Understanding Conformance Testing Using the NIST HL7 v2 LOI Validation Tool

Conformance Criterion:

Transmit laboratory orders

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Purpose

- Provide an additional resource to explain the process of HIT Module conformance testing related to HL7 v2 Laboratory Order Interface (LOI) Messaging
- Describe NIST approach for assessing and validating the test messages
- Provide an overview of the testing requirements

Table of Contents

Resources

- Test Tool Web Site (hl7v2-loi-r1-testing.nist.gov)
  - Validation Tools
  - User Documentation
    - Normative Test Process Document (on Test Tool Documentation Tab)
    - S&I Framework Lab Order Interface (LOI) Implementation Guide (http://www.hl7.org/implement/standards/product_brief.cfm?product_id=152)
    - LOI-EHR Tool Quick Reference Guide (In Process)
    - LOI-EHR Tool Tutorial (In Process)
  - Release Notes for each version of Test Tool (on Test Tool Documentation Tab)
- LOI Test Tool Google Group for submitting questions to the Test Tool developers (https://groups.google.com/d/forum/hl7v2-lab-orders-interface-testing)

Scope of Conformance Testing - LOI-EHR

Testing is directed at a Health IT Module (product), not specific instances (installations) of the Module

- The conformance criterion is focused on testing the capability of an HIT Module to create HL7 messages for transmission of orders for clinical laboratory tests
- Site-specific configuration of the HIT Module is not being tested
- Method of transmitting the order messages is not being tested

Testing focus and scope are narrow

- Testing encompasses only specific use cases described in the LOI Implementation Guide (IG)
- Testing does not attempt to address the entire spectrum of use cases found in practice
- *How* the LOI messages are transmitted/exported from the HIT Module is out of scope
- Receiving HIT Modules (e.g., LISs) are not being tested using the LOI-EHR Test Plan in the LOI Test Tool

HIT Module conformance testing is driven by the test data

- The HIT Module is required to demonstrate the ability to create HL7 v2 lab order messages; specific test data for the messages are provided in Test Cases
- The test data and Test Cases do not cover all possible clinical lab tests; through consultation with clinical laboratory experts, a subset of key lab tests were selected for testing
- The format in which the test data are displayed on the screen of the HIT Module is not part of the testing

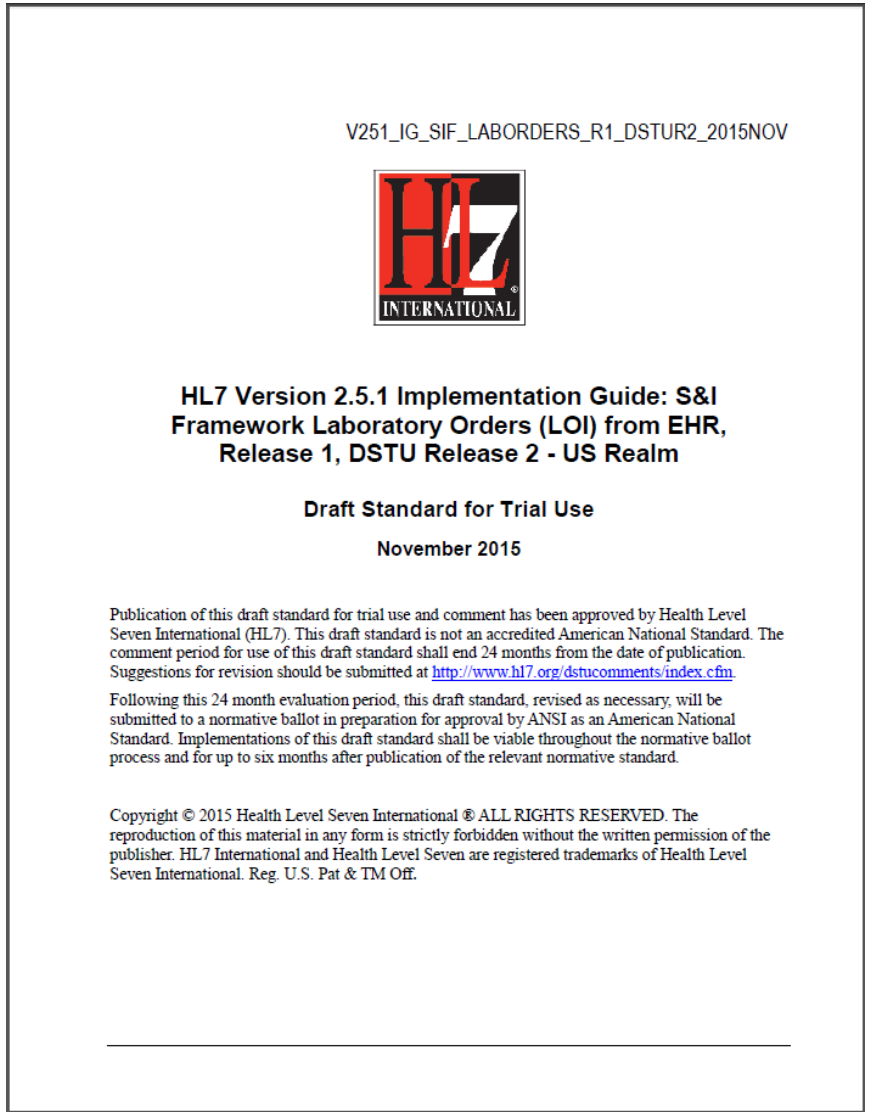
Clinical laboratory subject matter experts, in collaboration with the National Institute of Standards and Technology (NIST), provided the Test Scenarios, Test Cases, and Test Data for the Laboratory Order Interface (LOI) conformance testing

Conformance Criterion - LOI-EHR

Create laboratory orders testing evaluates the capability for an HIT Module in the ambulatory setting to generate laboratory orders for electronic transmission via messages that are conformant to

- *HL7 Version 2.5.1 Implementation Guide: S&I Framework Laboratory Orders from EHR, Release 1, DSTU Release 2 - US Realm (November 2015)*
- Logical Observation Identifiers Names and Codes (LOINC) version 2.50 vocabulary standard

Conformance Standards Document – LOI-EHR



V251_IG_SIF_LABORDERS_R1_DSTUR2_2015NOV

HL7 Version 2.5.1 Implementation Guide: S&I Framework Laboratory Orders (LOI) from EHR, Release 1, DSTU Release 2 - US Realm

Draft Standard for Trial Use

November 2015

Publication of this draft standard for trial use and comment has been approved by Health Level Seven International (HL7). This draft standard is not an accredited American National Standard. The comment period for use of this draft standard shall end 24 months from the date of publication. Suggestions for revision should be submitted at http://www.hl7.org/dstucomments/index.cfm.

Following this 24 month evaluation period, this draft standard, revised as necessary, will be submitted to a normative ballot in preparation for approval by ANSI as an American National Standard. Implementations of this draft standard shall be viable throughout the normative ballot process and for up to six months after publication of the relevant normative standard.

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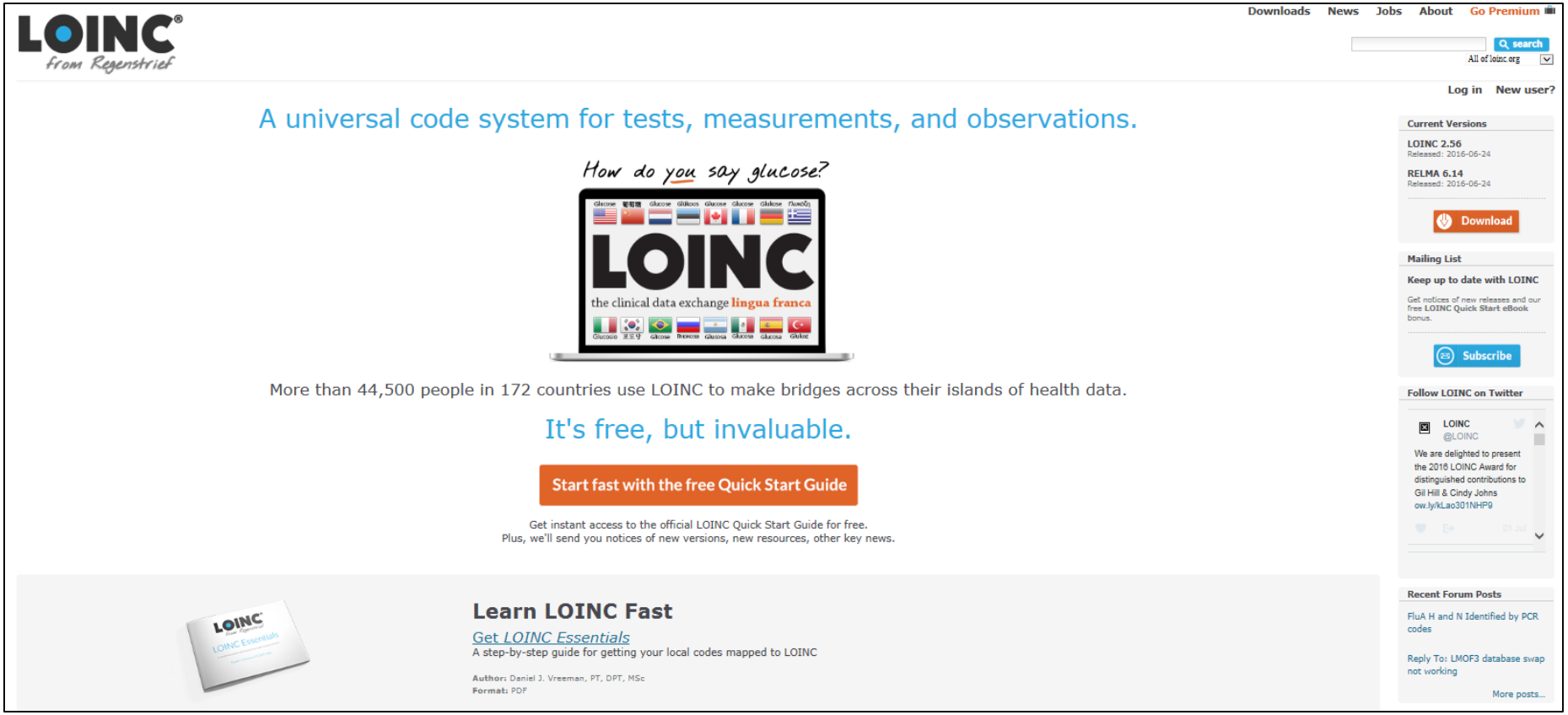
HL7 v2.5.1 LOI Implementation Guide, Release 1, DSTU Release 2, Nov 2015

http://www.hl7.org/implement/standards/product_brief.cfm?product_id=152

Vocabulary Standard Web Site – LOI-EHR



LOINC® Database version 2.50

http://loinc.org/

Create Laboratory Orders Testing Process

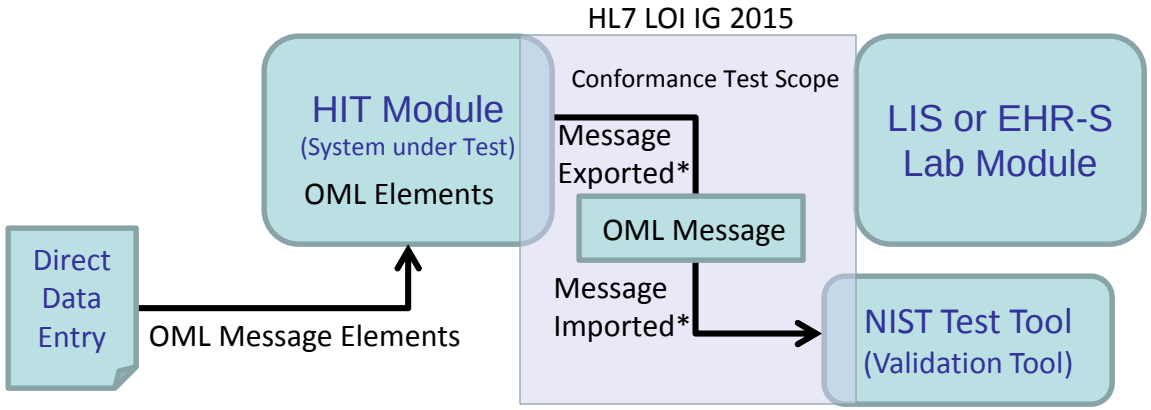


Diagram does not show testing process for Acknowledgment messages or messages for cancellation of an order sent via the LIS

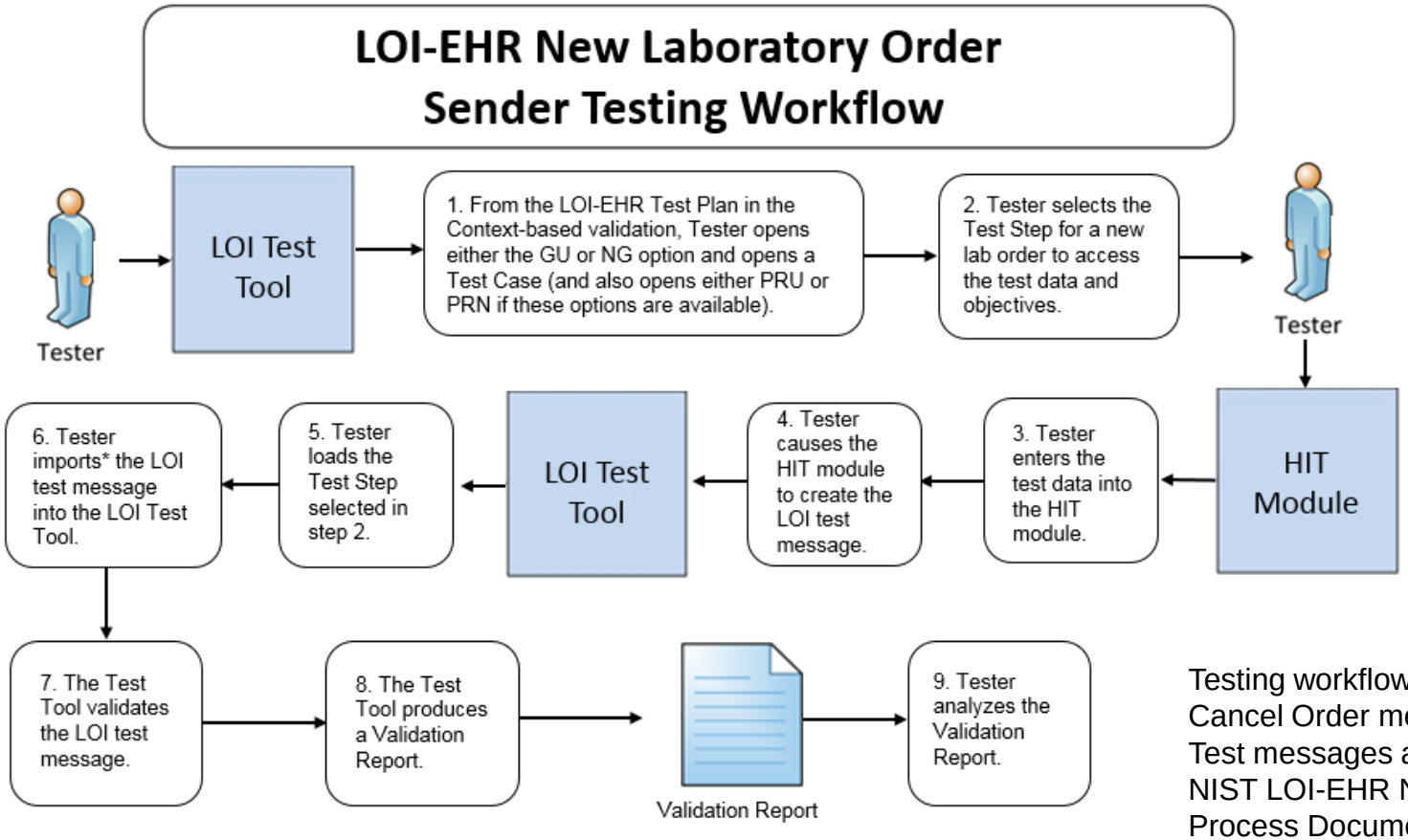
1. The HIT Module (e.g., EHR-S) is the system being tested. The HIT Module is required to create messages that meet the conformance and vocabulary standards (See previous slides).
2. Test data can be entered into the Module directly via the user interface (manually) or can be imported via an incoming message (using any automated method).
3. The Module is expected to process the test data to create a message. This message is exported* from the Module and imported* into the NIST Test Tool for automated validation.
4. Test data are available through the Test Tool via the Test Steps. Each Test Step includes a Test Story that provides the context, a Test Data Specification that lists the test data, a Message Content Data Sheet that shows a conformant message (in a table format) including a detailed profile of the required elements, a Test Message, and (where applicable) a Juror Document.

*How the message is exported/imported/received is not in-scope for certification testing

Create New Lab Orders Testing Workflow Diagram

This diagram shows

- How the steps of the create new lab orders test are sequenced
- When the Test Tool is to be used



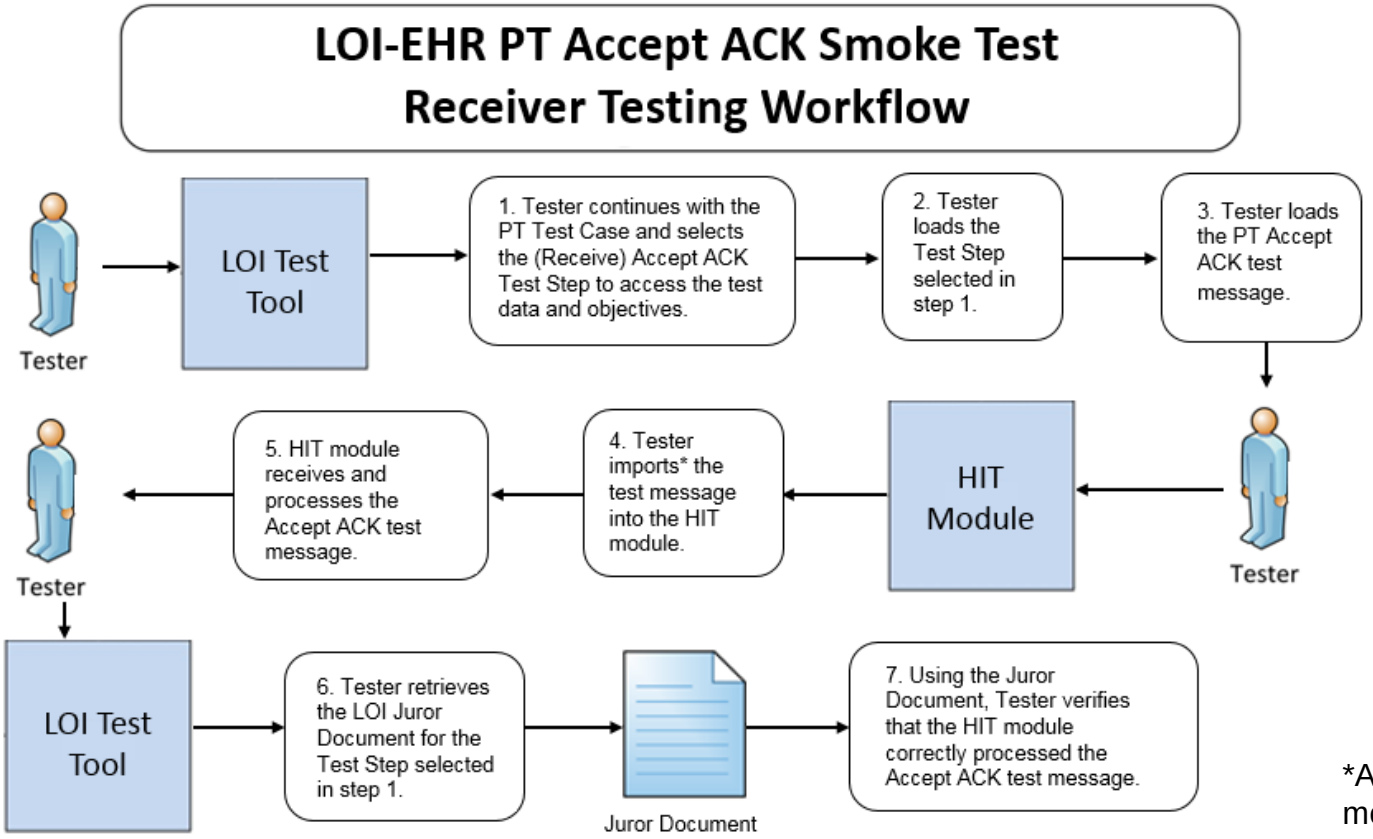
*The method by which the LOI test message is imported into the LOI Tool from the HIT module is not specified.

Testing workflow diagrams for Cancel Order messages and Add-on Test messages are available in the NIST LOI-EHR Normative Test Process Document accessed via the Documentation tab in the LOI Tool

Receive Accept ACK Testing Workflow Diagram

This diagram shows

- How the steps of the receive Accept Acknowledgement* test are sequenced
- When the Test Tool is to be used



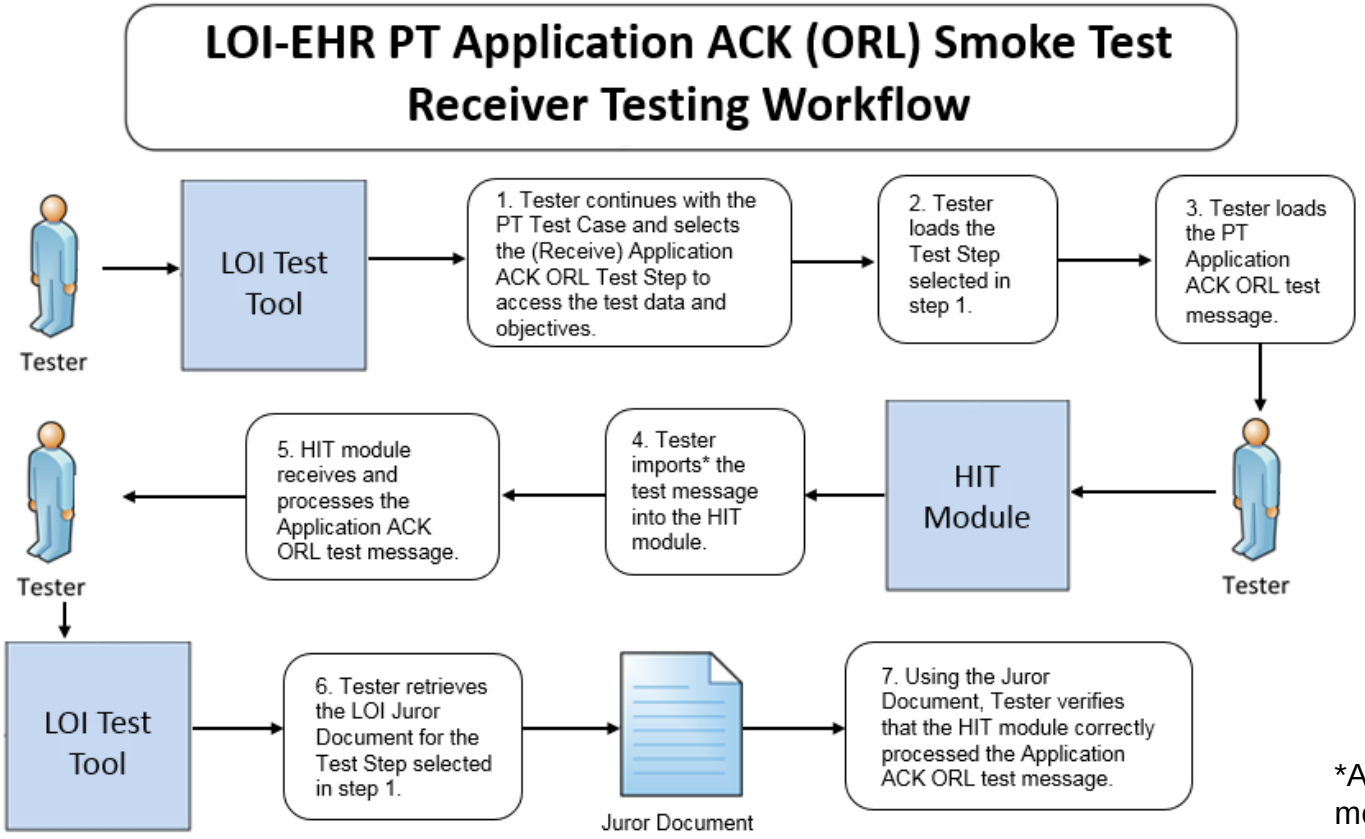
*The method by which the LOI test message is exported from the LOI Tool and imported into the HIT Module is not specified.

*Acknowledgement messages are tested only in the PT Test Scenario

Receive Application ACK Testing Workflow Diagram

This diagram shows

- How the steps of the send Application Acknowledgement* test are sequenced
- When the Test Tool is to be used



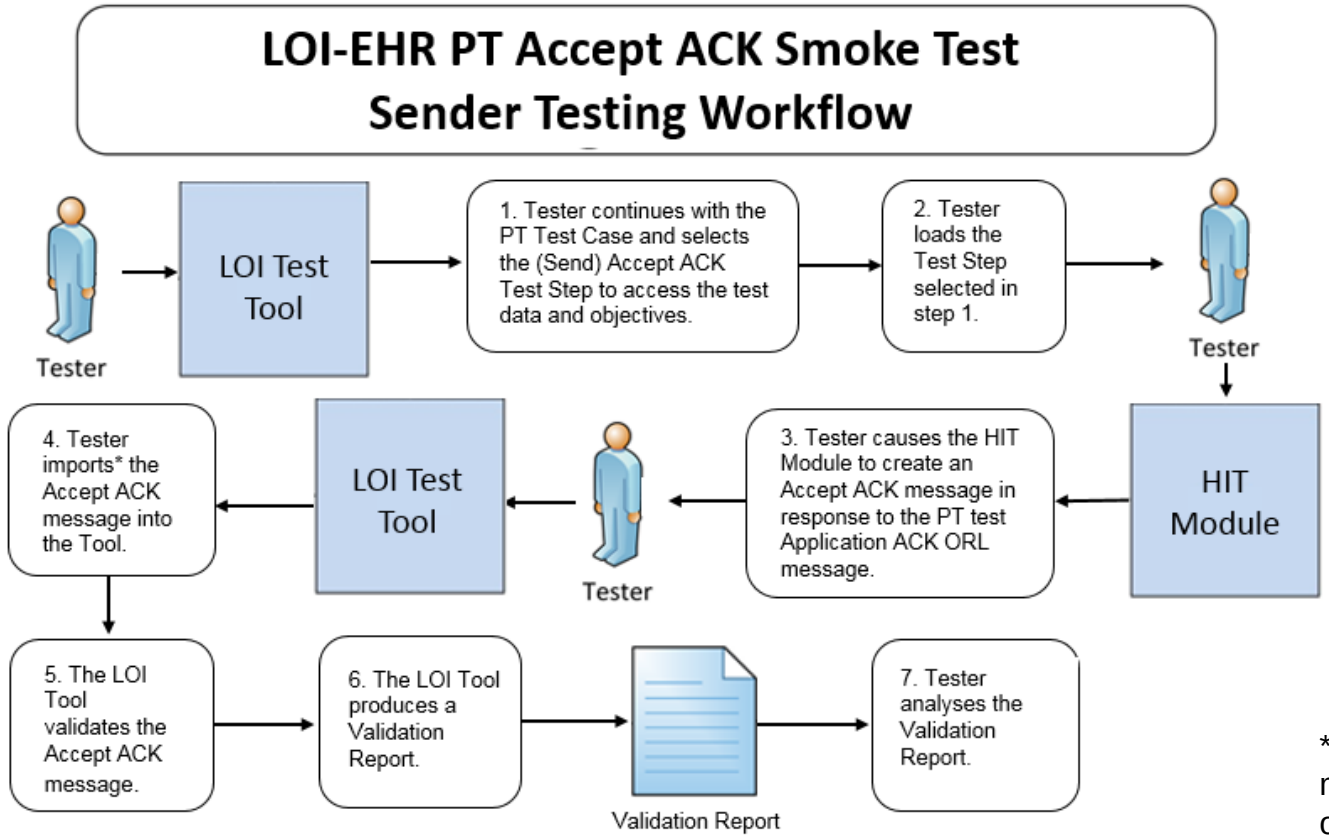
*The method by which the LOI test message is exported from the LOI Tool and imported into the HIT Module is not specified.

*Acknowledgement messages are tested only in the PT Test Scenario

Send Accept ACK Testing Workflow Diagram

This diagram shows

- How the test steps are sequenced for the send Accept Acknowledgement* message (sent in response to the Application Acknowledgement message)
- When the Test Tool is to be used



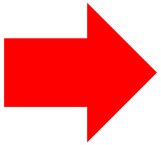
*Acknowledgement messages are tested only in the PT Test Scenario

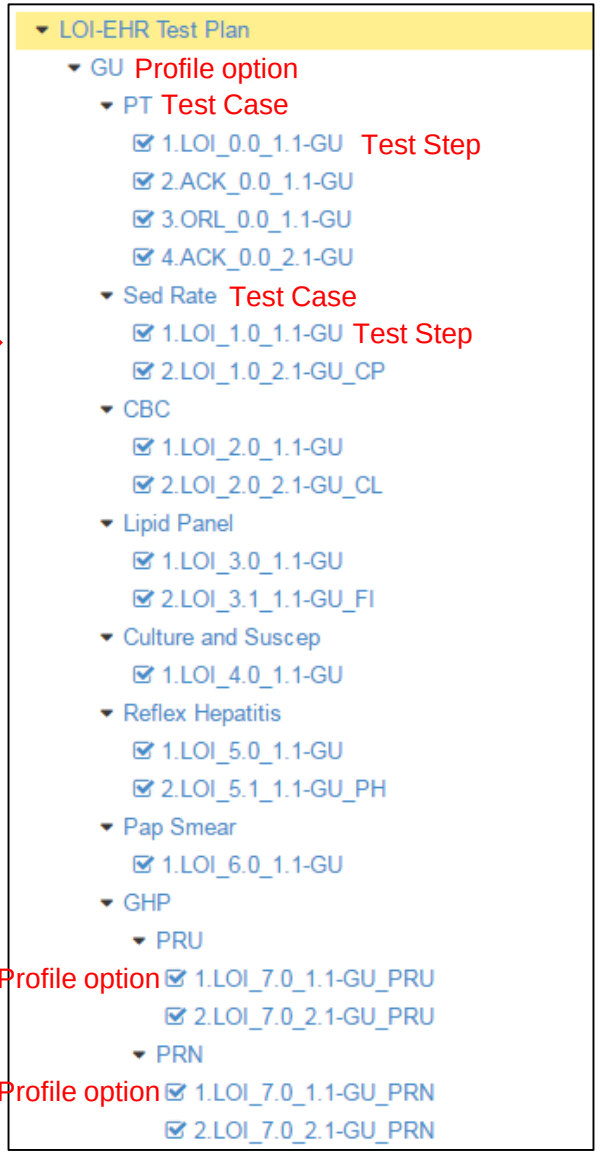
Test Cases and Test Steps

- Test data are available in the LOI Test Tool via the Test Cases provided in the LOI-EHR Test Plan
- The Test Cases are composed of Test Steps
- Each Test Step includes a Test Story, Test Data Specification, Message Content Data Sheet, Test Message, and (where applicable) a Juror Document
- The HL7 Version 2.5.1 Implementation Guide: S&I Framework Laboratory Orders (LOI) from EHR interoperability standard defines four Profile options relevant for conformance testing:
  - LOI_GU_PRU_PROFILE – ID: 2.16.840.1.113883.9.85
  - LOI_GU_PRN_PROFILE – ID: 2.16.840.1.113883.9.86
  - LOI_NG_PRU_PROFILE – ID: 2.16.840.1.113883.9.87
  - LOI_NG_PRN_PROFILE – ID: 2.16.840.1.113883.9.88
- The Tool provides **ten** Test Cases for the GU Profile options and **ten** for the NG Profile options, some of which use either the PRU or PRN Profile option
- For the purpose of the testing, conformance to either the GU_PRU, GU_PRN, NG_PRU, **or** NG_PRN Profile option is required — the Vendor will inform the Tester as to which Profile option their HIT Module is conformant

Test Cases and Test Steps (cont'd)

- Test Cases/Steps for the four Profile options are provided in the LOI-EHR Test Plan in the LOI Test Tool
- This figure shows a sub-set of the Test Cases/Steps in the LOI-EHR Test Plan for the GU Profile option
- The Tester shall execute all **ten** Test Cases for **either** the GU or NG Profile (and in some instances for the GU_PRU or GU_PRN or NG_PRU or NG_PRN Profile option)
- For certain Test Cases, the Tester need not execute optional* Test Cases





*Support for the capabilities in optional Test Cases is preferred but not required

Test Cases and Test Steps (cont'd)

Test Steps for Test Cases 1-2 are shown in the table below

Test Cases	NG Test Steps	GU Test Steps	Description
1 - Minimally populated PT Messages (Smoke Test)	LOI_0.0_1.1-NG	LOI_0.0_1.1-GU	New order of a single test panel to demonstrate ability to generate a basic LOI message Corresponds to the LRI test result message for the PT and INR Test Step
	ACK_0.0_1.1-NG	ACK_0.0_1.1-GU	Accept Acknowledgement message to reveal simple failures of the acknowledgment message severe enough to preclude further testing.
	ORL_0.0_1.1-NG	ORL_0.0_1.1-GU	ORL Application Acknowledgement message to reveal simple failures of the acknowledgment message severe enough to preclude further testing.
	ACK_0.0_2.1-NG	ACK_0.0_2.1-GU	Acknowledgement message to demonstrate capability to create a positive Accept Acknowledgment message in response to successful receipt of the ORL message
2 - Maximally Populated SED Rate Messages	LOI_1.0_1.1-NG	LOI_1.0_1.1-GU	• New order of a single test • Corresponds to the LRI test result message for the Sed Rate Test Steps
	LOI_1.0_2.1-NG_CP	LOI_1.0_2.1-GU_CP	• Cancel order message **from a provider to an LIS** for a previously ordered test prior to sample collection

- Minimally populated means the LOI example messages contain single occurrences of all required ("R") elements
- Maximally populated means the LOI example messages contain all the R, RE, C(a/b) elements defined in the implementation guide

Test Cases and Test Steps (cont'd)

Test Steps for Test Cases 3-5 are shown in the table below

Test Cases	NG Test Steps	GU Test Steps	Description
3 - Typically Populated CBC Message	LOI_2.0_1.1-NG	LOI_2.0_1.1-GU	• New order of a single test panel to generate a typical LOI message • Corresponds to the LRI test result message for the CBC Test Steps
	LOI_2.0_2.1-NG	LOI_2.0_2.1-GU	• Cancel order message **from a laboratory to an EHR-S** for a previously ordered test due to broken specimen container
4 - Typically Populated Lipid Panel Messages	LOI_3.0_1.1-NG	LOI_3.0_1.1-GU	• New order of a single test panel to generate a typical LOI message • Ask-at-Order-Entry: Fasting status • Corresponds to the LRI test result message for the Lipid Panel Test Steps
	LOI_3.1_1.1-NG_FI (**Optional**)	LOI_3.1_1.1-GU_FI (**Optional**)	• New order of a single test panel to generate a typical LOI message • Ask-at-Order-Entry: Fasting status • Corresponds to the LRI test result message for the Lipid Panel Test Steps • Tests for the optional Financial Profile • Payer is a third party; billed to Medicare.
5 - Typically Populated Culture & Susceptibility Messages	LOI_4.0_1.1-NG	LOI_4.0_1.1-GU	• New order of a single test panel for a microbiology test with automatic reflex • Corresponds to the LRI test result message for the Culture and Suscep Test Steps

- Typically populated means the LOI example message contains data that are routinely sent whether the data element is R (Required) or RE (Required, but may be empty)

Test Cases and Test Steps (cont'd)

Test Steps for Test Cases 6-7 are shown in the table below

Test Cases	NG Test Steps	GU Test Steps	Description
6 - Typically Populated Reflex Hepatitis Messages	LOI_5.0_1.1-NG	LOI_5.0_1.1-GU	• New order of a single test panel with automatic reflex • Ask-at-Order-Entry: Pregnancy status • Corresponds to the LRI test result message for the Reflex Hepatitis Test Steps
	LOI_5.1_1.1-NG_PH (**Optional**)	LOI_5.1_1.1-GU_PH (**Optional**)	• New order of a single test panel with automatic reflex for the optional Public Health Profile • Ask-at-Order-Entry: Pregnancy status • Payer is a third party; billed to private insurance • Corresponds to the ELR test result messages for the Final Quantitative Result with Reflex Testing Test Steps

7 - Typically Populated Pap Smear AP Message	LOI_6.0_1.1-NG	LOI_6.0_1.1-GU	• New order for commonly ordered anatomic pathology test
			• Ask-at-Order-Entry:
			  ○ Date of last menstrual period
			  ○ "Did the patient have a previous abnormal Pap report, treatment, or biopsy?" (Yes/No/Unknown)
			• Corresponds to the LRI test result message for the Pap Smear Test Step

- Typically populated means the LOI example message contains data that are routinely sent whether the data element is R (Required) or RE (Required, but may be empty)

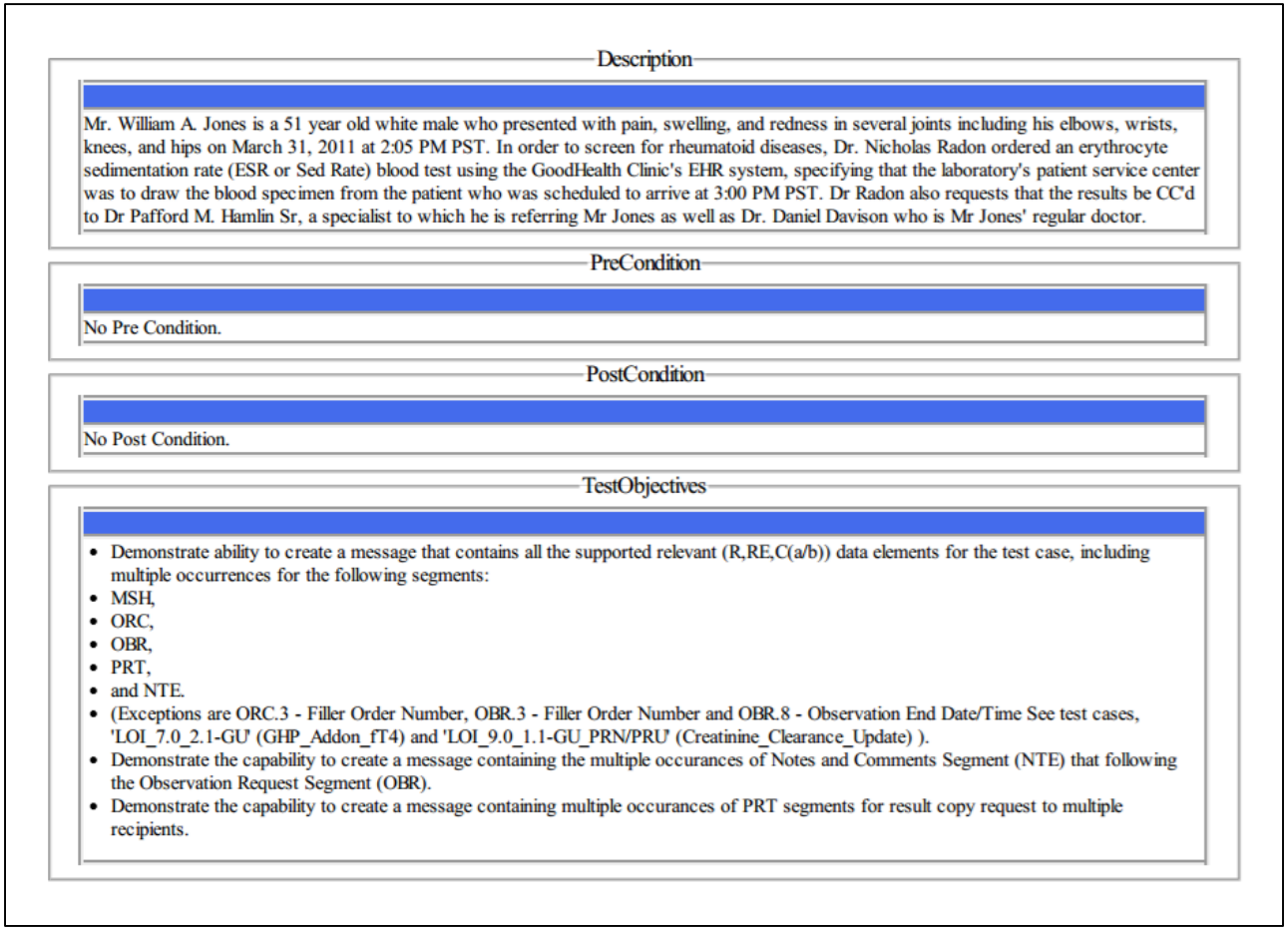
Test Cases and Test Steps (cont'd)

Test Steps for Test Cases 8-10 are shown in the table below

Test Cases	NG Test Steps	GU Test Steps	Description
8 - Maximally Populated GHP Messages	LOI_7.0_1.1-NG_PRU AND LOI_7.0_2.1-NG_PRU **OR** LOI_7.0_1.1-NG_PRN AND LOI_7.0_2.1-NG_PRN	LOI_7.0_1.1-GU_PRU AND LOI_7.0_2.1-GU_PRN **OR** LOI_7.0_1.1-GU_PRN AND LOI_7.0_2.1-GU_PRN	**PRU** New (future) order for general health profile (GHP) containing multiple panels and single test • Confirmatory order for a telephone order for an add-on single test to the previously ordered general health profile • LOI_7.0_1.1-NG/GU_**PRU** GHP has been ordered and resulted. **PRN** New (future) order for general health profile (GHP) containing multiple panels and single test • Confirmatory order for a telephone order for an add-on single test to the previously ordered general health profile • LOI_7.0_1.1-NG/GU_**PRN** GHP has been ordered and resulted.
9 - Maximally Populated Creatinine Clearance Messages	LOI_9.0_1.1-NG_PRU **OR** LOI_9.0_1.1-NG_PRN	LOI_9.0_1.1-GU_PRU **OR** LOI_9.0_1.1-GU_PRN	• **PRU or PRN** New order of a single test panel and a single test with multiple specimens • Ask-at-Order-Entry: o Pregnancy Status o Patient Weight o Collection Volume of 24 Hour Urine
10 - Minimally Populated Prostate Biopsy Message	LOI_10.0_1.1-NG	LOI_10.0_1.1-GU	New order for commonly ordered anatomic pathology test

- Minimally populated means the LOI example messages contain single occurrences of all required ("R") elements
- Maximally populated means the LOI example messages contain all the R, RE, C(a/b) elements defined in the implementation guide

Test Data Documents* for Each Test Step



Description

Mr. William A. Jones is a 51 year old white male who presented with pain, swelling, and redness in several joints including his elbows, wrists, knees, and hips on March 31, 2011 at 2:05 PM PST. In order to screen for rheumatoid diseases, Dr. Nicholas Radon ordered an erythrocyte sedimentation rate (ESR or Sed Rate) blood test using the GoodHealth Clinic's EHR system, specifying that the laboratory's patient service center was to draw the blood specimen from the patient who was scheduled to arrive at 3:00 PM PST. Dr Radon also requests that the results be CC'd to Dr Pafford M. Hamlin Sr, a specialist to which he is referring Mr Jones as well as Dr. Daniel Davison who is Mr Jones' regular doctor.

PreCondition

No Pre Condition.

PostCondition

No Post Condition.

TestObjectives

- Demonstrate ability to create a message that contains all the supported relevant (R,RE,C(a/b)) data elements for the test case, including multiple occurrences for the following segments:
- MSH,
- ORC,
- OBR,
- PRT,
- and NTE.
- (Exceptions are ORC.3 - Filler Order Number, OBR.3 - Filler Order Number and OBR.8 - Observation End Date/Time See test cases, 'LOI_7.0_2.1-GU' (GHP_Addon_fT4) and 'LOI_9.0_1.1-GU_PRN/PRU' (Creatinine_Clearance_Update)).
- Demonstrate the capability to create a message containing the multiple occurances of Notes and Comments Segment (NTE) that following the Observation Request Segment (OBR).
- Demonstrate the capability to create a message containing multiple occurances of PRT segments for result copy request to multiple recipients.

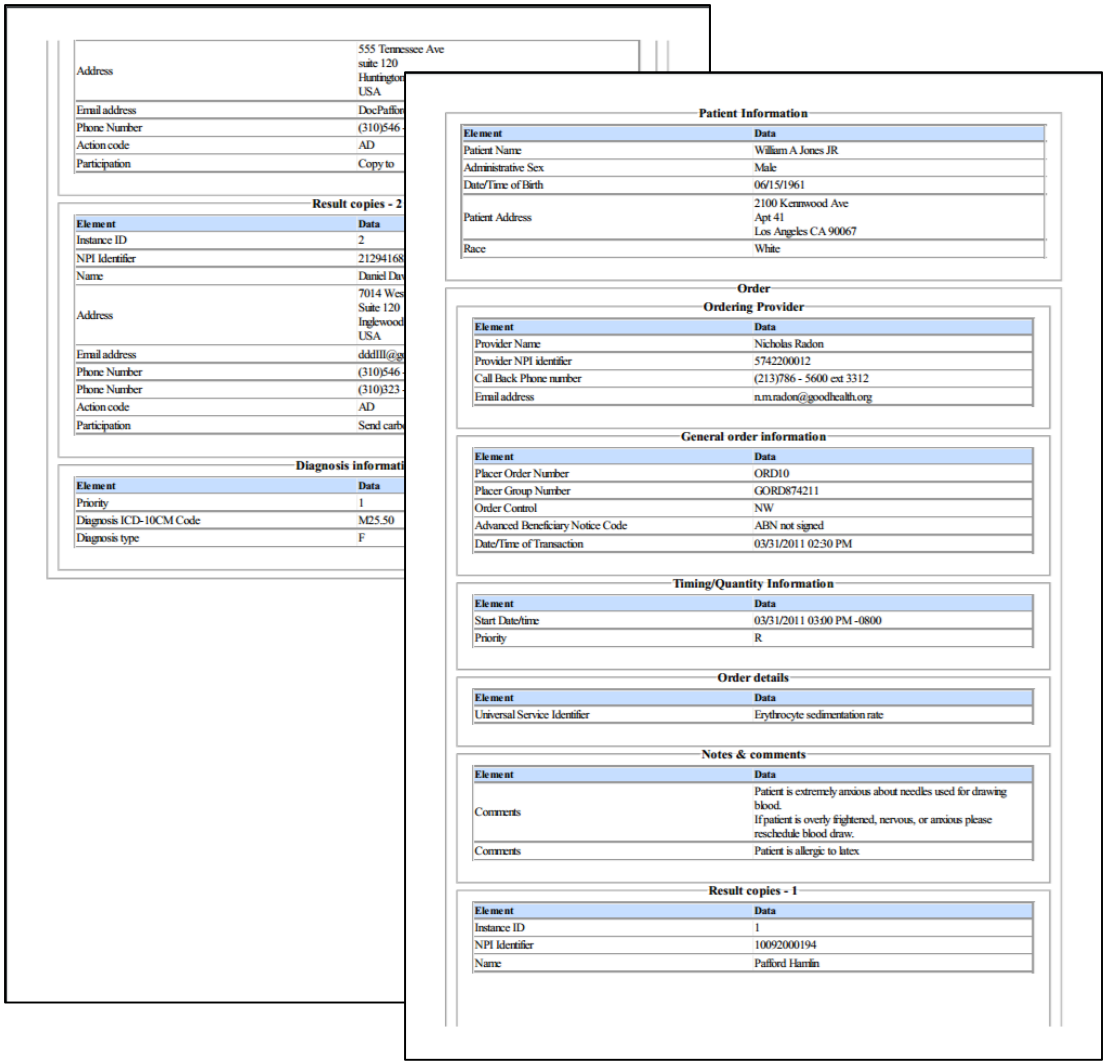
Example: Test Data pdf document for the LOI_1.0_1.1-GU_ Sed Rate Order Test Step

Test Story

- Each Test Step includes a narrative Test Story that describes a real world situation and provides context for the Test Step
- Along with the Test Story description is information about PreConditions, PostConditions, Test Objectives, and (where applicable) Notes to Testers

*Available for viewing online and via downloaded pdf or txt file

Test Data Documents for Each Test Step (cont'd)



Address	555 Tennessee Ave suite 120 Huntington USA
Email address	DocPaffor
Phone Number	(310)546-
Action code	AD
Participation	Copy to

Result copies - 2

Element	Data
Instance ID	2
NPI Identifier	21294168
Name	Daniel Du
Address	7014 Wes Suite 120 Inglewood USA
Email address	dddIII@g
Phone Number	(310)546-
Phone Number	(310)323-
Action code	AD
Participation	Send carb

Diagnosis informati

Element	Data
Priority	1
Diagnosis ICD-10CM Code	M25.50
Diagnosis type	F

Patient Information

Element	Data
Patient Name	William A Jones JR
Administrative Sex	Male
Date/Time of Birth	06/15/1961
Patient Address	2100 Kennwood Ave Apt 41 Los Angeles CA 90067
Race	White

Order

Ordering Provider

Element	Data
Provider Name	Nicholas Radon
Provider NPI identifier	5742200012
Call Back Phone number	(213)786 - 5600 ext 3312
Email address	n.m.radon@goodhealth.org

General order information

Element	Data
Placer Order Number	ORD10
Placer Group Number	GORD874211
Order Control	NW
Advanced Beneficiary Notice Code	ABN not signed
Date/Time of Transaction	03/31/2011 02:30 PM

Timing/Quantity Information

Element	Data
Start Date/time	03/31/2011 03:00 PM -0800
Priority	R

Order details

Element	Data
Universal Service Identifier	Erythrocyte sedimentation rate

Notes & comments

Element	Data
Comments	Patient is extremely anxious about needles used for drawing blood. If patient is overly frightened, nervous, or anxious please reschedule blood draw.
Comments	Patient is allergic to latex

Result copies - 1

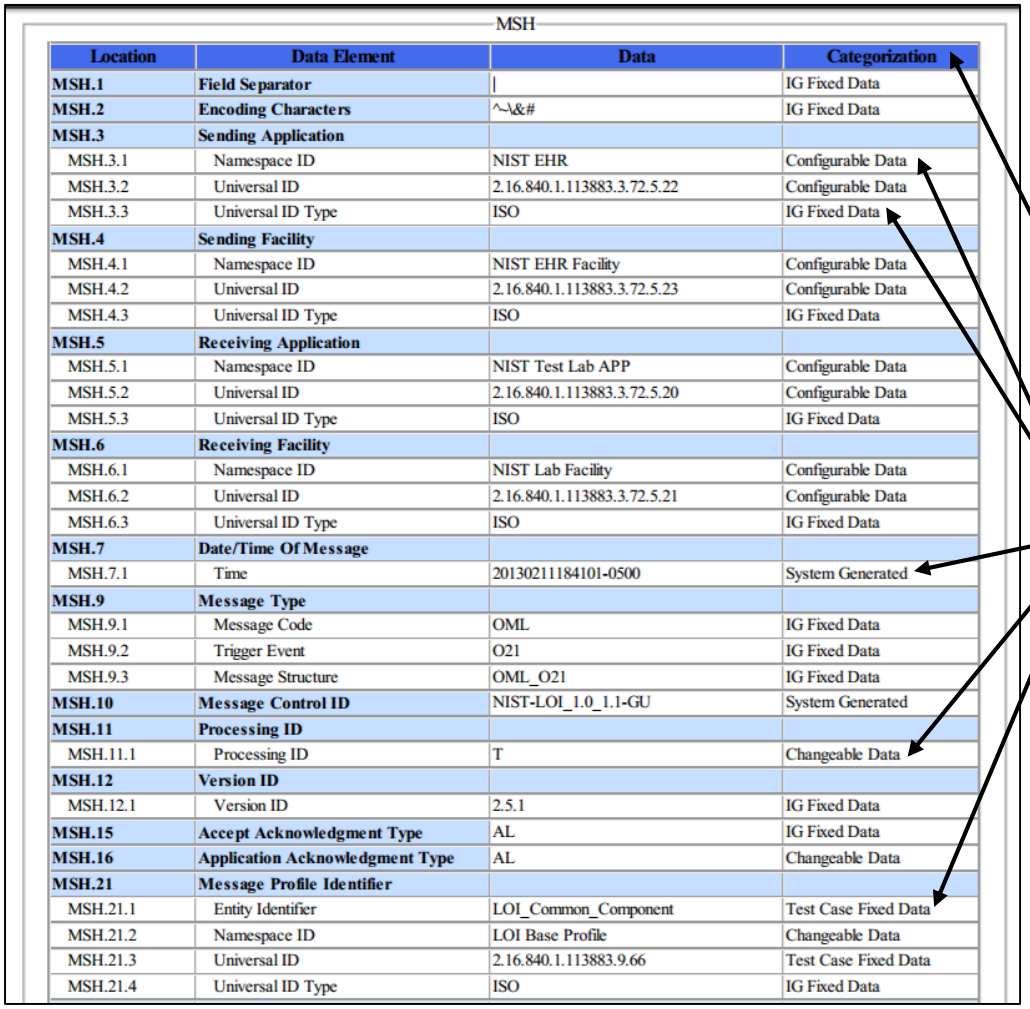
Element	Data
Instance ID	1
NPI Identifier	10092000194
Name	Pafford Hamlin

Example: Test Data pdf document for the LOI_1.0_1.1-GU_ Sed Rate Order Test Step

Test Data Specification

- Each Test Step includes a Test Data Specification that
  - Lists data associated with the Test Story
  - Consists of typical information found in the clinical setting
- A test message is generated using these data and the LOI-EHR Test Tool functions

Test Data Documents for Each Test Step (cont'd)



MSH

Location	Data Element	Data	Categorization
MSH.1	**Field Separator**	|	IG Fixed Data
MSH.2	**Encoding Characters**	^~\&#	IG Fixed Data
MSH.3	**Sending Application**		
MSH.3.1	Namespace ID	NIST EHR	Configurable Data
MSH.3.2	Universal ID	2.16.840.1.113883.3.72.5.22	Configurable Data
MSH.3.3	Universal ID Type	ISO	IG Fixed Data
MSH.4	**Sending Facility**		
MSH.4.1	Namespace ID	NIST EHR Facility	Configurable Data
MSH.4.2	Universal ID	2.16.840.1.113883.3.72.5.23	Configurable Data
MSH.4.3	Universal ID Type	ISO	IG Fixed Data
MSH.5	**Receiving Application**		
MSH.5.1	Namespace ID	NIST Test Lab APP	Configurable Data
MSH.5.2	Universal ID	2.16.840.1.113883.3.72.5.20	Configurable Data
MSH.5.3	Universal ID Type	ISO	IG Fixed Data
MSH.6	**Receiving Facility**		
MSH.6.1	Namespace ID	NIST Lab Facility	Configurable Data
MSH.6.2	Universal ID	2.16.840.1.113883.3.72.5.21	Configurable Data
MSH.6.3	Universal ID Type	ISO	IG Fixed Data
MSH.7	**Date/Time Of Message**		
MSH.7.1	Time	20130211184101-0500	System Generated
MSH.9	**Message Type**		
MSH.9.1	Message Code	OML	IG Fixed Data
MSH.9.2	Trigger Event	O21	IG Fixed Data
MSH.9.3	Message Structure	OML_O21	IG Fixed Data
MSH.10	**Message Control ID**	NIST-LOI_1.0_1.1-GU	System Generated
MSH.11	**Processing ID**		
MSH.11.1	Processing ID	T	Changeable Data
MSH.12	**Version ID**		
MSH.12.1	Version ID	2.5.1	IG Fixed Data
MSH.15	**Accept Acknowledgment Type**	AL	IG Fixed Data
MSH.16	**Application Acknowledgment Type**	AL	Changeable Data
MSH.21	**Message Profile Identifier**		
MSH.21.1	Entity Identifier	LOI_Common_Component	Test Case Fixed Data
MSH.21.2	Namespace ID	LOI Base Profile	Changeable Data
MSH.21.3	Universal ID	2.16.840.1.113883.9.66	Test Case Fixed Data
MSH.21.4	Universal ID Type	ISO	IG Fixed Data

Message Content Data Sheet

- Each Test Step includes a Message Content Data Sheet that shows a conformant message instance
- The category of the test data is listed in the Categorization column
- The Categorization indicates how the data in the messages that are imported into the Tool are assessed by the validation engine

Example: Test Data pdf document for the LOI_1.0_1.1-GU_ Sed Rate Order Test Step

Test Data Documents for Each Test Step (cont'd)

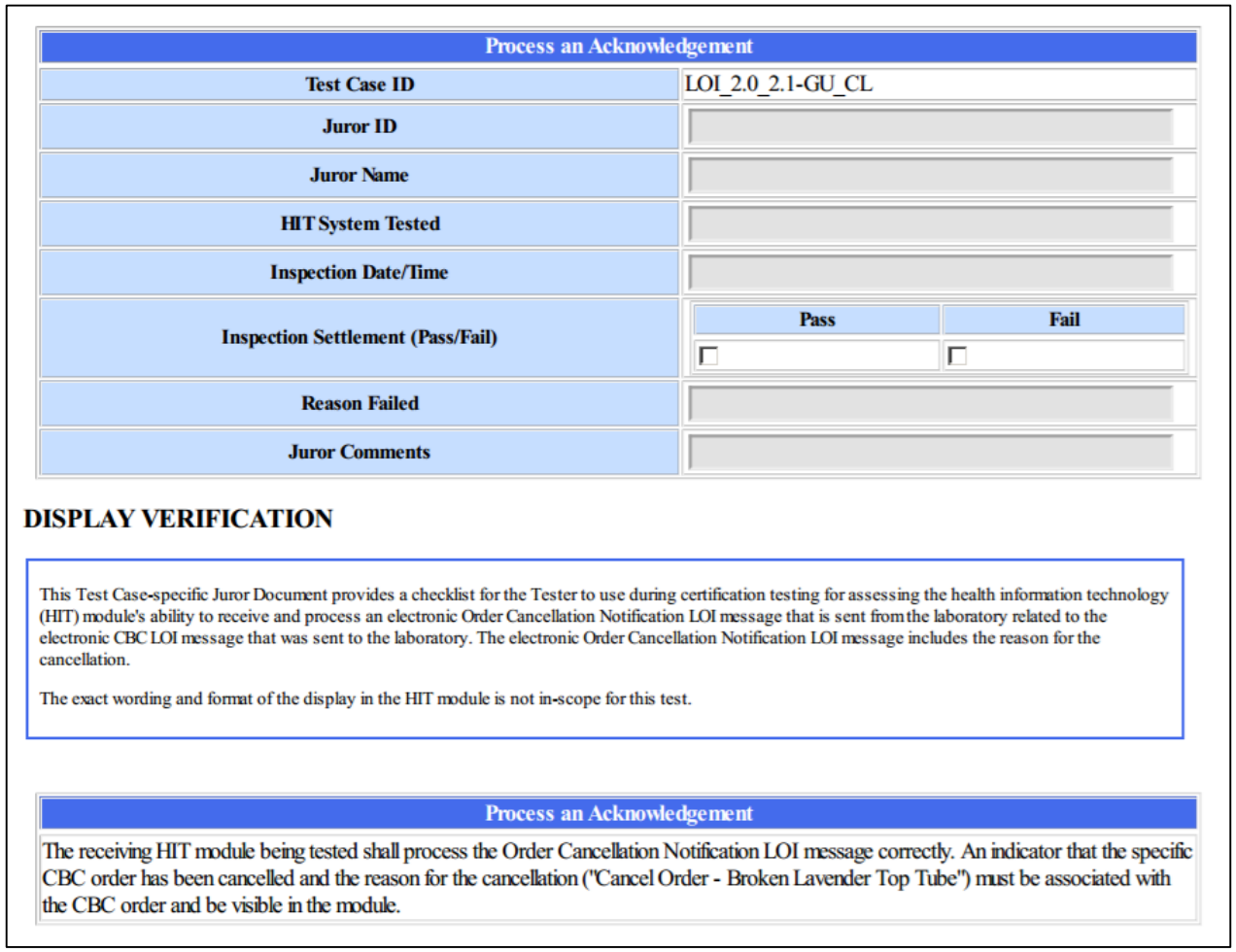
```
MSH|^~\&#|NIST EHR^2.16.840.1.113883.3.72.5.22^ISO|NIST EHR Facility^2.16.840.1.113883.3.72.5.23^ISO|NIST Test Lab
APP^2.16.840.1.113883.3.72.5.20^ISO|NIST Lab Facility^2.16.840.1.113883.3.72.5.21^ISO|20130211184101-0500||OML^O21^OML_O21|NIST-
LOI_1.0_1.1-GU|T|2.5.1|||AL|AL|||||LOI_Common_Component^LOI Base Profile^2.16.840.1.113883.9.66^ISO~LOI_GU_Component^LOI GU
Profile^2.16.840.1.113883.9.78^ISO~LAB_PRU_Component^LOI PRU Profile^2.16.840.1.113883.9.82^ISO

PID|1||PATID1234^^^NIST MPI&2.16.840.1.113883.3.72.5.30.2&ISO^MR||Jones^William^A^JR^^^L||19610615|M||2106-
3^White^HL70005|2100 Kennwood Ave^Apt 41^Los Angeles^CA^90067^^H

ORC|NW|ORD10^NIST EHR^2.16.840.1.113883.3.72.5.24^ISO||GORD874211^NIST
EHR^2.16.840.1.113883.3.72.5.24^ISO|||||201103311430|||5742200012^Radon^Nicholas^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI||
^^PH^^^213^7865600^3312~^^X.400^n.m.radon@goodhealth.org|||||4^Advanced Beneficiary Notice has not been
signed^HL70339^^^^2.5.1^^ABN not signed

TQ1|1||||||201103311500-0800||R^^HL70485

OBR|1|ORD10^NIST EHR^2.16.840.1.113883.3.72.5.24^ISO||500^Erythrocyte sedimentation rate^99USL^30341-2^Erythrocyte sedimentation
rate^LN^20130421^^Erythrocyte sedimentation
rate||||||||||||5742200012^Radon^Nicholas^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI|^^PH^^^626^5552341^3312~^^Internet^n.ra
don@goodhealth.org||||||||||10092000194^Hamlin^Pafford^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI~2129416824^Davison^Daniel
^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI

NTE|1||Patient is extremely anxious about needles used for drawing blood.\E\br\E\If patient is overly frightened, nervous, or anxious please
reschedule blood draw.

NTE|2||Patient is allergic to latex

PRT|1^NIST EHR^2.16.840.1.113883.3.72.5.22^ISO|AD||RCT^Result Copies To^HL70912^^^^^^Copy
to|10092000194^Hamlin^Pafford^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI||||||||555 Tennessee Ave^suite 120^Huntington
Park^CA^90255^USA^B|^^FX^^^323^5555555~^^Internet^DocPafford@gooddr.com~^^PH^^^310^5465550^19

PRT|2^NIST EHR^2.16.840.1.113883.3.72.5.22^ISO|AD||RCT^Result Copies To^HL70912^^^^^^Send carbon copies
to|2129416824^Davison^Daniel^^^^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI||||||||7014 West Arbor Vitae St^Suite
120^Inglewood^CA^90313^USA^B|^^FX^^^310^5465555~^^Internet^dddIII@gooddr.com~^^PH^^^310^5465550^18~^^PH^^^310^3235780^
19

DG1|1||M25.50^Pain in unspecified joint^I10C|||F|||||||1
```

Example Test Message

- A test message is provided that coincides with the Test Story for the Test Step
- For the LOI-EHR Test Plan, the lab order test messages are created and exported (sent) by the HIT Module being tested and are imported (received) by the LOI Test Tool (acting as the LIS or EHR-S lab module)

Example: Test Message for the
LOI_1.0_1.1-GU_ Sed Rate Order Test Step

Test Data Documents for Each Test Step (cont'd)



Process an Acknowledgement	
Test Case ID	LOI_2.0_2.1-GU_CL
Juror ID	
Juror Name	
HIT System Tested	
Inspection Date/Time	
Inspection Settlement (Pass/Fail)	Pass ☐ Fail ☐
Reason Failed	
Juror Comments	

DISPLAY VERIFICATION

This Test Case-specific Juror Document provides a checklist for the Tester to use during certification testing for assessing the health information technology (HIT) module's ability to receive and process an electronic Order Cancellation Notification LOI message that is sent from the laboratory related to the electronic CBC LOI message that was sent to the laboratory. The electronic Order Cancellation Notification LOI message includes the reason for the cancellation.

The exact wording and format of the display in the HIT module is not in-scope for this test.

Process an Acknowledgement
The receiving HIT module being tested shall process the Order Cancellation Notification LOI message correctly. An indicator that the specific CBC order has been cancelled and the reason for the cancellation ("Cancel Order - Broken Lavender Top Tube") must be associated with the CBC order and be visible in the module.

Juror Document

Each (receiver) Test Step includes a Juror Document – a checklist used by the Tester/Inspector to assess and record whether the HIT Module being tested is able to process the message according to the LOI specification

Example: Juror Document pdf for the LRI_2.0_2.1-GU_CL Cancel CBC Lab Order Test Step

Test Data Categorization and Validation

- The Message Content Data Sheet shows the categorization of the test data that are provided for each Location in the LRI message
- The category assigned to the data is directly related to how the associated message content is validated by the Test Tool, as shown in the table below

Data Categorization	Description	Validation
Configurable	Data typically configured by the system (customer-definable). Example data are provided.	Validate for the presence of data
System Generated	Data typically generated automatically by the system, e.g., message time. Example data are provided.	Validate for the presence of data
IG Fixed	Data that are fixed by the implementation guide; data can't be changed. Specific data are provided.	Validate for the presence and data content
Test Case Fixed	Data that are specific and fixed by the test case; data should not be changed. Specific data are provided	Validate for the presence and selectively validate for data content
Changeable	Data where the exact content is not relevant for the test case and can be changed for the purposes of testing. Example data are provided.	Validate for the presence of data

Test Data Validation

- The Test Tool validates a message for the *presence and exact content* of the data for Locations assigned to the **IG Fixed** category and for selective Locations assigned to the **Test Case Fixed** category
- The Test Tool validates a message for the *presence* of data for Locations assigned to **any of the other** categories
  - These data are necessary for the transaction, but the exact content is either not relevant for the Test Step or may be system-dependent
  - Example: Universal ID for the Performing Organization

Location	Value	Category	Assessment
OBR.4.1	500	Test Case Fixed Data	Content must be present and exactly "500"
OBR.4.2	Erythrocyte sedimentation rate*	Changeable Data	Content must be present and indicate a value equivalent to Erythrocyte sedimentation rate
OBR.4.3	99USL	Test Case Fixed Data	Content must be present and exactly "99USL"
OBR.2.3	2.16.840.1.113883.3.72.5.24	Configurable Data	Content must be present and a valid value
OBR.2.4	ISO	IG Fixed Data	Content must be present and exactly "ISO"

- The Tester may also inspect the message during validation; the Inspection Test Guides in the Normative Test Process Document provide guidance

*This text is provided as the Value for Location OBR.4.2 in the message for the LOI_1.0_1.1-GU Test Step

NIST LOI-EHR Test Tool Overview

Purpose: The tool validates LOI messages created by HIT Modules and is intended to be used for conformance testing according to the standards listed on the Conformance Standards page of this slide set

Tool Key Capabilities	
Context-based testing / LOI-EHR Test Plan	• Used for conformance testing driven by test data • Validates HIT Modules that create HL7 messages in accordance with the ONC S&I Framework Laboratory Orders (LOI) to EHR implementation guide (IG) • Provides Juror document for inspection testing
Profile Viewer	Provides a browse-able version of the conformance profile that encapsulates the requirements. Profile Viewer tab is accessible in Context-based testing once a Test Case or Test Step is "loaded". Can be used to assist in the interpretation of message errors.
Value Sets Browser	Provides a browse-able view of the Value Sets and Vocabulary requirements. Value Sets tab is accessible in Context-based testing once a Test Case or Test Step is "loaded". Can be used to assist in the interpretation of value set errors.
Documentation	Provides access to documents that assist in using the Tool for conformance testing (including the NIST Normative Test Process Document, Implementation Guide, and Release Notes).

No registration or log-in credentials are required. Simply click on the link below (or type in the url) to access and use the Tool

hl7v2-loi-r1-testing.nist.gov

NOTE: The Test Tool (.war file) can also be downloaded and installed locally.
NOTE: Web Application is compatible with Firefox, Chrome, Safari, and IE9+. Recommended browsers are Firefox and Chrome.

Register to Google Group at: https://groups.google.com/d/forum/hl7v2-lab-orders-interface-testing to ask questions and provide feedback.

NIST LOI-EHR Test Tool Screen Shot

1. Open LOI Validation tool using link: (hl7v2-loi-r1-testing.nist.gov) and click on Context-based

2. Test Selection view of page displays.

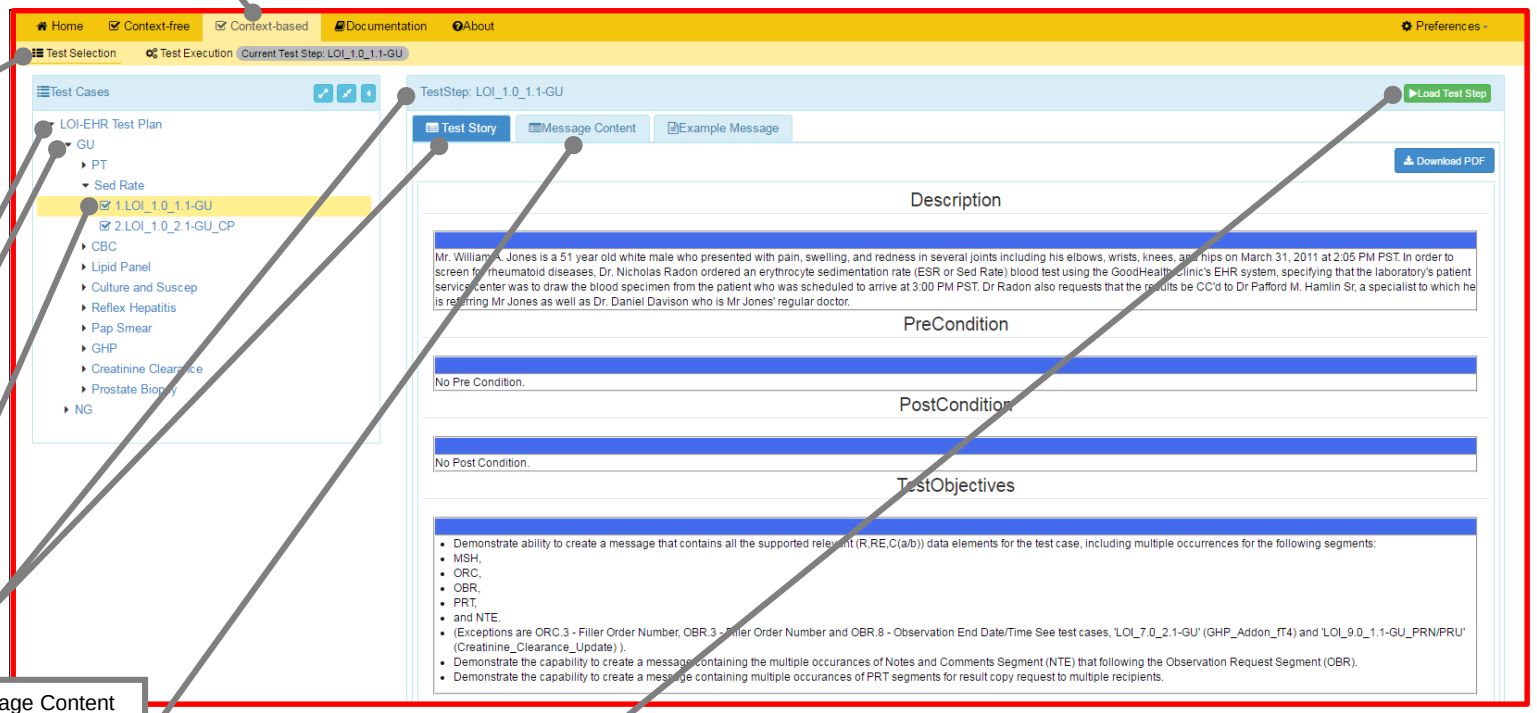
3. Click on arrows to open LOI-EHR Test Plan and then the set of GU Test Cases.

4. Click on arrows to expand the Test Cases. Click on a Test Step.

5. Test Step Title and Test Story tab display.

6. Click Message Content tab to view and download the message content sheet

7. Click on Load Test Step button to proceed with conformance testing for the Test Step.



HIT Context-based Validation

This feature is used to test HIT Modules for conformance to the LOI standards. The majority of the validation involves automated testing that assesses the LOI messages created by the Module and sent to the LIS Test Harness. Another type of validation pertains to the inspection testing. This process utilizes an inspector to ascertain if the Acknowledgement and Cancel Order messages created by the LIS Test Harness are processed correctly by the Module. The Juror Document guides the inspector through the assessment process.

Resources

- Test Tool Web Site (hl7v2-loi-r1-testing.nist.gov) provides
  - Test Tool (API, Web Application, and Desktop)
  - Test Cases/Steps, Test Stories, Test Data, Message Content Sheets, Example Messages, Juror Documents
  - User Documentation
  - Testing Artifacts
    - Message Profiles
    - Value Sets
    - Validation Reports
- Contact
  - Rob Snelick (rsnelick@nist.gov)