganism identified (1) with antibiotic susceptibilities (1.1, 1.2, 1.3, etc.)

Example OBX.4:

```
<OBX.4>1.2</OBX.4>
```

**OBX. 5 - Observation Value (Varies) - Conditional or Empty**

The Observation Value field contains the value for the observation identified in OBX.3. The data type for this field is specified in OBX.2. When valued this observation will be sent as a Numeric type (NM), a Coded Entry (CWE or CNE xml encoded as a CWE tag), a String (ST), or a Structured Numeric (SN). Other data types may be added in future versions if the need arises. Single value numeric results may be reported in the Numeric data type (NM); ranges, inequalities, etc., shall be reported in structured numeric (SN). When the value is a nominal result that comes from a list of values, such as organisms, or other coded concepts, it shall be sent as a CWE (or CNE) datatype. For the NAHLN, the allowed values for each LOINC code with nominal results will be provided in value set tables from the NAHLN terminology service.

For quantitative tests (LOINC scale of "Qn" etc.) in which only the interpretation is reported OBX.5 may be omitted and only OBX.8 sent or OBX.5 may be populated with a flavor of null such as "MASK." However, the NAHLN preferred way of messaging only interpretation is with an ordinal LOINC code.

An example of OBX.5 as a structured numeric is shown below. This example shows how to send a titer value of 1:40:

```
<OBX.5>
  <SN.2>1</SN.2>
```

```
<SN.3>:</SN.3>
<SN.4>40</SN.4>
</OBX.5>
```

An example of OBX.5 as a numeric value is shown below.

```
<OBX.5>34.5</OBX.5>
```

#### NAHLN Specific Usage:

Agglutination titers are sometimes reported as “incomplete agglutination at ...” This is interpreted as the titer is somewhere at or slightly less than the indicated dilution. Thus the less than or equal symbol is used for the “comparator.” This is not strictly mathematically valid. But because of common usage when reporting these titers we use a symbol combined with the dilution at which the incomplete agglutination was observed.

Thus “Incomplete agglutination at 1:32” would be messaged as:

```
<OBX.5>
  <SN.1><=</SN.1>
  <SN.2>1</SN.2>
  <SN.3>:</SN.3>
  <SN.4>32</SN.4>
</OBX.5>
```

**Conditionality:** This field must be populated if Result Status (OBX.11) equals Final (“F”) and the OBX.8 field is not valued. If Result Status equals “X” (no result available) this field may empty, or the tags not sent.

#### Program Specific Constraints:

CSF – For all NAHLN approved analyses to be reported for the CSF program, the value in OBX.5 shall be a numeric result (e.g. a Ct value).

WS-AI – For all NAHLN approved analyses to be reported for the WS-AI program, the value in OBX.5 shall be a numeric result (e.g. a Ct value).

#### Implementation Specific Issue:

For Orion Rhapsody implementations, this field presents problems because its Symphonia mapper does not understand the XML standard “mixed” attribute that allows either elements *or* text data inside OBX.5 One solution is to create separate derived schemas one for compound elements (CWE, EI and SN types) and another for simple elements (NM and ST types). The resulting messages from either will be valid against the standard schema.

## OBX.6 - Units (CNE) - Conditional

OBX.6 is a Conditional field - any OBX segment with a value of NM in OBX.2 except unitless counts shall have units associated with it. Units are to be supplied as a coded entry (CNE) data type. The default coding system consists of the ISO abbreviation for a single case unit (ISO 2955-83) plus extensions that do not collide with ISO abbreviations. We designate this coding system as either ISO+ or UCUM.<sup>18</sup> The ISO+ abbreviations are the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations

<sup>18</sup> <https://ucum.nlm.nih.gov/>

need to be sent. The Uniform Code for Units of Measure (UCUM) system of units is rapidly overtaking ISO+ and may at some point replace it in the NAHLN standard.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	R		Identifier	Units abbreviated in ISO or ANSI standard abbreviation or Uniform Code for Units of Measure (UCUM) code. Local codes for pseudo units such as S/P, Ct, etc.
2	199	ST	RE		Text	Textual description
3	20	ID	R	0396	Name of Coding System	Either ISO for metric units or ANS+ for "English" units, or UCUM for more current units. Or L for local codes.

An example of OBX.6 is shown below:

```
<OBX.6>
  <CWE.1>G</CWE.1>
  <CWE.2>gram</CWE.2>
  <CWE.3>ISO</CWE.3>
</OBX.6>
```

### OBX.8 - Abnormal Flags (IS) - Conditional or Empty

This field contains a value representing the categorical interpretation of a quantitative result value in OBX.5. This field is required or empty, but it is strongly recommended that this value be sent when applicable. The NAHLN approved values that may be sent in this field are defined in the user defined table 0078 - Abnormal flags. In the past, this field was used to convey results that were outside the normal ranges for specific observations. Over the years it has evolved to the point where it is used as an interpretation field. For example, a Ct value in OBX.5 could be interpreted as Detected, Not Detected, Non-negative or Indeterminate in this field.

This is the interpretation of the individual value in this test. It is *not* a case classification, diagnosis, etc. Many testing programs use high sensitivity tests for screening in which a positive test triggers a case classification of "suspect," "potential positive," "presumptive positive," etc. In that case the value here should be "POS." For some programs this must be sent as NNEG (or not messaged at all).

Borrowing from version 2.8, this field can also be used to convey conditions related to the result or non-result. "This field may also be used to convey an assessment of an observation where no legitimate result may be obtained. This includes laboratory assays that are rejected due to the presence of interfering substances, specimen toxicity or failure of quality control."

An example of OBX.8 is shown below:

```
<OBX.8>IND</OBX.8>
```

**Conditionality:** This field must be populated if Result Status (OBX.11) equals final and the OBX.5 field is not valued. If Result Status equals "X" (no result available) this field may empty, or the tags not sent.

#### HL7 User Defined Table 0078

POS	Positive
NEG	Negative
IND	Indeterminate
S	Susceptible
R	Resistant
I	Intermediate susceptibility
QCF	Quality control failure
AC	Anticomplementary
ILF	Insufficient Lymphoid Follicles
...	...

**OBX.11 - Observation Results Status (ID) - Required**

This is a required field that is an ID data type indicating whether the result is final, preliminary, etc. Since only final results will be transmitted to NAHLN the majority of the time the value of this field will be “F” for “final.” This release of the NAHLN does not support corrected results. This will change in future releases. Values for this field come from HL7 Defined Table 0085. As of this release of the NAHLN, only the " F" "C" and "X" codes are supported.

An example of OBX.11 is shown below:

<OBX.11>F</OBX.11>

HL7 Table 0085

F	Final results; Can only be changed with a corrected result.
C	Corrected result.
X	Results cannot be obtained for this observation

In the future and in more relaxed use outside of NAHLN two additional values may be supported. Note that the word "Preliminary" in this context refers to the individual observation value being preliminary and subject to change based on further validation, rather than preliminary accession status indicating additional testing remains to be done.

HL7 Table 0085 (additional future values)

P	Preliminary result. Still requires validation and finalization.
---	---

**OBX-14 Date/Time of the Observation (DTM) - Required or Empty**

This field represents the physiologically relevant date-time or the closest approximation to that date-time. In the case of tests performed on specimens, the relevant date-time is the specimen’s collection date-time. In the case of observations taken directly on the patient (e.g., history/clinical signs), the observation date-time is the date-time that the observation was performed.

It is only necessary for observations where the physiologically relevant time is not included as part of the request such as the specimen collection datetime. Need for this field is rare in NAHLN usage.

Example of OBX.14

<OBX.14>20050822-0800</OBX.14>

### OBX-16 Responsible Observer (XCN) - Required or Empty

This field contains the identifier of the individual directly responsible for the observation (i.e., the person who either performed or verified it). In a laboratory, the observer is the technician who performed or verified the analysis. The code for the observer is recorded as a CWE data type.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	15	ST	O		ID Number	The identifier assigned to the responsible observer.
2	194	FN	O		Family Name	The surname of the observer.
3	30	ST	O		Given Name	The first name of the observer.
4	30	ST	RE		Second and Further Given Names or Initials Thereof	Middle name or initial of the responsible diagnostician.
5	20	ST	RE		Suffix (e.g., JR or III)	Jr, III, etc.
9	227	HD	O	0363	Assigning Authority	The assigning authority for the identifier in XCN.1

#### OBX.16.9 Assigning Authority (HD) - Conditional

An Assigning Authority component shall be provided for the ID given. Assigning authorities are provided in the form of an HD data type, and consist of a NamespaceID, Universal ID and Universal ID type as described in **Note on Identifiers and Their Assigning Authorities**.

#### OBX.17 - Observation Method (CWE) - Conditional

This field is a coded entry (CWE) for the specific method used in the observation. It is generally used to convey details of the method that are too specific to be of interest to the clinician or epidemiologist but are important at the laboratory or laboratory network level.

The NAHLN terminology service provides a set of OIDs representing the approved or validated methods that will be accepted for programs currently supported by the NAHLN. In cases where the NAHLN has required approved methods to be used in sample analysis, the OID for the specific approved method will be valued in the first component, the test description of the method in the second component and the assigning authority (ISO) in the third component.

In many—now *most*—cases no additional method code is needed and this field is omitted. Program-specific guidance will make clear when OBX.17 is required.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	20	ST	RE		Identifier	Identifier in a coding system such as NAHLN Method OIDs.
2	199	ST	RE		Text	Method description
3	20	ID	RE	0396	Name of Coding System	Coding system used to assign Observation Method identifier. When an OID is used, the value for this field would be ISO.
4	20	ST	CE		Alternate Identifier	Local code for method
5	199	ST	CE		Alternate Text	Local coding system text for method
6	20	ID	CE	0396	Name of Alternate Coding System	L for local code
9	199	ST	C		Original Text	Method description as recorded in source system.

An example of OBX.17 is shown below:

```
<OBX.17>
  <CWE.1>2.16.840.1.113883.3.5.1.2.8.9</CWE.1>
  <CWE.2>CAHFS Exotic Avian Paramyxovirus 1 RRT PCR</CWE.2>
  <CWE.3>ISO</CWE.3>
</OBX.17>
```

Method OID codes can be found at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation\\_method](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation_method)

Or by looking up in the right hand column of the observation LOINC code list at

[http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation\\_id](http://vtsl.vetmed.vt.edu/nahln/main.cfm?page=subset&subset=observation_id)

#### **Program Specific Constraints:**

**CSF Program:** For all NAHLN approved analyses to be reported for the CSF program, the method code must be supplied in OID format. See the program documentation and the terminology services web site for appropriate values

**WS-AI Program:** For all NAHLN approved analyses to be reported for the WS-AI program, the method code must be supplied in OID format. See the program documentation and the terminology services web site for appropriate values

### **OBX.18 Equipment Instance Identifier (EI) - Required or Empty**

This field identifies the Equipment Instance (e.g., Analyzer, Analyzer module, group of Analyzers) responsible for the production of the observation. It does not represent the type of equipment used in the analysis, but is the local identifier assigned by an institution to the specific piece of equipment used to create the observation value. It would most likely be populated with either a serial number or a local inventory control number. There are currently no NAHLN use cases.

Rarely if ever used.

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS
1	199	ST	R		Entity Identifier	The equipment ID assigned to this device.
3	199	ST	R		Universal ID	OID for the organization that assigned the entity identifier. For example, the OID for NVSL
4	6	ID	R	0301	Universal ID Type	The identifier type of the universal ID. This should be ISO (ISO OID)

Example OBX.18:

```
<OBX.18>
  <EI.1>98-01-1231312</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
  <EI.4>ISO</EI.4>
</OBX.18>
```

### OBX.19 - Date/Time of the Analysis (DTM) - Required or Empty

This field contains the date/time the analysis was performed. This field is a Date/Time (DTM) data type and is Required or Empty. It is used to communicate a timestamp added by equipment used in analysis. Need for this field is rare in NAHLN usage unless it helps track instrument records, etc. It differs from OBR.22 in being the time the machine made the measurement rather than the time the technician confirmed that measurement.

An example of OBX.19 is shown below:

```
<OBX.19>200508231532-0800</OBX.19>
```

### OBX.21 - Observation Instance Identifier (EI) - Required

This field is used to differentiate individual instances of the same observation on the same specimen. Its main function is to distinguish the case when the same observation is resent or corrected from that in which a new observation is made in the same order such as when a test is repeated due to some issue with testing discovered after recording the first observation. It would most likely be populated by a system primary key on a result table. It need not be human readable.

This field remains "optional" (Required or Empty) in the schema for backward compatibility. However, experience is demonstrating that this is a critical piece of information for sorting out duplications, facilitating corrections, etc. Any new implementations **absolutely should populate this field.**

An example of OBX.21 is shown below:

```
<OBX.21>
  <EI.1>R12345-23</EI.1>
  <EI.3>2.16.840.1.113883.3.5.1.2</EI.3>
  <EI.4>ISO</EI.4>
</OBX.21>
```



## Acknowledgment Message ACK

The HL7 specification provides a message structure that is intended to communicate back to the user any errors that were encountered during processing. This message structure is of type ACK (Chapter 2, HL7 version 2.6) and has been customized for NAHLN (NAHLN\_ACK). In this mode, a single acknowledgment message is returned to the sender to indicate successful receipt of the message or one of a small range of error conditions.

Message Acknowledgment varies slightly when messaging via a router. When messages pass through a store-and-forward router, the router can only acknowledge committing the message to its local storage. It cannot guarantee that the final recipient will be able to successfully process the contents. Thus, the system now supports Commit Acknowledgment as well as both synchronous and asynchronous Application Acknowledgment.

Both types of NAHLN\_ACK message structure consist of the following segments: Message Header (MSH), Message Acknowledgment (MSA), and Error (ERR). Details on the individual segments and fields within each segment can be found in the NAHLN\_ACK conformance profile.

### ACK Message Structure

<u>ACK^R25^ACK_R25</u>	<u>General Acknowledgment</u>	<u>Chapter</u>	<u>NAHLNS Usage</u>
MSH	Message Header	2	Required
MSA	Message Acknowledgment	2	Required
[{ ERR }]	Error	2	Used in case of errors

### Message Header Segment (MSH)

The structure of the Message Header is the same as the MSH in the OPU\_R25 message. The following discussion addresses the relationship of each field to those in the original message.

See MSH Segment structure table in the OPU message section above.

### MSH.1 and MSH.2 Field Separator and Encoding Characters

These can be copied directly from the incoming message as they are retained only for compatibility with the traditional “pipe” encoding method.

### MSH.4 Sending Facility

The sending facility of the Acknowledgment message is the same as MSH.6 in the original message.

### MSH.6 Receiving Facility

The receiving facility of the Acknowledgment message is the same as MSH.4 in the original message.

## MSH.7 Date/Time of Message

This is the date/time of the Acknowledgment message. In most cases of connection-based messages, this will be within at most seconds of the date/time of the original message. In store and forward based systems, it may be significantly later.

## MSH.9 Message Type

This field identifies the specific message type and structure. For this guide all messages are ACK, all events are R25, and all resulting message structures are ACK\_R25. So the value of this field is always

```
<MSH.9>
  <MSG.1>ACK</MSG.1>
  <MSG.1>R25</MSG.1>
  <MSG.3>ACK_R25</MSG.3>
</MSH.9>
```

## MSH.10 Message Control ID

This is the message control ID of the Acknowledgment message. It is a unique identifier generated by the receiving (NAHLN repository or NAHLN Message broker) system and used to uniquely identify the Acknowledgment itself.

## MSH.11 Processing ID

The processing ID is the same as that of the original message and may be copied directly from MSH.11.

## MSH.12 Version ID

The version ID of all messages covered by this guide will be 2.6. It can be copied directly from the original message's MSH.12 or defaulted.

## Message Acknowledgment Segment (MSA)

The Message Acknowledgment segment contains the information needed by the sending facility to match up the acknowledgment to the original message in its system and to determine the result of the transmission.

SEQ	DT	OPT	RP/#	TBL#	ELEMENT NAME
1	ID	R		0008	Acknowledgment Code
2	ST	R			Message Control ID

## MSA.1 Acknowledgment Code

This is a coded item for the HL7 Table with one of three codes: "AA" indicates successful acceptance of the message. "AR" indicates rejection of the message. Messages may be rejected either because they are a message type, structure or processing ID that the system does not accept or because of internal issues unrelated to message structure such as database failure. "AE" indicates an error in the message structure or content. Additional acknowledgement codes will be supported in the future if necessary.

HL7 Table 0008

AA	Original mode: Application Accept - Enhanced mode: Application
----	--

	acknowledgment: Accept
AE	Original mode: Application Error - Enhanced mode: Application acknowledgment: Error
AR	Original mode: Application Reject - Enhanced mode: Application acknowledgment: Reject
CA	Enhanced mode: Accept acknowledgment: Commit Accept
CE	Enhanced mode: Accept acknowledgment: Commit Error
CR	Enhanced mode: Accept acknowledgment: Commit Reject

## MSA.2 Message Control ID

This is the Message Control ID from the message header of the original message. It is copied directly from MSH.10 of the incoming message. It is used by the original sending system to match the acknowledgment message to the original submission message.

## Error Segment (ERR)

The error segment allows return of detailed error information to allow the sending facility to debug their application. It will occur in messages returning an “AE” or “CE” Acknowledgment Code and is used to convey the details of any errors detected. ERR segments may be used with “AA” Acknowledgment Codes to convey information that does not prevent processing but that senders need to address. Early implementations simply sent the output from validating XML parser or stack traces from databases. Future implementations may provide additional error diagnostic information.

SEQ	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	CWE	R		0357	HL7 Error Code
4	ID	R		0516	Severity
7	TX	R			Diagnostic Information

## ERR.3 HL7 Error Code

The type of error is provided as a coded entry with exceptions. The possible values are provided in HL7 Table 0357.

**HL7 Table 0357 - Message error condition codes**

Value	Description	Comment
0	Message accepted	Success. Optional, as the AA conveys success. Used for systems that must always return a status code.
100	Segment sequence error	Error: The message segments were not in the proper order, or required segments are missing.
101	Required field missing	Error: A required field is missing from a segment
102	Data type error	Error: The field contained data of the wrong data type, e.g. an NM field contained “FOO”.
103	Table value not found	Error: A field of data type ID or IS was compared against the corresponding table, and no match was found.
200	Unsupported message type	Rejection: The Message Type is not supported.
201	Unsupported event code	Rejection: The Event Code is not supported.
202	Unsupported processing id	Rejection: The Processing ID is not supported.
203	Unsupported version id	Rejection: The Version ID is not supported.

Value	Description	Comment
204	Unknown key identifier	Rejection: The ID of the patient, order, etc., was not found. Used for transactions <i>other than</i> additions, e.g. transfer of a non-existent patient.
205	Duplicate key identifier	Rejection: The ID of the patient, order, etc., already exists. Used in response to addition transactions (Admit, New Order, etc.).
206	Application record locked	Rejection: The transaction could not be performed at the application storage level, e.g., database locked.
207	Application internal error	Rejection: A catchall for internal errors not explicitly covered by other codes.

Because the NAHLN uses the v2.xml encoding, most of the possible errors will be detected by a validating XML parser using the schema definitions provided by the IT committee. The trick will be translating the error thrown by the parser into the correct HL7 format error. This is not simply an academic exercise. It will be important for sending facilities using commercial HL7 tools. However, for NAHLN it will be acceptable to return 207 “Application internal” as the error code, and include the diagnostic output of the XML parser as ERR.7 “Diagnostic Information.”

### ERR.4 Severity

This coded value for HL7 table values is used to differentiate warnings from errors. Most errors use “E” for error. Warning and Information can be used with “AA” codes to carry information such as upcoming password expiration dates.

HL7 Table 0516 – Error severity

Value	Description	Comment
W	Warning	Transaction successful, but there may issues
I	Information	Transaction was successful but includes information e.g., inform patient
E	Error	Transaction was unsuccessful

### ERR.7 Diagnostic Information

This is a text (TXT) field for application level information to help with diagnosis of the problem by the sending facility. For validating XML parsers that produce useful error descriptions, those descriptions will be returned in this field.

Experience has shown that XML parser output is inadequate for many laboratory users to find the cause of errors. Moving forward, it is best practice to include more human-readable description of the specific error(s) here.

## Appendix A: XML Encoding

As of the summer of 2003, the HL7 Version 2 XML Encoding Syntax has been an official standard. All messages, segment groups, segments, fields, components, and subcomponents are represented as XML elements. The data type is represented as a fixed attribute of each element (that is, it is derived from the DTD or schema file.) These elements form a natural hierarchy that follows the hierarchical message definition from the standard.

Tag names are automatically derived from the positional definition of each element in the original encoding format. This is less human-friendly but more likely to remain 100% compatible with the rest of HL7.

The basic NAHLN Result Message has been encoded in customized schemas to allow simple validation of message structure and some content. It is *highly* recommended that a validating XML editor be used when debugging any NAHLN messaging system. Interpretation of validation error messages will detect the vast majority of errors made by beginning message implementations. Once messaging is functioning well, validation may be superfluous and may be turned off.

The following is an example of an acknowledgment message showing acceptance of a submission message.

```
<?xml version="1.0" encoding="UTF-8"?>
<ACK_R25>
  <MSH>
    <MSH.1>|</MSH.1>
    <MSH.2>^~\&amp;</MSH.2>
    <MSH.4>
      <HD.1>A432L56</HD.1>
      <HD.2>2.16.840.1.113883.3.5.1.8</HD.2>
      <HD.3>ISO</HD.3>
    </MSH.4>
    <MSH.6>
      <HD.1>0038w50</HD.1>
      <HD.2>2.16.840.1.113883.3.5.1.3</HD.2>
      <HD.3>ISO</HD.3>
    </MSH.6>
    <MSH.7>20050324123606-0500</MSH.7>
    <MSH.9>
      <MSG.1>ACK</MSG.1>
      <MSG.2>R25</MSG.2>
      <MSG.3>ACK_R25</MSG.3>
    </MSH.9>
    <MSH.10>2731</MSH.10>
    <MSH.11>
      <PT.1>P</PT.1>
    </MSH.11>
    <MSH.12>
      <VID.1>2.6</VID.1>
    </MSH.12>
  </MSH>
  <MSA>
    <MSA.1>AA</MSA.1>
    <MSA.2>7615</MSA.2>
  </MSA>
</ACK_R25>
```

Note that data types appear in two forms, simple and complex. A simple data type can be represented as a single (#PCDATA) element. A complex data type contains, or can contain, more than one component.

When a field contains a single instance of a simple data type such as ST, ID or IS, the value alone is provided as a text (#PCDATA) entry. If the field contains a complex element, even if that element has only the first component populated, the element is displayed as a tag with its contents. Compare MSH.10 with MSH.11 for example.

Note also fields MSH.1 and MSH.2. These are holdovers from the vertical bar delimited form of HL7 where these fields define the delimiters for the rest of the message. Because this XML is a literal translation from the archetypical pipe delimited form these are retained as vestigial message elements. The ampersand subcomponent separator is interesting in that it requires escaping as an XML entity “&” in the XML.

## Validation

One of the great advantages of the XML encoding is that widely available tools for parsing and validating the syntax and structure (and some but not all content) of incoming messages may be used. Validation can be performed against either Document Type Definitions (DTDs) or Schemas (XSDs). The NAHLN uses only schemas. Information about the schema file used to create a particular message is to be included in the Profile ID field of the MSH segment (MSH.21).

To validate against Schemas, the schema location is either specified manually in the editor or other validating parser or associated with the namespace of the document in the root tag. Including an external link to the schema creates a small security weakness, so normally the receiving system assigns a local schema file for validation.

## Location of Schemas

In most programming libraries, the schema location can be overridden in code to point to a local copy. The most current schema can be found at:

<https://vtsl.vetmed.vt.edu/nahln/Documents/NAHLNMessageSchemas/NAHLNResultBase.xsd>

Message validation may occur in two places in the data flow. The sending application may validate against schemas to check its work prior to sending. On the receiving end, the receiver may validate against schemas as part or all of its message integrity checking. Because the sending application cannot know for certain what type of validation the receiver is going to apply it should not specify the Schema in the transmission.

## Namespaces

The NAHLN violates the HL7 XML encoding standard in one small way. The content of the NAHLN message is carried in the default namespace (noNamespace). It should really be in a namespace defined by HL7. Because this added complexity without immediate value, it was omitted. Note however that at some point in the future, there may be minor changes to the root element definition to include a namespace declaration. This will only affect the second line of the message.

## Appendix B: Full Sample Message

The following is a sample of a message reporting final test results based the NAHLN result message version 1.0.5. Please note that the values provided in this message are for illustration purposes only. Relevant codes (LOINC, SNOMED, etc.) and identifiers for your local messages will need to be determined and used in the messages. .

```
<?xml version="1.0" encoding="UTF-8" ?>
<OPU_R25>
<MSH>
  <MSH.1>|</MSH.1>
  <MSH.2>^~\&amp;</MSH.2>
  <MSH.3>
    <HD.1>STRLMS</HD.1>
    <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
    <HD.3>ISO</HD.3>
  </MSH.3>
  <MSH.4>
    <HD.1>0031s80</HD.1>
    <HD.2>2.16.840.1.113883.3.5.6.1.4</HD.2>
    <HD.3>ISO</HD.3>
  </MSH.4>
  <MSH.6>
    <HD.1>987JF20</HD.1>
    <HD.2>2.16.840.1.113883.3.5.6.1.4</HD.2>
    <HD.3>ISO</HD.3>
  </MSH.6>
  <MSH.7>200812190810-0800</MSH.7>
  <MSH.9>
    <MSG.1>OPU</MSG.1>
    <MSG.2>R25</MSG.2>
    <MSG.3>OPU_R25</MSG.3>
  </MSH.9>
  <MSH.10>1003456</MSH.10>
  <MSH.11>
    <PT.1>P</PT.1>
  </MSH.11>
  <MSH.12>
    <VID.1>2.6</VID.1>
  </MSH.12>
  <MSH.21>
    <EI.1>NAHLNResultBaseV1_0_5</EI.1>
    <EI.3>2.16.840.1.113883.3.5.9</EI.3>
    <EI.4>ISO</EI.4>
  </MSH.21>
</MSH>
<PV1>
  <PV1.2>C</PV1.2>
  <PV1.7>
    <XCN.1>VET001</XCN.1>
    <XCN.2>
      <FN.1>Vet</FN.1>
    </XCN.2>
    <XCN.3>Joe</XCN.3>
    <XCN.4>B.</XCN.4>
    <XCN.9>
      <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
      <HD.3>ISO</HD.3>
    </XCN.9>
  </PV1.7>
  <PV1.19>
    <CX.1>D0800675</CX.1>
    <CX.4>
      <HD.2>2.16.840.1.113883.3.5.1.2</HD.2>
      <HD.3>ISO</HD.3>
    </CX.4>
  </PV1.19>
</PV1>
<ROL>
  <ROL.1>
    <EI.1>232345</EI.1>
    <EI.3>2.16.840.1.113883.3.5.6.2</EI.3>
    <EI.4>ISO</EI.4>
  </ROL.1>
  <ROL.2>UC</ROL.2>

```

```

<ROL.3>
  <CWE.1>SUB</CWE.1>
  <CWE.2>Submitter</CWE.2>
  <CWE.3>HL70443</CWE.3>
</ROL.3>
<ROL.4>
  <XCN.1>GIB001</XCN.1>
  <XCN.2>
    <FN.1>Gibson</FN.1>
  </XCN.2>
  <XCN.3>Henry</XCN.3>
  <XCN.4>T.</XCN.4>
  <XCN.5>Jr.</XCN.5>
  <XCN.9>
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## Appendix C: Example OID Tree

The Object Identifier hierarchy shown below is an example hierarchy that shows both the external hierarchy of the AAVLD root OID as well as the hierarchy assigned by a single laboratory under their root. Not all laboratories will need or want to create such a complete system as you see here under the CAHFS Partner arc, but it is available if it helps with management.

