

# Using Mirth to Transform HL7 v2.x into ELINCS (v.HL7-R1)

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## Revision History

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2008-08-24		Transformer for ELINCS version 2.5.1
2008-09-03	b	Transforming HL7 v2.3 Into v2.5.1 (ELINCS)
2008-09-12	c	Using Mirth to Transform HL7 v2.x into v2.5.1 (ELINCS)
2008-09-15	d	Using Mirth to Transform HL7 v2.x into v2.5.1 (ELINCS)
2008-09-16	e	Using Mirth to Transform HL7 v2.x into v2.5.1 (ELINCS)
2008-09-17	f	Using Mirth to Transform HL7 v2.x into v2.5.1 (ELINCS)
2008-09-18	g	Using Mirth to Transform HL7 v2.x into v2.5.1 (ELINCS)
2008-11-11	h	Using Mirth to Transform HL7 v2.x into ELINCS (v.HL7-R1)
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## 1. Introduction

The EHR-Laboratory Interoperability and Connectivity Specification (ELINCS) is a messaging system intended to standardize the electronic reporting of test results from clinical laboratory information systems (LIS) to electronic health record (EHR) systems.

### 1.1. Purpose and Scope

The Mirth Project open source integration engine can transform an HL7 compliant message into an ELINCS v2.5.1 compliant message. The Mirth channel performs a sequence of validation tests on the incoming message and transforms individual fields as needed to produce an ELINCS v2.5.1 compliant message. Any required fields which are missing or invalid will be reported in the log file.

### 1.2. References

EHR-Laboratory Interoperability and Connectivity Specification v2.5.1

ELINCS EDGE tool v1.1

HL7 Specification v2.5

### 1.3. Assumptions

The Mirth ELINCS transformation channel assumes that the incoming message is a generic HL7 v2.x compliant message. In addition, the incoming message must include the necessary information for all ELINCS required fields in order for the transformation to be successful (ELINCS compliant).

## 2. Specifications

### 2.1. ELINCS Use Case

The ELINCS specification addresses the following use case for the reporting of laboratory results to EHR applications.

- A laboratory order is entered into an ambulatory EHR system by a clinician
- The EHR system generates a lab requisition that is communicated to the clinical laboratory
- The information from the order requisition is manually entered or electronically imported into the laboratory information system (LIS) of the laboratory
- The specimen(s) required for the order are made available to the laboratory
- The laboratory performs or attempts to perform the ordered tests
- Information regarding the status and results of the ordered tests is electronically transmitted to the EHR system that generated the lab requisition

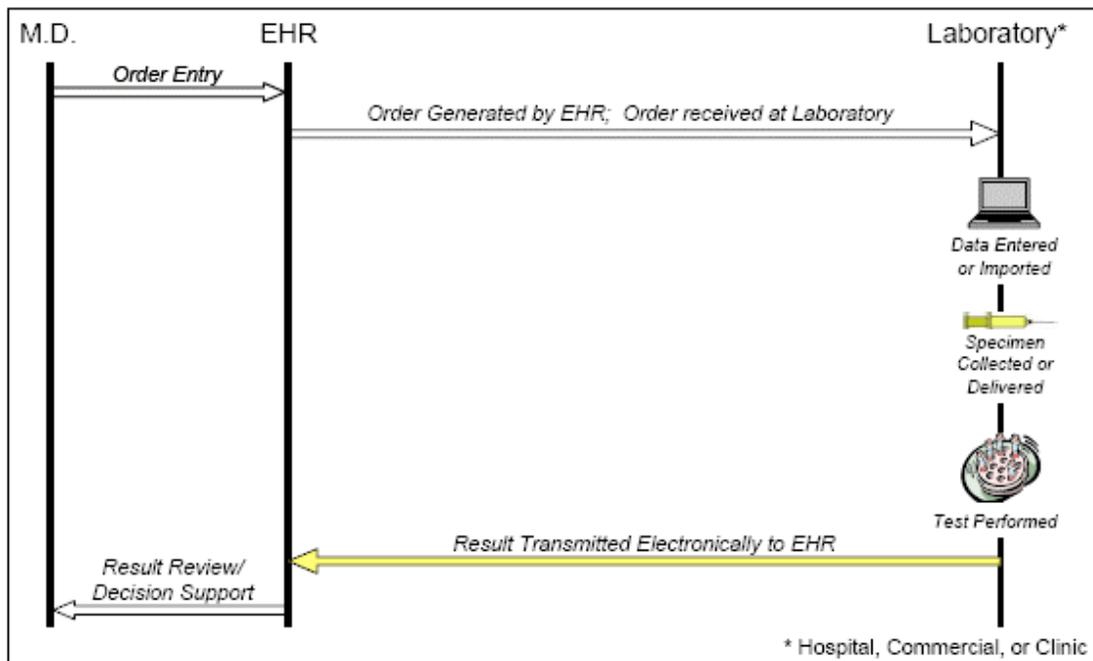


Figure 2.1: The general use case supported by the ELINCS Specification

The ELINCS use case is general and encompasses a number of typical scenarios:

- A paper lab requisition is given to a patient in the physician's office. The patient travels to a lab facility, where she presents the order for processing and where a specimen is collected.
- A paper lab requisition is given to a patient in the physician's office. The patient travels to a lab facility, where she presents the order for processing and where a specimen is collected.
- An electronic lab requisition is transmitted from the EHR system to the laboratory. A paper copy of the requisition is given to the patient. The patient travels to a lab facility, where she presents the order for processing and
- Other combinations of the elements in the above scenarios, as consistent with the assumptions of the ELINCS use case.

The ELINCS use case explicitly *does not* encompass the following scenarios:

- A lab result is electronically communicated from one EHR system to another EHR system, for example, in the course of referring a patient or transferring the care of a patient.
- Lab results are shared among entities participating in a regional data-sharing network, for example between a lab system and a regional data-sharing repository.
- Individual lab results include contextual information about the patient encounter to which they related, or other clinical information typically communicated in “continuity of care records” and similar documents.

## 2.2. HIE Use Case

The health information exchange (HIE) use case has three steps.

- A laboratory test result in a non-ELINCS file format is transmitted electronically from an LIS to an HIE
- The HIE transforms the non-ELINCS format into an ELINCS format
- The HIE transmits the ELINCS formatted test result to the clinician who ordered the test

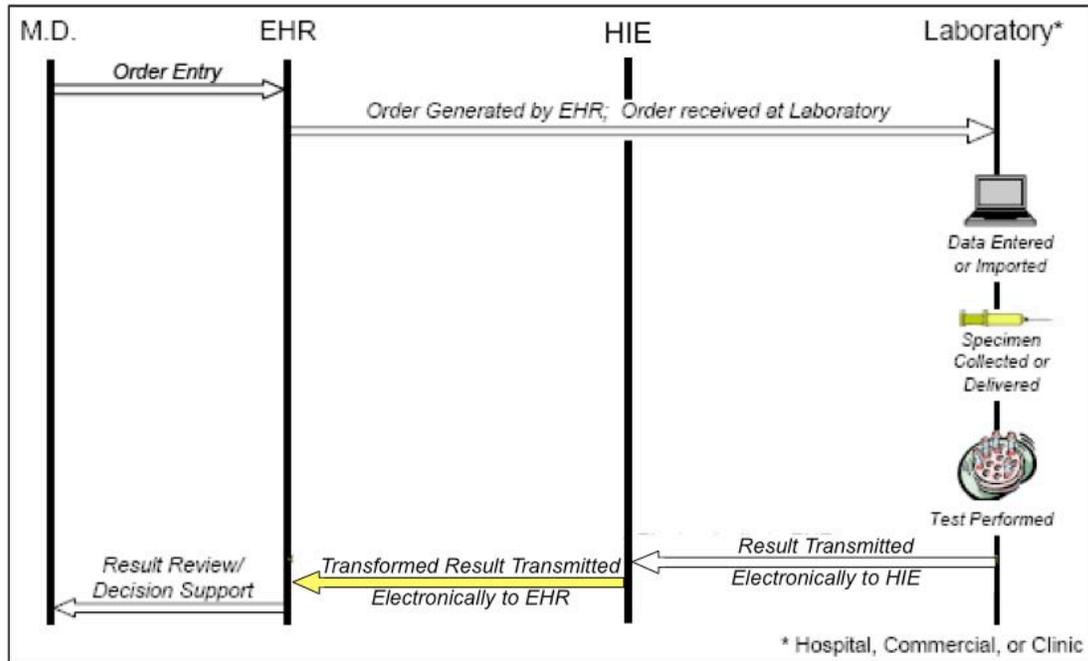


Figure 2.2: The ELINCS Specification adapted to the HIE use case

The HIE use case addresses the typical workflow of clinical data in the delivery of laboratory test results to ambulatory practices.

- A substantial percentage of ambulatory laboratory test results are produced as an outpatient service by laboratory departments in hospitals. The percentage varies by health service area; in some health markets a majority of test results are performed by local hospitals and not by commercial laboratories.<sup>1</sup>
- Most ambulatory practices order laboratory test results from more than one vendor
- Most ambulatory practices do not utilize an EHR to receive incoming laboratory test results

<sup>1</sup> A 2006 survey by Redwood MedNet of laboratory utilization among ambulatory practices in Lake and Mendocino counties in Northern California found that the five small rural hospital laboratories combined for a 62% market share of outpatient testing across the 5,000 square mile region.

These typical workflow conditions present an insurmountable barrier to the adoption of ELINCS as proscribed by the ELINCS use case, which is, unfortunately, incapable of scaling up to a critical mass in lab testing.<sup>2</sup> Compounding the structural deficiency of the current ELINCS use case are the following significant systemic resource constraints on the primary actors in lab test result delivery.

- LIS modules found in small hospitals are typically produced by a small software vendors lacking a credible incentive to adopt a standardized data feed (e.g., ELINCS)
- Small hospitals lack leverage over their LIS vendor to request an advanced output format (e.g., ELINCS), and if an LIS upgrade is sought the facilities may lack the budget to pay for a module capable of standardized data output<sup>3</sup>
- Small physician practices ordering tests lack leverage with small hospital labs to demand standardized data formats (e.g., ELINCS)

Even if small LIS vendors deployed ELINCS compliant software, the combination of small hospitals with limited IT resources plus small practices with, effectively, no IT resources will prevent adoption of the ELINCS standard. Fortunately, the HIE use case explicitly addresses these limitations.

- Unlike small hospitals or their LIS vendors, an HIE has a natural incentive to transform non-standard electronic file formats into standard formats such as ELINCS.
- Adoption of an ELINCS format for laboratory results delivery by an HIE addresses the complexity of “*n times n*” software installations by establishing a streamlined “*1 times n*” network topology for results delivery traffic channels
- Deployment of the ELINCS file specification within the topology of an HIE mitigates the ELINCS use case limitation against regional data sharing imposed by the v2.5.1 specification.
- Adding the HIE as a delivery service in the small hospital laboratory workflow increases the likelihood that a lab data stream can be expressed in ELINCS format because the HIE can transform a non-standard file into ELINCS format after receiving a result message from an LIS that lacks ELINCS capability.
- The HIE use case, which essentially enables on-the-fly transformation of non-ELINCS laboratory results into ELINCS results, can accelerate adoption of standard formats for clinical data across an entire health care community.

Without the presence of a standards champion such as an HIE at the center of a clinical community, it is unlikely that ELINCS adoption can reach a tipping point merely on point to point feeds from a few commercial laboratories to the limited installed base of EHRs. However, the Mirth tool kit now provides an HIE with the agility to transform non-standard HL7 v2.x messages into standard v2.5.1 (ELINCS) messages.

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<sup>2</sup> A 2006 survey by Redwood MedNet of laboratory utilization among ambulatory practices in Lake and Mendocino Counties in Northern California indicates that the ELINCS use case, if fully deployed, will deliver only 12% of lab tests to local practices due to the prevalence of practices with no EHR and the dominance of hospital laboratories with no ELINCS compliant data feed.

<sup>3</sup> One critical access rural hospital the Redwood MedNet region requires a \$40,000 field upgrade of their Meditech system to enable the LIS module to express LOINC values for each test

## 2.3. ELINCS Interaction Model

Based on the use case described in section 2.1, an interaction model may be defined for the ELINCS specification. Although messaging in the ELINCS specification is based on HL7 v2.5, the interaction model is based on the HL7 v3.0 methodology.

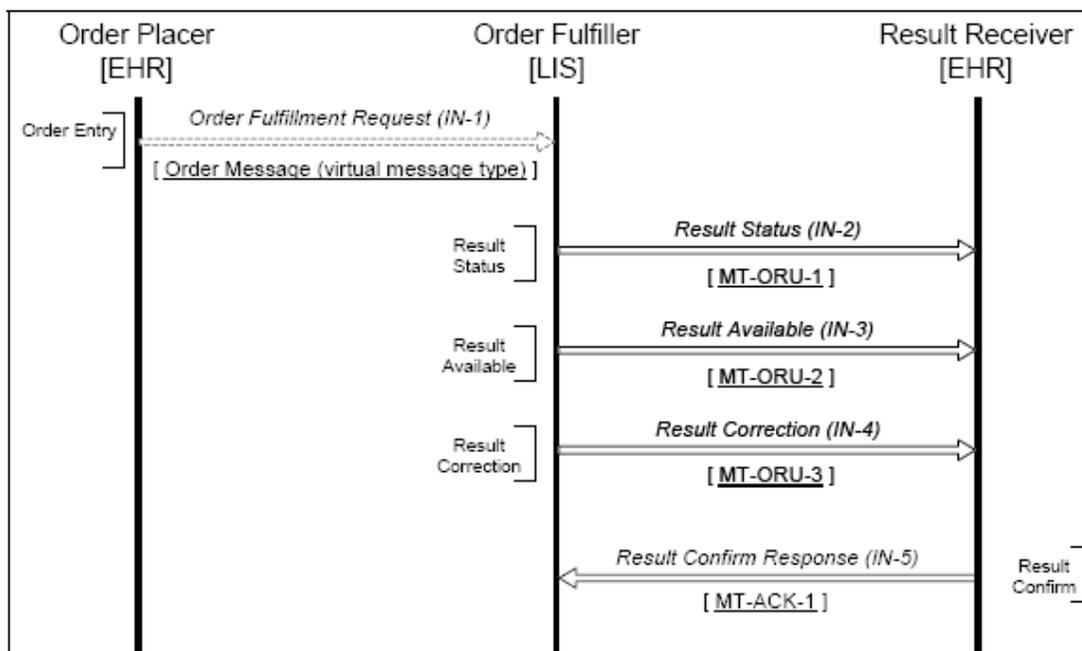


Figure 2.3 -- The ELINCS Interaction Model

The artifacts consist of a set of interactions, each of which describes a single, one-way electronic communication. The interactions are defined by the following set of components:

- **Trigger event:** The real-world event that causes the interaction to occur. For example, "Order Entered" or "Result Available".
- **Application roles:** The communicating systems or sub-systems at the sending and receiving end of the interaction. For example, "Order Placer" or "Order Fulfiller".
- **Message Type:** A precise specification of the rules that govern the construction of the message that is transmitted in the course of the interaction, including the specification of the required/optional fields and the contents of populated fields (with respect to structure, terminology and coding rules). The message types are based on existing HL7 v2.4 messages (such as the ORU message). An example ECLINCS message type is "MT-ORU-1".
- **Receiver Responsibilities:** The specification of subsequent actions that must be taken by the system in the receiving role of an interaction. For example, the initiation of additional messaging or the specific storing/processing of the data received.

### 3. Mirth Transformation Channel

A Mirth transformation channel can transform an inbound HL7 v2.x message into an outbound ELINCS v2.5.1 message. This can be accomplished in 6 separate transformation steps which validate the HL7 v2.3 message and convert it into a v2.5.1 (ELINCS) compliant message.

- Constants
- Default Maps
- Main Functions
- Segment Cleanup
- Validation
- Transformation

All errors and warnings encountered in any of the steps are written to the wrapper.log file.

#### 3.1. Constants

The *transformer\_constants* step contains various constants and lookup tables as defined by the ELINCS specification.

##### 3.1.1 clearUnusedFields

This variable, if set to true will clear any value in the HL7 message which is not supported by the ELINCS specification.

##### 3.1.2 Time zone offset constants

These represent constants which are predefined for the various time zones.

They include the following

Constant / Variable Name	Value
constant_EST	-0500
constant_CST	-0600
constant_MST	-0700
constant_EST	-0800

##### 3.1.2.1 defaultTimezoneOffset

Determines the default time zone offset to use for dates.

- The default value for this variable is set to constant\_PST

### 3.1.3 Message Type Variables

The message type variables are constants which represent the various types of HL7 messages. They include the following:

Constant	Description	Value
Constant_result_status	Result Status message type	MT-ORU-1
Constant_result_available	Result Available message type	MT-ORU-2

### 3.1.4 Lookup Maps

The lookup maps are used for validation processing to insure that only valid codes are entered in the various HL7 messages. They include the following:

Map Name	Description	Specification Ref.
map_specSourceCode	Specimen Source Codes	HL7 Table 0487 and 0353
map_processingID	Processing IDs	HL7 Table 0103
map_adminSex	Administrative Sex	HL7 Table 0001
map_univTypeID	Universal Type IDs	ELINCS Table 0362
map_codingSystem	Coding Systems	ELINCS Table 0396
map_specimenActionCode	Specimen Action Codes	HL7 Table 0065
map_observedResultStatusCode	HL7 Table 0065	HL7 Table 0085
map_obrResultStatus	OBR-25 Result Status (ID)	7.5.13
map_obxValueType	OBX-2 Value Type (ID)	7.8.3

### 3.2. Default Maps

The *transformer\_default\_maps* transformer step is used to populate default values for various segments of the HL7 message.

#### 3.2.1 Default Producer Information

If any of the default producer information fields are not set, the transformer will assign a default value from the associated *siteInfo* field. For example, if the *address1* field is not set for any given producer, the *address1* in the *siteInfo* will be used as a default value for this producer.

#### 3.2.2 Global Authority ID

If the global authority ID is not set, the default value of “CLIA” is used.

#### 3.2.3 MSH Segment

The following default values will be used for the MSH segment(s):

Message Segment	Default Value
MSH-4.1	Sending Facility Local ID (ST)
MSH-4.2	Sending Facility Universal ID (ST)
MSH-4.3	Sending Facility Universal ID Type (ID)

#### 3.2.4 OBR Segment

The following default values will be used for the OBR segment(s):

Message Segment	Default Value
OBR-3.1	GUID (universal unique ID) if it is blank
OBR-3.3	Sending Facility Universal ID (ST)
OBR-3.4	Sending Facility Universal ID Type (ID)
OBR-4.3	local lab coding system (“99Lab”)
OBR-11.1	Specimen Action Code (“L” Lab Obtained from patient)
OBR-20.1	(“RO”)

### 3.2.5 OBX Segment

The following default values will be used for the OBX segment(s):

Message Segment	Default Value
OBX-3.3	local lab coding system ("99Lab")
OBX-11.1	Observation Result ("F" Final)
OBX-23.1	Sending Facility Universal ID Type (ID)
OBX-23.7	local lab coding system ("99Lab")
OBX-23.10	globalFacilityId
OBX-24.1	siteInfo address1
OBX-24.2	siteInfo locality
OBX-24.3	siteInfo region
OBX-24.4	siteInfo postalcode

## 3.3. Main Functions

The *transformer\_main\_functions* contains common functions which are called from other transformer steps during the transformation process.

### 3.3.1 logMessageError

Description: Logs an error message

Inputs: error message text

Outputs: none

### 3.3.2 determineMessageType

Description: determines the message type (e.g. Result Status, Result Available) based on the result status code in segment OBR.25.1)

Inputs: none

Outputs: messageType (as defined in transformer\_constants / MessageTypes - 3.1.3)

### 3.3.3 isValidElincsDate

Description: Determines if the specified date is in a proper Elincs compliant date format.

Inputs: date field text

Outputs: true/false

### 3.3.4 formatTSTimeZone

Description: If no timezone is specified for a given date field, the defaultTimeZone is appended to the date field text as specified (as defined in transformer\_constants – 3.1.2.4)

Inputs: date field text

Outputs: date field text w/appended defaultTimeZone if not present

### 3.3.5 formatTS

Description: if seconds do not exist, it appends “00” to the seconds field. Additionally, if no time zone exists, it appends the defaultTimeZone to the date field text as specified (as defined in transformer\_constants – 3.1.2.4)

Inputs: date field text

Outputs: date field text w/appended seconds and/or defaultTimeZone if not present

### 3.3.6 deleteSegment

Description: removes a segment from the HL7 message

Inputs: segment name, id, subid, segment number, \*removeElementsAfter flag)

Outputs: none

\*note: if removeElementsAfter flag is set to true, all nested segments after this segment will also be removed.

### 3.3.7 isEmpty

Description: determines if the associated field is empty

Inputs: segment name, id, subid

Outputs: true/false

**3.3.8 isEmptySegment**

Description: determines if the associated segment is empty

Inputs: segment name, id, subid, segment number

Outputs: true/false

**3.3.9 isEmptySubComponent**

Description: determines if the associated subcomponent is empty

Inputs: segment name, id, subid, subcomponent

Outputs: true/false

**3.3.10 isEmptySegmentSubComponent**

Description: determines if the associated segment subcomponent is empty

Inputs: segment name, id, subid, segment number, subcomponent

Outputs: true/false

**3.3.11 showValidValues**

Description: n/a – this method is not currently in use

### 3.4. Segment Cleanup

The *transformer\_seg\_obr-15.1\_cleanup* step is used to change existing values for certain OBR message segments to valid ELINCS compliant values as defined in the ELINCS specification.

#### 3.4.1 OBR 15.1

Any of the following values present in OBR-15.1 are converted as shown.

Original Value	Converted Value
STOOL	STL
WOUND	WND
FLUID	FLU
MOUTH	SAL
ARM	BLDV
ABLD	BLDA
REC	STL
VAG	GENV
SKIN	SKN
THROA	THRT
GB or MISC	ORH

## 3.5. Validation

The *transformer\_messages\_validation* step is used to change existing values for certain message segments into valid ELINCS compliant values as defined in the ELINCS specification.

### 3.5.1 Message Header Segment (MSH)

#### 3.5.1.1 MSH-4.2

If the incoming message is missing field MSH-4.2 (encoding chars.), the following occurs:

- An error is logged: “The Sending Facility has an unspecified Universal ID (MSH-4.2) and no default has been set”

If the incoming message has no value set for field MSH-4.2, the following occurs:

- The Sending Facility Universal ID is defaulted to the Sending Facility Universal ID
- A warning is logged: “The Sending Facility Universal ID (MSH-4.2) has been defaulted to x”

#### 3.5.1.2 MSH-4.3

If the incoming message is missing field MSH-4.3 (sending application), the following occurs:

- An error is logged: “The Sending Facility has an unspecified Universal Type ID (MSH-4.3)”

If the incoming message has no value set for field MSH-4.3, the following occurs:

- The Sending Facility Universal ID is defaulted to the value of “CLIA”
- A warning is logged: “The Sending Facility Universal ID (MSH-4.2) has been defaulted to CLIA”

#### 3.5.1.3 MSH-7.1

If the incoming message is missing field MSH-7.1 (date/time of message), the following occurs:

- An error is logged: “The Date/Time sending system created message is unspecified (MSH-7)”

#### **3.5.1.4 MSH-10.1**

If the incoming message is missing field MSH-10.1 (message control ID), the following occurs:

- An error is logged: “The Message Control ID is unspecified (MSH-10)”

#### **3.5.1.5 MSH-11.1**

If the incoming message is missing field MSH-11.1 (processing ID), the following occurs:

- An error is logged: “The Processing ID is unspecified (MSH-11)”

If the incoming message has a value set for the field MSH-11.1, the validation code will attempt to lookup the value in the table HL7 0103, and if the value does not exist in the table, the following occurs:

- An error is logged: “The Processing ID (MSH-11) is invalid - value: x - table: (HL7 0103)”

### **3.5.2 Patient Information Segment (PID)**

If there is more than 1 PID segment the following occurs:

- An error is logged: “ELINCS 2.5.1 does not permit more than 1 PID segment.”

#### **3.5.2.1 PID-3.1**

If the incoming message is missing field PID-3.1 (patient Identifier), the following occurs:

- An error is logged: “The Patient Identifier List - Patient ID unspecified (PID-3 - PID instance: 1)”

#### **3.5.2.2 PID-7.1**

If the incoming message is missing field PID-7.1 (date/time of birth), the following occurs:

- An error is logged: “The Date/Time of Birth field is unspecified (PID-7 - PID instance: 1)”

If the incoming message has a value set for PID-7.1 (date/time of birth), but the date is not a valid ELINCS date, the following occurs:

- An error is logged: “The Date/Time of Birth field is an invalid date (PID-7 - PID instance: 1)”

### 3.5.2.3 PID-8.1

If the incoming message is missing field PID-8.1 (administrative sex), the following occurs:

- An error is logged: “The Administrative Sex is unspecified (PID-8 - PID instance: 1)”

If the incoming message has the field PID-8.1, the validation code will attempt to lookup the value in the table HL7 0001, and if the value does not exist in the table the following will occur:

- An error is logged: “The Administrative Sex (PID-8 - PID instance: 1 is invalid - value: x - table: (HL7 0001)”

## 3.5.3 Observation Request Segment (OBR)

The following is true for every OBR segment in the incoming message:

### 3.5.3.1 OBR-2.1

If the incoming message is missing field OBR-2.1 (placer order number), the following occurs:

- An error is logged: “The Placer Order Number - Entity Identifier is unspecified (OBR-2.1 - OBR instance: x)”

### 3.5.3.2 OBR-3.1

If the incoming message is missing field OBR-3.1 (filler order number – entity identifier), the following occurs:

- An error is logged: “The Filler Order Number - Entity Identifier is unspecified (OBR-3.1 - OBR instance: x)”

If the incoming message has no value set for field OBR-3.1 (filler order number–entity identifier), the following occurs:

- The Filler Order Number – Entity Identifier is defaulted to a GUID value
- A warning is logged: “The Filler Order Number (OBR-3.1) has been defaulted to: x”

### **3.5.3.3 OBR-3.3**

If the incoming message is missing field OBR-3.3 (filler order – universal id), the following occurs:

- An error is logged: “The Filler Order Number - Universal ID is unspecified (OBR-3.3 - OBR instance: x)”

If the incoming message has no value set for field OBR-3.3 (filler order number–universal id) the following occurs:

- The Filler Order Number – Universal ID is defaulted to the Sending Facility Universal ID (ST)
- A warning is logged: “The Filler Order Number - Universal Type ID (OBR-3.3) has been defaulted to: x”

### **3.5.3.4 OBR-3.4**

If the incoming message is missing field OBR-3.4 (filler order – universal type id), the following occurs:

- An error is logged: “The Filler Order Number - Universal Type ID is unspecified (OBR-3.4 - OBR instance: x)”

If the incoming message has the field OBR-3.4 (filler order – universal type id), the validation code will attempt to lookup the value in the table ELINCS 0362, and if the value does not exist in the table, the following occurs:

- The Filler Order – Universal ID Type is defaulted to the value of “L-CL”
- An warning is logged: “The Filler Order Number - Universal Type ID (OBR-3.4) has been defaulted to L-CL”

### **3.5.3.5 OBR-4.1**

If the incoming message is missing field OBR-4.1 (universal service identifier - identifier), the following occurs:

- An error is logged: “The Universal Service Identifier - Identifier is unspecified (OBR-4.1 - OBR instance: x)”

### **3.5.3.6 OBR-4.2**

If the incoming message is missing field OBR-4.2 (universal service identifier - text description), the following occurs:

- An error is logged: “The Universal Service Identifier - Text Description is unspecified (OBR-4.2 - OBR instance: x)”

### 3.5.3.7 OBR-4.3

If the incoming message is missing field OBR-4.3 (universal service identifier - name of coding system), the following error is logged:

- An error is logged: “The Universal Service Identifier - Name of Coding System is unspecified (OBR-4.3 - OBR instance: x)”

If the incoming message has no value set for field OBR-4.3 (universal service identifier - name of coding system) the following occurs:

- The Universal Service Identifier - Name of Coding System is defaulted to “99Lab”
- A warning is logged: “The Universal Service Identifier - Name of Coding System (OBR-4.3) has been defaulted to: 99Lab”

If the incoming message has the field OBR-4.3 (universal service identifier - name of coding system) set to “lab”, the following occurs:

- The Universal Service Identifier - Name of Coding System is defaulted to “99Lab”
- A warning is logged: “The Universal Service Identifier - Name of Coding System of 'lab' will be modified to '99Lab' to conform to Local General coding System format”

If the incoming message has a value for OBR-4.3 (universal service identifier - name of coding system) that does not contain the text “99”, the following occurs:

- An error is logged: “The Universal Service Identifier (OBR-4.3) - Name of Coding System is invalid - value: x) - table: (ELINCS 0396)”

### 3.5.3.8 OBR-4.6

If the incoming message has a value for OBR-4.6 (universal service identifier - alternate name of coding system) that does not contain the text “99”, the following occurs:

- An error is logged: The Universal Service Identifier (OBR-4) - Alternate Name of Coding System is invalid - value: x”

### **3.5.3.9 OBR-7.1**

If the incoming message is missing field OBR-7.1 (date/time of observation), the following occurs:

- An error is logged: “The Observation Date/Time is unspecified (OBR-7 - OBR instance: x)”

If the incoming message has a value set for OBR-7.1 (date/time of observation), but the date is not a valid ELINCS date, the following occurs:

- An error is logged: “The Observation Date/Time field is an invalid date (OBR-7 - OBR instance: x)”

### **3.5.3.10 OBR-8.1**

If the incoming message has a value set for OBR-8.1 (date/time of observation (TS)), but the date is not a valid ELINCS date, the following occurs:

- An error is logged: “The Observation End Date/ime (TS) field is an invalid date (OBR-8 - OBR instance: x)”

### **3.5.3.11 OBR-11-1**

If the incoming message is missing field OBR-11.1 (specimen action code), the following warning is logged:

- The Specimen Action Code (OBR-11) is defaulted to the value of “F”
- A warning is logged: “The Specimen Action Code (OBR-11) is unspecified and has been defaulted to: F )”

If the incoming message is missing field OBR-11.1 (specimen action code (OBR-11)), the following warning is logged:

- An error is logged: “The Specimen Action Code is unspecified (OBR-11 - OBR instance: x)”

If the incoming message has a value set for the field OBR-11.1, the validation code will attempt to lookup the value in the table HL7 0065, and if the value does not exist in the table, the following will occur:

- An error is logged: “The Specimen Action Code (OBR-11) is invalid - value: x”

If the incoming message has the field OBR-11.1 set to a blank value, the following will occur:

- The Specimen Action Code (OBR-11) is defaulted to the value of “F”
- A warning is logged: “The Specimen Action Code (OBR-11) is unspecified and has been defaulted to: F )”

**3.5.3.12 OBR-14.1**

If the message type is “Result Available” or “Result Correction” and field OBR-14.1 (specimen received date) has an invalid ELINCS date, the following will occur:

- An error is logged: “The Specimen Received Date field is an invalid date (OBR-14 - OBR instance: x)”

**3.5.3.13 OBR-15-1**

If the incoming message has a value set for the field OBR-15.1 (specimen source id), the validation code will attempt to lookup the value in the table HL7 0070, and if the value does not exist in the table, the following will occur:

- An error is logged: “The Specimen Source ID (OBR-15) is invalid - value: x - table: (HL7 0070)”

**3.5.3.14 OBR-16-1**

If the incoming message is missing field OBR-16.1 (ordering provider – id number) and is missing field ORC-12.1, the following occurs:

- An error is logged: “The Ordering Provider - ID Number is unspecified (OBR-16 - OBR instance: x)”

**3.5.3.15 OBR-16.2**

If the incoming message is missing field OBR-16.2 (ordering provider – family name) and is missing field ORC-12.2, the following occurs:

- An error is logged: “The Ordering Provider - Family Name is unspecified (OBR-16 - OBR instance: x)”

**3.5.3.16 OBR-16-3**

If the incoming message is missing field OBR-16.3 (ordering provider – given name) and is missing field ORC-12.3, the following occurs:

- An error is logged: “The Ordering Provider - Given Name is unspecified (OBR-16 - OBR instance: x)”

**3.5.3.17 OBR-16.13**

If the incoming message is missing field OBR-16.13 (ordering provider – id type code), the following occurs:

- A warning is logged: “The Ordering Provider - ID Type Code is unspecified (OBR-16 - OBR instance: x. Defaulting value)”

### 3.5.3.18 OBR-20.1

If the incoming message is missing field OBR-20.1 (filler field 1 (ST)) or the value is not set to either "RO" or "TS", the following occurs:

- A warning is logged: "The Filler Field 1 (ST) must be values 'RO' or 'TS' for (OBR-20 - OBR instance: x)"

If the incoming message has a blank value set for the OBR-20.1 (filler field 1 (ST)) field, the following occurs:

- The Filler Field 1 (ST) (OBR-20.1) is defaulted to the value of ""RO"
- A warning is logged: "The Filler Field 1 (ST) (OBR-20.1) is unspecified and has been defaulted to: RO"

### 3.5.3.19 OBR-22.1

If the incoming message is missing field OBR-22.1 (results rpt/status change date), the following occurs:

- A warning is logged: "The Results rpt/status change date is unspecified (OBR-22 - OBR instance: x)"

If the incoming message has a value set for OBR-22.1 (results rpt/status change date), and the value is an invalid ELINCS date, the following will occur:

- An error is logged: "The Results rpt/status change date is invalid (OBR-22 - OBR instance: x)"

### 3.5.3.20 OBR-25.1

If the incoming message is missing field OBR-25.1 (result status (ID)), the following occurs:

- A warning is logged: "The Result Status (ID) is unspecified (OBR-25 - OBR instance: x)"

If the incoming message has a value set for the field OBR-25.1 (result status (ID)), the validation code will attempt to lookup the value in the table HL7 0123, and if the value does not exist in the table, the following will occur:

- A warning is logged: "The Result Status (ID) for (OBR-25 - OBR instance: x) is invalid - table: (HL7 0123)"

### 3.5.4 Observations Segment (OBX)

The following is true for every OBX segment in the incoming message:

#### 3.5.4.1 OBX-2.1

If the incoming message has a value set for field OBX-2.1 and the message is missing field OBX-5.1 (observation result value), the following occurs:

- An error is logged: The Observation Result Value is undefined (OBX-5 - OBX instance: x) yet a value type was specified in OBX-2

#### 3.5.4.2 OBX-3.1

If the incoming message is missing field OBX-3.1 (*observation identifier – identifier*) the following occurs:

- An error is logged: “The Observation Identifier - Identifier is unspecified (OBX-3.1 - OBX instance: x).”

#### 3.5.4.3 OBX-3.2

If the incoming message is missing field OBX-3.2 (*observation identifier – text description*) the following occurs:

- An error is logged: “The Observation Identifier - Text Description is unspecified (OBX-3.2 - OBX instance: x).”

#### 3.5.4.4 OBX-3.3

If the incoming message is missing field OBX-3.3 (observation identifier - name of coding system), the following error is logged:

- An error is logged: “The Observation Identifier - Name of Coding System is unspecified (OBX-3.3 - OBX instance: x)”

If the incoming message has no value set for field OBX-3.3 (observation identifier - name of coding system) the following occurs:

- The Observation Identifier - Name of Coding System is defaulted to “99Lab”
- A warning is logged: “The Observation Identifier - Name of Coding System (OBX-3.3) has been defaulted to: 99Lab”

If the incoming message has the field OBX-3.3 (universal service identifier - name of coding system) set to “lab”, the following occurs:

- The Observation Identifier - Name of Coding System is defaulted to “99Lab”
- A warning is logged: “The Observation Identifier - Name of Coding System of 'lab' will be modified to '99Lab' to conform to Local General coding System format”

If the incoming message has a value for OBX-3.3 (universal service identifier - name of coding system) that does not contain the text “99”, the following occurs:

- An error is logged: “The Observation Identifier (OBX-3.3) - Name of Coding System is invalid - value: x - - table: (ELINCS 0396)”

#### **3.5.4.5 OBX-4.1**

If the incoming message is missing field OBX-4.1 (observation identifier - observation sub-id (ST)), the following occurs:

- An error is logged: “The Observation Identifier - Observation Sub-ID (ST) is unspecified (OBX-4.1 - OBX instance: x)”

#### **3.5.4.6 OBX-11.1**

If the incoming message is missing field OBX-11.1 (observation result status), the following occurs:

- An error is logged: “The Observation Result Status is undefined (OBX-11 - OBX instance: x)”

If the incoming message has no value set for field OBX-11.1 (observation result status) the following occurs:

- The Observation Result Status is defaulted to the value of “F”
- A warning is logged: “The Observation Result Status (OBX-11.1) has been defaulted to: F”

If the incoming message has a value set for the field OBX-11.1, the validation code will attempt to lookup the value in the table HL7 0085, and if the value does not exist in the table, the following will occur:

- A warning is logged: “The Observation Result Status (OBX-11 - OBX instance:: x) is invalid - table: (HL7 0085)”

If the incoming message has a value set for the field OBX-11.1, and the value is in the table HL7 0085 but is not “X”, “D” or “N”:

If the value for field OBX-2.1 is missing, the following occurs:

- An error is logged: “The Observation Result Value type is undefined (OBX-2 - OBX instance: x)”

Otherwise, if the value for field OBX 2.1 is not a valid value in the HL7 table (0125), the following occurs:

- A warning is logged: “The Observation Result Value type (OBX-2 - OBX instance: x) is invalid - table: (HL7 0125)”

#### **3.5.4.7 OBX-23.1**

If the incoming message has no value set for field OBX-23.1 (performing organization name), the following occurs:

- The Performing Organization Name is defaulted to the value of the Label field for the Global Facility.
- A warning is logged: “The Performing Organization Name (OBX-23.1) has been defaulted to: x”

#### **3.5.4.8 OBX-23.7**

If the incoming message has no value set for field OBX-23.7 (performing organization name - namespace id (IS)) the following occurs:

- The Performing Organization Name - Namespace ID (IS) is defaulted to the value of the Label field for the Global Id Authority.
- A warning is logged: “The Performing Organization Name - Namespace ID (IS) is unspecified (OBX-23.7 - OBX instance: x)”

If the incoming message has a value set for field OBX-23.7 and the value does not exist in the ELINCS table (0362), the following occurs:

- An error is logged: “The Performing Organization Name (OBX-23) - Namespace ID (IS) is invalid - value: x”

**3.5.4.9 OBX-24.1**

If the incoming message has no value set for field OBX-24.1 (performing organization address - street address (SAD)), the following occurs:

- The Performing Organization Address is defaulted to the value of the Global Facility's Address.
- A warning is logged: "The Performing Organization Address (OBX-24.1) has been defaulted to: x"

**3.5.4.10 OBX-24.2**

If the incoming message has no value set for field OBX-24.2 (performing organization address - street address - city (ST)), the following occurs:

- The Performing Organization Address is defaulted to the value of the Global Facility's Address City.
- A warning is logged: "The Performing Organization Address (OBX-24.2) has been defaulted to: x"

**3.5.4.11 OBX-24.3**

If the incoming message has no value set for field OBX-24.3 (performing organization address - street address - state or province (ST)), the following occurs:

- The Performing Organization Address is defaulted to the value of the Global Facility's Address State/Province.
- A warning is logged: "The Performing Organization Address (OBX-24.3) has been defaulted to: x"

**3.5.4.12 OBX-24.4**

If the incoming message has no value set for field OBX-24.4 (performing organization address - street address - zip or postal code (ST)), the following occurs:

- The Performing Organization Address is defaulted to the value of the Global Facility's Zip/Postal Code.
- A warning is logged: "The Performing Organization Address (OBX-24.4) has been defaulted to: x"

### 3.6. Transformation

The *transformer\_messages\_transform* step is used to complete the transformation of message segments into valid ELINCS compliant values as defined in the ELINCS specification.

#### 3.6.1 Message Header Segment (MSH)

The MSH segment defines the intent, source, destination and some specifics of the syntax of a message.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Field Separator	1	ST	R	[1..1]	7.2.2
2	Encoding Characters	4	ST	R	[1..1]	7.2.3
3	Sending Application	227	HD	O	[0..1]	7.2.4
4	Sending Facility	227	HD	R	[1..1]	7.2.5
5	Receiving Application	227	HD	O	[0..1]	7.2.6
6	Receiving Facility	227	HD	RE	[0..1]	7.2.7
7	Date/Time Of Message	26	TS	R	[1..1]	7.2.8
8	Security	40	ST	X	[0..0]	
9	Message Type	15	MSG	R	[1..1]	7.2.9
10	Message Control ID	50	ST	R	[1..1]	7.2.10
11	Processing ID	3	PT	R	[1..1]	7.2.11
12	Version ID	60	VID	R	[1..1]	7.2.12
13	Sequence Number	15	NM	X	[0..0]	
14	Continuation Pointer	180	ST	X	[0..0]	
15	Accept Acknowledgment Type	2	ID	R	[1..1]	7.2.13

In order for the message to be an ELINCS compliant message MSH-4 must not use the Namespace ID. Instead, the Universal ID and Universal ID Type must be used. If the lab is CLIA certified, the value for the Universal ID Type must be “CLIA”, otherwise, it should be “CLIP”.

The date/time of message (MSH-7) is a required field. If this field is blank, the current date/time is used to populate this field. In addition, both the seconds and the time zone offset are required. If the seconds or time zone offset is not defined, they will be set to “00” for the seconds and use the default time zone offset (PST). The default time zone offset is defined at the top of the transformer under the “defaultTimeZoneOffset” variable. In addition, several constants have been defined for the various U.S. based time zone offsets.

The transformer hard-codes the following fields in the message to be ELINCS 2.5.1 compliant:

Field	Description	Value
MSH-9.1	message type	"ORU"
MSH-9.2	message type	"R01"
MSH-9.3	message type	"ORU_R01"
MSH-12.1	version id	"2.5.1"
MSH-15.1	accept acknowledgement type (id)	"AL"

The transformer sets the Conformance Statement ID based on the message type. The message type is derived from Result Status field (OBR-25) as per the ELINCS specification:

- If the Result Status = "I" or "X", it sets the Conformance Statement ID to ELINCS\_MT-ORU-1\_R1
- If the Result Status = "P" or "F" or "C", it sets the Conformance Statement ID to ELINCS\_MT-ORU-2\_R1

The transformer removes the following MSH fields (if the constant clearUnusedFields is set to "true") as they are unsupported by the ELINCS specification:

Field	Description
*MSH-4.1	namespace id
MSH-7.2	degree of precision
MSH-8	Security
MSH-13	sequence number
MSH-14	continuation pointer
MSH-16	application acknowledgement type
MSH-17	country code
MSH-18	character set
MSH-19	principal language of message
MSH-20	alternate character set handling scheme

\*Note: if the incoming message has a value set for this field, the following warning is logged: "The Namespace ID is not supported for the Sending Facility field (use Universal ID and Universal Type ID instead / setting value to " (MSH-4)"

### 3.6.2 Patient Information Segment (PID)

The PID segment is used to communicate patient identification information for lab results transmitted per the ELINCS laboratory specification. The segment contains permanent patient identifying and demographic information that is not likely to change frequently.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	<b>Set ID – PID</b>	4	SI	O	[0..1]	7.3.2
2	Patient ID	20	CX	X	[0..0]	
3	<b>Patient Identifier List</b> [CLIA]	250	CX	R	[1..*]	7.3.3
4	Alternate Patient ID - PID	20	CX	X	[0..0]	
5	<b>Patient Name</b> [CLIA]	250	XPN	R	[1..2]	7.3.4
6	<b>Mother's Maiden Name</b>	250	XPN	O	[0..*]	7.3.5
7	<b>Date/Time of Birth</b>	26	TS	RE	[0..1]	7.3.6
8	<b>Administrative Sex</b>	1	IS	R	[1..1]	7.3.7
9	Patient Alias	250	XPN	X	[0..0]	
10	<b>Race</b>	250	CE	O	[0..*]	7.3.8
11	<b>Patient Address</b>	250	XAD	O	[0..*]	7.3.9
12	County Code	4	IS	X	[0..0]	
13	<b>Phone Number - Home</b>	250	XTN	O	[0..*]	7.3.10
14	Phone Number - Business	250	XTN	X	[0..0]	
15	Primary Language	250	CE	X	[0..0]	
16	Marital Status	250	CE	X	[0..0]	
17	Religion	250	CE	X	[0..0]	
18	Patient Account Number	250	CX	X	[0..0]	
19	SSN Number - Patient	16	ST	X	[0..0]	
20	Driver's License Number - Patient	25	DLN	X	[0..0]	
21	Mother's Identifier	250	CX	X	[0..0]	
22	Ethnic Group	250	CE	X	[0..0]	
23	Birth Place	250	ST	X	[0..0]	
24	Multiple Birth Indicator	1	ID	X	[0..0]	
25	Birth Order	2	NM	X	[0..0]	
26	Citizenship	250	CE	X	[0..0]	
27	Veterans Military Status	250	CE	X	[0..0]	

For every PID segment in the incoming message:

The transformer hard-codes the following fields in the message to be ELINCS 2.5.1 compliant:

Field	Description	Value
PID-3.5	identifier type code	"PT"

The transformer removes the following PID fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
*PID-2	internal patient id - replaced by patient identifier list
PID-3.2	check digit code
PID-3.3	check digit scheme
PID-4	own family name prefix
PID-5	own family name
PID-5	family name pref. from partner/spouse
PID-5	family name from partner/spouse
PID-5.6	degree
PID-5.8	name rep. code
PID-7.2	date/time of birth/degree of precision
PID-9	patient alias
PID-12	country code
PID-14 – PID-27	removes all fields from PID-14 through PID-27
PD1	additional demographics
NK1	next of kin/associated parties
PV1	patient visit
PV2	patient visit - additional information
CTD	contact data

\*note: the value for this field is set to “” and not removed from the message

The transformer removes PID fields 14 – 38 as they are unsupported by the ELINCS specification.

### 3.6.3 Common Order Segment (ORC)

The Common Order segment (ORC) is used to transmit elements that are common to all of the tests ordered in a single lab requisition. Although the ORC segment is more commonly used to communicate information in the course of ordering tests, it may also be used in messages that report test results (such as ORU messages).

SEQ	ELEMENT NAME	LEN	DT	Usage	Cardinality	Comment/Description
<b>1</b>	<b>Order Control</b>	<b>2</b>	<b>ID</b>	<b>R</b>	<b>[1..1]</b>	<b>7.4.2</b>
2	Placer Order Number	50	EI	X	[0..0]	
3	Filler Order Number	22	EI	X	[0..0]	
<b>4</b>	<b>Placer Group Number</b>	<b>50</b>	<b>EI</b>	<b>R</b>	<b>[1..1]</b>	<b>7.4.3</b>
5	Order Status	2	ID	X	[1..1]	
6	Response Flag	1	ID	X	[0..0]	
7	Quantity/Timing	200	TQ	X	[0..0]	
8	Parent	200	CM	X	[0..0]	
9	Date/Time of Transaction	26	TS	X	[0..0]	
10	Entered By	250	XCN	X	[0..0]	
11	Verified By	250	XCN	X	[0..0]	
12	Ordering Provider	250	XCN	X	[0..0]	
13	Enterer's Location	80	PL	X	[0..0]	
14	Call Back Phone Number	250	XTN	X	[0..0]	
15	Order Effective Date/Time	26	TS	X	[0..0]	
16	Order Control Code Reason	250	CE	X	[0..0]	
17	Entering Organization	250	CE	X	[0..0]	
18	Entering Device	250	CE	X	[0..0]	
19	Action By	250	XCN	X	[0..0]	
20	Advanced Beneficiary Notice Code	250	CE	X	[0..0]	
21	Ordering Facility Name	250	XON	X	[0..0]	
22	Ordering Facility Address	250	XAD	X	[0..0]	
23	Ordering Facility Phone Number	250	XTN	X	[0..0]	
24	Ordering Provider Address	250	XAD	X	[0..0]	
25	Order Status Modifier	250	CWE	X	[0..0]	
26	Advance Beneficiary Notice Override Reason	60	CWE	X	[0..0]	
27	Filler's Expected Availability Date/Time	26	TS	X	[0..0]	
28	Confidentiality Code	250	CWE	X	[0..0]	
29	Order Type	250	CWE	X	[0..0]	
30	Enterer Authorization Mode	250	CWE	X	[0..0]	

The transformer hard-codes the following fields in the message to be ELINCS 2.5.1 compliant:

Field	Description	Value
PID-3.5	identifier type code	"PT"

The transformer removes the following ORC fields (if the constant clearUnusedFields is set to "true") as they are unsupported by the ELINCS specification:

Field	Description
ORC-2	placer order number
ORC-2	filler order number
ORC-5 – ORC-30	removes all fields from ORC-5 through ORC-30

### 3.6.4 Observation Request Segment (OBR)

The OBR segment serves as the report header for the set of observations (analytes) related to a laboratory test. The details of each individual observation appear in corresponding OBX segments.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Set ID - OBR	4	SI	O	[0..1]	7.5.2
2	Placer Order Number	50	EI	R	[1..1]	7.5.3
3	Filler Order Number [CLIA]	50	EI	R	[1..1]	7.5.4
4	Universal Service Identifier [CLIA]	250	CE	R	[1..1]	7.5.5
5	Priority - OBR	2	ID	X	[0..0]	
6	Requested Date/Time	28	TS	X	[0..0]	
7	Observation Date/Time	26	TS	R	[1..1]	7.5.6
8	Observation End Date/Time	26	TS	RE	[0..1]	7.5.7
9	Collection Volume	20	CQ	X	[0..0]	
10	Collector Identifier	250	XCN	X	[0..0]	
11	Specimen Action Code	1	ID	R	[1..1]	7.5.8
12	Danger Code	250	CE	X	[0..0]	
13	Relevant Clinical Info.	300	ST	X	[0..0]	
14	Specimen Received Date/Time	28	TS	X	[0..0]	
15	Specimen Source	300	SPS	X	[0..0]	
16	Ordering Provider [CLIA]	250	XCN	R	[1..1]	7.5.9
17	Order Callback Phone Number	250	XTN	X	[0..0]	
18	Placer Field 1	80	ST	X	[0..0]	
19	Placer Field 2	80	ST	X	[0..0]	
20	Filler Field 1 (Used for test id type)	2	ST	R	[1..1]	7.5.10
21	Filler Field 2 (Used for copy status)	60	ST	RE	[0..1]	7.5.11
22	Results Rpt/Status Chng - Date/Time [CLIA]	26	TS	R	[1..1]	7.5.12
23	Charge to Practice +	40	CM	X	[0..0]	
24	Diagnostic Serv Sect ID	10	ID	X	[0..0]	
25	Result Status [CLIA]	1	ID	R	[1..1]	7.5.13
26	Parent Result	400	PRL	C	[0..1]	7.5.14
27	Quantity/Timing	200	TQ	X	[0..1]	
28	Result Copies To	250	XCN	C	[0..5]	7.5.15
29	Parent	200	EIP	C	[0..1]	7.5.16
30	Transportation Mode	20	ID	X	[0..0]	
31	Reason for Study	250	CE	X	[0..0]	
32	Principal Result Interpreter +	200	CM	X	[0..0]	
33	Assistant Result Interpreter +	200	CM	X	[0..0]	
34	Technician +	200	CM	X	[0..0]	
35	Transcriptionist +	200	CM	X	[0..0]	
36	Scheduled Date/Time +	28	TS	X	[0..0]	
37	Number of Sample Containers *	4	NM	X	[0..0]	
38	Transport Logistics of Collected Sample *	250	CE	X	[0..0]	
39	Collector's Comment *	250	CE	X	[0..0]	
40	Transport Arrangement Responsibility	250	CE	X	[0..0]	

For every OBR segment in the incoming message:

- The transformer removes the following OBR fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
OBR-3.2	namespace id
OBR-5	Priority
OBR-6	requested date/time
OBR-7.2	observation date/time - degree of precision
OBR-8.2	observation end date/time - degree of precision
OBR-9	collection volume
OBR-10	collector identifier
OBR-12	danger code
OBR-13	relevant clinical info
OBR-14.2	specimen received date/time - degree of precision
OBR-15.2	Additives
OBR-15.4	body site
OBR-16.8	source table
OBR-16.10	name type code
OBR-16.11	identifier check digit
OBR-16.12	code indentifying check digit
OBR-16.15	ordering provider
OBR-17	order callback phone
OBR-18	placer field 1
OBR-19	placer field 2
OBR-20	filler field 1
OBR-22.2	results rpt/status change date/time - degree of precision
OBR-23	charge to practice
OBR-24	diag. service sect

- The transformer sets the seconds to “00” and the time zone offset to “defaultTimeZoneOffset” if a value exists for the field OBR-22.1 (results status change date/time), and no seconds and/or time zone is set.

- The transformer hard-codes the following fields in the message to be ELINCS 2.5.1 compliant:

Field	Description	Value
*OBR-16.3	ordering provider - user identifier	"U"

\*note: the field is hard-coded only if the incoming message has not value set for this field / additionally, the following warning is logged: "The Ordering Provider - User Identifier was unspecified / setting value to 'U: unspecified' (OBR-16 - OBR instance: x)"

### 3.6.4.1 OBR-11.1

If the value for OBR-11.1 (specimen action code) is set to "G" (reflex test), the following occurs:

- The fields OBR-30 through OBR-49 are removed from the message
- If no value exists for field OBR-50.1, the following error is logged: "The Universal Service Identifier - Identifier is unspecified (OBR-50.1 - OBR instance: x)"
- If no value exists for field OBR-50.2, the following error is logged: "The Universal Service Identifier - Text Description is unspecified (OBR-50.2 - OBR instance: x)"
- If no value exists for field OBR-50.3, the following error is logged: "The Universal Service Identifier - Name of Coding System is unspecified (OBR-50.3 - OBR instance: x)"

### 3.6.4.2 OBR-16.1

If a value is not set for OBR-16.1 (ordering provider – id number) and the value for ORC-12.1 (ordering provider – id number) exists, the following occurs:

- The value of field OBR-16.1 is set to the existing value in field ORC-12.1

If the value is not set for both OBR-16.1 and ORC-12.1, the following occurs:

- An error is logged: "The Ordering Provider - ID Number is unspecified (OBR-16 - OBR instance: x)"

### **3.6.4.3 OBR-16.2**

If a value is not set for OBR-16.2 (ordering provider – family name) and a value for ORC-12.2 (ordering provider – family name) exists, the following occurs:

- The value of field OBR-16.2 is set to the existing value in field ORC-12.2

If the value is not set for both OBR-16.2 and ORC-12.2, the following occurs:

- An error is logged: "The Ordering Provider - Family Name is unspecified (OBR-16 - OBR instance: x)"If the value is not set for both OBR-16.1 and ORC-12.1, the following occurs:

### **3.6.4.4 OBR-16.3**

If a value is not set for OBR-16.3 (ordering provider – given name) and a value for ORC-12.3 (ordering provider – given name) exists, the following occurs:

- The value of field OBR-16.3 is set to the existing value in field ORC-12.3

If the value is not set for both OBR-16.3 and ORC-12.3, the following occurs:

- An error is logged: "The Ordering Provider – Given Name is unspecified (OBR-16 - OBR instance: x)"

### **3.6.4.5 OBR-16.4**

If a value is not set for OBR-16.4 (ordering provider – second/further given name) and if the value for ORC-12.4 (ordering provider – second/further given name) exists, the following occurs:

- The value of field OBR-16.4 is set to the existing value in field ORC-12.4

### **3.6.4.6 OBR-26.1**

If a value is set for OBR-26.1 (parent result - reflex tests) and OBR-11.1 (specimen action code) is not set to "G" (reflex test), the following occurs:

- The field OBR-26 (reflex tests) is removed from the message

If a value is not set for OBR-26.1 (parent result - reflex tests) or OBR-11.1 (specimen action code) is set to "G" (reflex test), the following occurs:

- If no value exists for field OBR-26.1.1, the following error is logged: "The Parent Result - Parent Observation Identifier (CE) - Identifier (ST) - is unspecified, yet this is a Reflex Test (OBR-26 - OBR instance: x)"

- If no value exists for field OBR-26.1.2, the following error is logged: “The Parent Result - Parent Observation Identifier (CE) - Text (ST) - is unspecified, yet this is a Reflex Test (OBR-26 - OBR instance: x”
- If no value exists for field OBR-26.1.3, the following error is logged: “The Parent Result - Parent Observation Identifier (CE) - Name of Coding System (ID) is unspecified, yet this is a Reflex Test (OBR-26 - OBR instance: x”

#### **3.6.4.7 OBR-29.1**

If a value is set for OBR-29.1 (parent - reflex tests) and OBR-11.1 (specimen action code) is not set to “G” (reflex test), the following occurs:

- The field OBR-29 (reflex tests) is removed from the message

If a value is not set for OBR-29.1 (parent - reflex tests) or OBR-11.1 (specimen action code) is set to “G” (reflex test), the following occurs:

- If no value exists for field OBR-29.1.1, the following error is logged: “The Parent (EIP) - Filler Assigned Identifier - Entity Identifier (ST) - is unspecified, yet this is a Reflex Test (OBR-29 - OBR instance: x”
- If no value exists for field OBR-29.1.2, the following error is logged: “The Parent (EIP) - Filler Assigned Identifier - Universal ID (ST) - is unspecified, yet this is a Reflex Test (OBR-29 - OBR instance: x”
- If no value exists for field OBR-29.1.3, the following error is logged: “The Parent (EIP) - Filler Assigned Identifier - Universal ID Type (ID) is unspecified, yet this is a Reflex Test (OBR-29 - OBR instance: x”

### 3.6.5 Notes Segment (NTE)

The NTE segment is commonly used for sending notes and comments that accompany test-result data. Note that, depending on its position in the ORU message, this segment may be associated with an OBR segment or with an OBX segment.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Set ID – NTE	4	SI	O	[0..1]	7.6.2
2	Source of Comment	8	ID	X		
3	Comment	65536	FT	RE	[0..*]	7.6.3
4	Comment Type	250	CE	O	[0..1]	7.6.4

For every NTE segment in the incoming message:

- The transformer removes the following NTE fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
NTE-2	source of comment
NTE-5 – NTE-x	removes all segments NTE-5 through NTE-x

### 3.6.6 Timing/Quantity (TQ1)

In HL7 messaging, the TQ1 segment is used generally to specify the complex timing of events and actions, such as those that occur in order management and scheduling systems. This segment determines the quantity, frequency, priority, and timing of a service. For the purposes of ELINCS, the Timing/Quantity segment is used exclusively to communicate the time at which the ordering provider intended a test to be performed.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Set ID – TQ1	4	SI	O	[0..1]	7.7.2
2	Quantity	20	ID	X	[0..0]	
3	Repeat Pattern	540	RPT	X	[0..0]	
4	Explicit Time	20	TM	X	[0..0]	
5	Relative Time and Units	20	CQ	X	[0..0]	
6	Service Duration	20	CQ	X	[0..0]	
7	Start Date/Time	26	TS	C	[0..1]	7.7.3
8	End Date/Time	26	TS	C	[0..1]	7.7.4
9	Priority	250	CWE	X	[0..0]	
10	Condition Text	250	TX	X	[0..0]	
11	Text Instruction	250	TX	X	[0..0]	
12	Conjunction	10	ID	X	[0..0]	

For every TQ1 segment in the incoming message:

- The transformer removes the following TQ1 fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
TQ1-2	quantity
TQ1-3	repeat pattern
TQ1-4	explicit time
TQ1-5	relative time and units
TQ1-6	service duration
TQ1-9 – TQ1-12	removes fields TQ1 through TQ1-12

If no value is set for field TQ1-7.1 (start date/time) and no value is set for TQ1-8.1 (end date/time), the following occurs:

- An error is logged: “Neither TQ1-7 Start Date/Time (TS) nor TQ1-8 End Date/Time are filled in for (TQ1 instance: x)”

If a value is set for field TQ1-7.1 (start date/time) but the date is not a valid ELINCS date, the following occurs:

- An error is logged: “Timing/Quantity - Start Date/Time (TS) date invalid for (TQ1-7 - TQ1 instance: x)”

If a value is set for field TQ1-8.1 (end date/time) but the date is not a valid ELINCS date, the following occurs:

- An error is logged: “Timing/Quantity - End Date/Time (TS) date invalid for (TQ1-8 - TQ1 instance: x)”

### 3.6.7 Observations Segment (OBX)

The OBX segment is used to transmit a single lab-result value. It represents the smallest indivisible unit of a laboratory report. When the results of laboratory panels are reported, the ordered panel is typically reported in the OBR segment, and the results of each test performed in the panel are reported as individual OBX segments “nested” beneath the OBR segment. When the results of individually ordered tests are reported, there is a single OBX segment for each OBR segment.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Set ID – OBX	4	SI	O	[0..1]	7.8.2
2	Value Type	2	ID	C	[0..1]	7.8.3
3	Observation Identifier [CLIA]	250	CE	R	[1..1]	7.8.4
4	Observation Sub-ID	20	ST	R	[1..1]	7.8.5
5	Observation Value [CLIA]	99999 <sup>3</sup>	*	C	[0..1]	7.8.6
6	Units [CLIA]	250	CE	RE	[0..1]	7.8.7
7	References Range [CLIA]	60	ST	RE	[0..1]	7.8.8
8	Abnormal Flags [CLIA]	5	IS	RE	[0..2]	7.8.9
9	Probability	5	NM	X	[0..0]	
10	Nature of Abnormal Test	2	ID	X	[0..0]	
11	Observation Result Status [CLIA]	1	ID	R	[1..1]	7.8.10
12	Date Last Observation Normal Value	26	TS	X	[0..0]	
13	User Defined Access Checks	20	ST	X	[0..0]	
14	Date/Time of the Observation	26	TS	X	[0..0]	
15	Producer's Reference	250	CE	X	[0..0]	
16	Responsible Observer	250	XCN	RE	[0..*]	7.8.11
17	Observation Method	250	CE	X	[0..0]	
18	Equipment Instance Identifier	22	EI	X	[0..0]	
19	Date/Time of the Analysis	26	TS	X	[0..0]	
20	Reserved for HL7 v2.6			X	[0..0]	
21	Reserved for HL7 v2.6			X	[0..0]	
22	Reserved for HL7 v2.6			X	[0..0]	
23	Performing Organization Name [CLIA]	570	XON	R	[1..1]	7.8.12
24	Performing Organization Address	2915	XAD	R	[1..1]	7.8.13
25	Performing Organization Medical Director	3220	XCN	RE	[0..1]	7.8.14

For every OBX segment in the incoming message:

- The transformer sets the seconds to “00” and the time zone offset to “defaultTimeZoneOffset” if a value exists for the field OBX-19.1 (date/time of analysis and no seconds and/or time zone is set.
- The transformer removes the following OBX fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
OBX-9	probability
OBX-10	nature of abnormal test
OBX-12	date last observation normal value
OBX-13	user defined access checks
OBX-14	date/time of observation
OBX-15.4	producer's reference
OBX-16.1	responsible observer – id number
OBX-16.9 – 16.23	removes fields 16.9 through 16.23
OBX-17	observation method
OBX-18	equipment instance identifier
OBX-19.2	date/time of analysis – degree of precision
OBX-26 – OBX-x	Removes fields OBX-26 through OBX-x

### 3.6.8 Specimen Segment (SPM)

The SPM segment is used to transmit information about a single specimen. The SPM segment relays information about the type of specimen the test was performed on and the date/time the specimen was received by the laboratory.

SEQ	ELEMENT NAME	LEN	DATA TYPE	Usage	Cardinality	Comment/Description
1	Set ID – SPM	4	SI	O	[0..1]	7.9.2
2	Specimen ID	80	EIP	O	[0..1]	7.9.3
3	Specimen Parent IDs	80	EIP	X	[0..0]	
4	Specimen Type [CLIA]	250	CWE	R	[1..1]	7.9.4
5	Specimen Type Modifier	250	CWE	X	[0..0]	
6	Specimen Additives	250	CWE	X	[0..0]	
7	Specimen Collection Method	250	CWE	O	[0..1]	7.9.5
8	Specimen Source Site	250	CWE	O	[0..1]	7.9.6
9	Specimen Source Site Modifier	250	CWE	O	[0..*]	7.9.7
10	Specimen Collection Site	250	CWE	O	[0..0]	
11	Specimen Role	250	CWE	X	[0..0]	
12	Specimen Collection Amount	20	CQ	O	[0..1]	7.9.8
13	Grouped Specimen Count	8	NM	X	[0..0]	
14	Specimen Description	250	ST	O	[0..1]	7.9.9
15	Specimen Handling Code	250	CWE	X	[0..0]	
16	Specimen Risk Code	250	CWE	X	[0..0]	
17	Specimen Collection Date/Time	26	DR	O	[0..1]	7.9.10
18	Specimen Received Date/Time	26	TS	O	[0..1]	7.9.11
19	Specimen Expiration Date/Time	26	TS	X	[0..0]	
20	Specimen Availability	1	ID	X	[0..0]	
21	Specimen Reject Reason	250	CWE	O	[0..1]	7.9.12
22	Specimen Quality	250	CWE	O	[0..1]	7.9.13
23	Specimen Appropriateness	250	CWE	O	[0..1]	7.9.14
24	Specimen Condition	250	CWE	X	[0..0]	
25	Specimen Current Quantity	20	CQ	X	[0..0]	
26	Number of Specimen Containers	4	NM	X	[0..0]	
27	Container Type	250	CWE	X	[0..0]	
28	Container Condition	250	CWE	X	[0..0]	
29	Specimen Child Role	250	CWE	X	[0..0]	

For every SPM segment in the incoming message:

- The transformer removes the following SPM fields (if the constant clearUnusedFields is set to “true”) as they are unsupported by the ELINCS specification:

Field	Description
SPM-3	specimen parent id's
SPM-5	specimen type modifier
SPM-6	specimen additives
SPM-10	specimen collection site
SPM-11	specimen role
SPM-13	grouped specimen count
SPM-15	specimen handling code
SPM-16	specimen risk code
SPM-19	specimen expiration date/time
SPM-20	specimen availability
SPM-24 –SPM-x	Removes fields SPM-24 through SPM-x

#### **3.6.8.1 SPM-4.1**

If the incoming message has no value set for the SPM-4.1 (specimen type - identifier) field, the following occurs:

- The Specimen Type - Identifier (SPM-4.1) is defaulted to the value of "U"
- A warning is logged: “The Specimen Type (SPM-4.1) has been defaulted to U”

#### **3.6.8.2 SPM-4.2**

If the incoming message has no value set for the SPM-4.2 (specimen type - text) field, the following occurs:

- The Specimen Type - Text (SPM-4.2) is defaulted to the value of “Unknown”
- A warning is logged: “The Specimen Type (SPM-4.2) has been defaulted to Unknown”

### 3.6.8.3 SPM-4.3

If the incoming message has no value set for the SPM-4.3 (specimen type – name of coding system) field, the following occurs:

- The Specimen Type – Name of Coding System (SPM-4.3) is defaulted to the value of "HL70353"
- A warning is logged: "The Specimen Type (SPM-4.3) has been defaulted to HL70353"

### 3.6.9 Additional Segments

The transformer removes the following segments from the message as they are unsupported as per the ELINCS specification:

Segment	Description
FT1	Financial Transaction
CTI	Clinical Trial Identification
DSC	Continuation Pointer

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## 5. Glossary

Term	Definition
CLIA	Clinical Laboratory Improvement Amendments.
EDGE Tool	An open-source application for building and validating ELINCS compliant messages.
ELINCS	The EHR-Laboratory Interoperability and Connectivity Specification
EHR	Electronic Health Record
HIE	Health Information Exchange
HL7	Health Level Seven, a healthcare data interchange standard.
LIS	Laboratory Information System
LOINC	Logical Observation Identifiers Names and Codes, a database for uniquely normalizing laboratory observations.
Mirth Project	Open source software toolkit for data communication, filtering, and transformation
MSH	Message Header Segment (HL7)
NTE	Note Segment (HL7)
OBR	Observation Request Segment (HL7)
OBX	Observations Segment (HL7)
ORC	Common Order Segment (HL7)
PID	Patient Identification Segment (HL7)
SPM	Specimen Segment (HL7)
TQ1	Timing Quantity Segment (HL7)

## 6. References

ELINCS v2.5.1 Specification (HL7-R1)