Vermont Electronic Laboratory Reporting (ELR)

HL7 2.5.1 Implementation Guide

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Version 4.0

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VERMONT
DEPARTMENT OF HEALTH

Contents

Introduction

If you need help accessing or understanding this information, please contact AHS.VDHELRSupport@vermont.gov.

Purpose

The “Vermont Electronic Laboratory Reporting (ELR) HL7 2.5.1 Implementation Guide” is a resource for health care organizations (HCOs) to successfully onboard and send electronic laboratory reporting (ELR) to the Vermont Department of Health, in an HL7 2.5.1 format. Within this document, HCOs will find standards, best practices, helpful tips for ELR messages, and onboarding instructions. This information can be utilized for sending successful ELR messages and troubleshooting issues as they arise.

This document is meant to provide additional, Vermont specific guidance and can be utilized alongside the HL7 Version 2.5.1 Implementation Guide. In some instances, Vermont guidance will supersede the HL7 guidance. Within each segment section of this document, Vermont specific guidance will be noted in the “comments" section.

Intended Audience

This guide is intended for both HCOs required to send the Health Department reportable laboratory test results, as well as the health information exchange groups (intermediaries) charged with implementing and supporting ELR onboarding and transmission. The reader of this guide should have a solid HL7 foundation and be familiar with the contents of the HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm).

Please Note

Throughout this document, health care organization or HCO will be used, which represents any organization responsible for sending reportable laboratory results to the Vermont Department of Health. The term intermediaries will represent organizations that assist ELR senders with onboarding and ELR reporting, including health information exchange organizations. The two main intermediaries sending to Vermont include VITL and the AIMS platform. (Please see definitions section for more information about these organizations.)

Benefits of Electronic Laboratory Reporting

ELR offers long-term benefits to both laboratories and public health agencies.

Laboratory benefits include:

- Automation of reporting reduces laboratory person hours and duplicate data entry.
- Single data pipeline removes the need for multiple faxes and in some cases, phone calls.
- More timely reporting.
- Reduction in human errors.

Public Health Agency benefits include:

- Faster, more accurate and complete data leads to improved public health response to cases of reportable conditions.
- More effective response to outbreaks.
- Reduces person hours spent manually entering data, which also reduces duplicate records and human error.

Acronyms and Definitions

Acronym	Full Name	Description
AIMS	APHL Informatics Messaging Services	The AIMS platform is a CDC based intermediary for onboarding and sending ELRs from a sending facility to a public health agency (such as the Vermont Department of Health). The AIMS platform is maintained by APHL.
APHL	Association of Public Health Laboratories	APHL is available to laboratories and public health agencies when ELR related questions arise.
CDC	Centers for Disease Control and Prevention	A federal agency within the U.S. Department of Health and Human Services. "CDC serves the American public – individuals, families, and communities who rely on accurate data, health guidance, and preventive measures." About CDC | About CDC | CDC
CLIA	Clinical Laboratory Improvement Amendments	CMS (Centers for Medicare & Medicaid Services) is the entity responsible for regulating CLIA certifications. CLIA certifications ensure laboratory testing is regulated, ensuring test results are accurate, reliable, and timely.
EHR	Electronic Health Record	An electronic version of a patient's health record. The term is sometimes used when referring to the system that holds patient health records or a specific vendor (e.g. Epic). A patient's health record often consists of information such as demographics, billing, current medications, medical history, immunization status, allergies, x-rays, laboratory results, etc., and originates from a wide variety of sources stored in different data formats. The EHR is designed to gather information from various sources and formats and compile it within a single interface easily accessible to clinicians at the point of care. The standardization required for this level of data sharing also makes it possible to export and exchange data with other entities in a standard way.
ELR	Electronic Laboratory Reporting	ELR for public health is the automated transmission of laboratory reports in an electronic format rather than in a manual format (such as faxing or through mail). These are most often sent from CLIA certified laboratories to state and local public health departments, healthcare systems, and the CDC. A sending information system generates a standardized (in structure and content) message, which is transmitted by electronic means to a receiving system capable of receiving and consuming the standardized message.

HL7	Health Level Seven International	An all-volunteer, non-profit organization involved in the development of international healthcare informatics interoperability standards, and the standard for exchanging health information between medical applications.
LIMS	Laboratory Information Management System	Software and processes within a laboratory that facilitate accessioning orders, analysis of results, quality control, and reporting results.
LOINC	Logical Observation Identifiers Names and Codes	A universal code system for identifying laboratory and clinical observations. LOINC codes are used in ELR messages to convey information related to the laboratory tests that have been ordered and resulted.
NIST Message Validator	National Institutes of Standards and Technology Message Validator	A message validation tool provided by NIST. Intended for ONC Health IT certification testing, it provides robust structure and content checking for transmission of ELR to public health agencies. Available at https://hl7v2-elr-testing.nist.gov/mu-elr
OID	Object Identifier	A structured code used to identify an 'object' such as a hospital or a software application used at one of the facilities exchanging information with an HL7 message.
PHIN VADS	Public Health Information Network Vocabulary Accessand Distribution System	PHIN VADS provides standard vocabularies to CDC and its Public Health Partners in one place. PHIN VADS is a web-based enterprise vocabulary system for accessing, searching, and distributing vocabularies used within the PHIN. It promotes the use of standards-based vocabulary within PHIN systems to support the exchange of consistent information among Public HealthPartners. The PHIN VADS is available at the following web location: https://phinvads.cdc.gov/vads/SearchHome.action
RCMT	Reportable Condition Mapping Table	Provides mapping between a reportable condition and its associated LOINC laboratory tests and SNOMED laboratory results. The RCMT is available at the following web location: https://phinvads.cdc.gov/vads/SearchHome.action
SNOMED or SNOMEDCT	Systematized Nomenclature of Medicine--Clinical Terms	A comprehensive clinical terminology, originally created by the College of American Pathologists (CAP) and, as of April 2007, owned, maintained, and distributed by the International Health Terminology Standards Development Organization (IHTSDO), a not-for-profit association in Denmark. SNOMED codes relevant for ELR are found in the RCMT available at the following web location: https://phinvads.cdc.gov/vads/SearchHome.action Another search browser includes: SNOMED CT - Home

VDH	Vermont Department of Health	The state level public health agency in Vermont. VDH also serves as a clearinghouse for reportable conditions and lab resultswithin Vermont, meaning that VDH will refer condition specific case information to the appropriate local public health agency and programs.
VITL	Vermont Information Technology Leaders	A non-profit organization that supports health information exchange in Vermont, including ELR. Also referred to as the VHIE (Vermont's Health Information Exchange), VITL is an ELR intermediary organization. VITL - Vermont Health Information Exchange - VITL

Standard Documents

The implementation of Electronic Laboratory Reporting (ELR) should follow two key documents: the Vermont Reportability Rule and the national HL7 version 2.5.1 ELR Implementation Guide.

Vermont Reportability Rule

Vermont's Reportable and Communicable Disease Rule (referred to as Vermont Reportability Rule in this document) provides details around the conditions and lab results that are required to be reported to the Vermont Department of Health. A link to the most up to date Vermont Reportability Rule, as a PDF, can be found on this page:

Infectious Disease Reporting and Data | Vermont Department of Health

The Vermont Reportability Rule provides guidance on which conditions and lab results must be reported, required timeliness for reporting, and details around specific information that must be included in these reports. The Vermont Reportability Rule is periodically reviewed and updated, either every couple of years or through an emergency amendment. This review may add or remove reportable diseases and lab results, and at times clarify or change guidance for reporting a disease or lab result. HCOs will receive guidance on these updates via a Vermont Health Alert Network (HAN) advisory; however, the Health Department is always available for questions.

You may sign up for HAN advisories here: Health Alerts & Advisories | Vermont Department of Health

In addition, section seven of the Vermont Reportability Rule indicates what must be included in a reportable lab finding and these data elements may differ from national guidance. This information has also been commented on in the segment comments sections of this guide below.

HL7 Version 2.5.1 Implementation Guide

The HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm) includes instructions on HL7 ELR messaging. Information regarding the different segments, fields, and HL7 language is included. Segment and field requirements, as well as code details, are also included so that HL7 messages can be formatted properly. Messages following this implementation guide will include correctly formatted ELR messages with correct content, however, please review the rest of this implementation guide for additional Vermont specific guidance and requirements.

Additional Reporting Guidance

More details about reporting lab results can be found on the following sites:

Vermont Department of Health Lab Result Reporting:
https://www.healthvermont.gov/disease-control/infectious-disease-reporting-and-data/lab-result-reporting

Vermont Department of Health Promoting Interoperability Program:

https://www.healthvermont.gov/systems/hospitals-health-systems/promoting-interoperability-program

Centers for Medicare & Medicaid Services Promoting Interoperability Program:

https://www.cms.gov/medicare/regulations-guidance/promoting-interoperability-programs

Onboarding Process

Overview

Each laboratory will onboard with an intermediary including either Vermont's HIE (operated by VITL) or the APHL AIMS Platform (a CDC-supported intermediary).

ELR onboarding generally consists of four phases of onboarding.

1. Preparation
2. Connection and Pre-Testing
3. Content Testing and Validation
4. Parallel Reporting and Production

Laboratories will work directly with the intermediary organizations, including during the preparation process, for connection set up and pre-testing, and issue resolution found during testing. Intermediaries will also set up NACK (Negative Acknowledgment) messages, which are automatic messages notifying the sender of an ELR failure.

The Health Department's role is to ensure the content of the message is correct and that the message meets Vermont specific rules. This means that the Health Department will be more focused on the content testing and validation of ELRs entering their system. This also includes verification that they are receiving all reportable ELRs from an HCO successfully.

- For more information about the onboarding process, which intermediary to onboard with, or for any questions, please contact the Health Department ELR Team at:

  AHS.VDHELRSupport@vermont.gov

- For more information about VITL, please visit the following website:

  https://vitl.net/

- For more information about APHL AIMS, please visit the following website:

  https://www.aphl.org/programs/informatics/Pages/aims_platform.aspx

Preparation

The following includes a list of tasks a sending laboratory must undertake prior to onboarding for electronic laboratory reporting.

1. Ensure all entities involved with ELR onboarding are engaged, including the Health Department, the laboratory vendor, and the chosen intermediary. Review the

onboarding process and timeline with all groups to ensure the appropriate resources and staff are available.

2. Review required standards.
    a. HL7 Version 2.5.1 Implementation Guide for ELR: HL7 Standards Product Brief - HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm) | HL7 International
    b. LOINC.org for order and result test codes: https://loinc.org/
    c. PHIN VADS for correct vocabulary value sets and SNOMED codes: https://phinvads.cdc.gov/vads/SearchVocab.action
3. Map local codes to LOINC and SNOMED codes and ensure correct value sets are being utilized (e.g. UCUM value set).
4. If possible, provide the Health Department with a list of tests the lab may report. This will both ensure the receiving system is set up correctly and help identify test cases.
    a. The Health Department can help with this step as well if the HCO has already been sending lab results through another method. A list of commonly reported lab results and which would be most helpful to test during the onboarding process can be provided to the HCO.

Connection and Pre-Testing

The following steps are high-level tasks included in this phase of onboarding.

1. Work with the intermediary to set up ELR feeds.
2. Create HL7 messages that follow the HL7 Version 2.5.1 Implementation Guide.
3. Utilize the NIST tool for validation: https://hl7v2-elr-testing.nist.gov/mu-elr
4. Perform initial validation testing with the intermediary.
5. Work with the intermediary and vendor to resolve errors.

Content Testing and Validation

Ideally, test messages will be created and sent to a test environment for the Health Department to conduct content testing and field validation, rather than directly to a production environment. The environment these messages are sent to may depend on vendor capabilities, however, and the process set-up can be discussed further with the intermediary. Content testing will include a review of the actual information, to ensure the information itself is correct and helpful for our epidemiology staff during their case

investigations. Validity testing will ensure the information found within a data field is logical and correct. For example, staff will perform a validity check to ensure information does not indicate a test was performed 20 years ago when it was actually performed one day ago.

If issues are found, the laboratory will be asked to make changes before moving forward in the onboarding process.

Testing Best Practices

- ELR messages must be constructed to pass testing. The Health Department will not update or add information to the HL7 message itself before processing. All message fields must be complete and include valid data.
- Utilize the NIST tool for testing: https://hl7v2-elr-testing.nist.gov/mu-elr
- Test messages must include a variety of resulted test types that represent what is typically reported by the laboratory. The Health Department can assist with determining what resulted test types to send, if requested.

How to Pass Content Testing and Validation

Every onboarding will present a unique set of issues and challenges. These are some general guidelines our team follows to pass a facility from the "Content Testing and Validation" phase to the "Parallel Reporting" phase.

- There are two types of system failures. One failure type creates a NACK message that is sent to the HCO automatically, with a reason for the failure. The second failure type is when an ELR does not pass a rule set at the Health Department system level. The HCO will be notified when either of these failures occur and they must be fixed prior to moving forward in the onboarding process.
- Generally, required fields must be complete and valid to move forward in onboarding. There may be some exceptions to this. For example, if a required field is not creating ELR system failures and the HCO is working on a validity fix that will take a long time to complete, the Health Department staff may allow the HCO to move to the parallel reporting phase.
- If ELRs are sent that are not reportable to the Health Department, the HCO must discontinue reporting them prior to moving forward to parallel reporting.
- If the segment structure is not correct in an ELR, the HCO must fix the structure prior to moving to parallel reporting. For example, there cannot be multiple ORC segments in one message.

Parallel Reporting and Production

Once content testing and validation has been completed successfully, the HCO sending ELRs will be moved to a parallel reporting phase. This includes sending ELRs to production, while faxing all reportable resulted lab tests to the Health Department at the same time. An alternative here is to send a list of all reportable resulted lab tests and required data elements to the Health Department. This serves two purposes:

- The Health Department will compare the faxed labs or the list of reportable labs to what was received via ELR during the same time frame. This will identify potential missing lab tests and workflows that must be set up at the HCO.
- Information on the faxed labs or the list of reportable labs will be compared to the information on the ELR, to confirm the ELR content is complete and accurate.

Once the Health Department is satisfied that they are receiving all reportable ELRs, and the content is correct, they will notify the HCO that they may stop faxing (and stop any other form of manual reporting) and move to full production.

Please Note:

The one exception to this is that all laboratories must still phone in any immediately reportable test results, according to the Vermont Reportability Rule:

Infectious Disease Reporting and Data | Vermont Department of Health.

The Health Department also recognizes that some remaining ELR issues may be minor and should not extend the parallel reporting phase, as faxing and manually reporting reportable lab tests can take a lot of resources. When this is the case, the Health Department staff may approve a discontinuation of manual reporting, but will require that the HCO still works on and resolves the issue(s) as soon as possible.

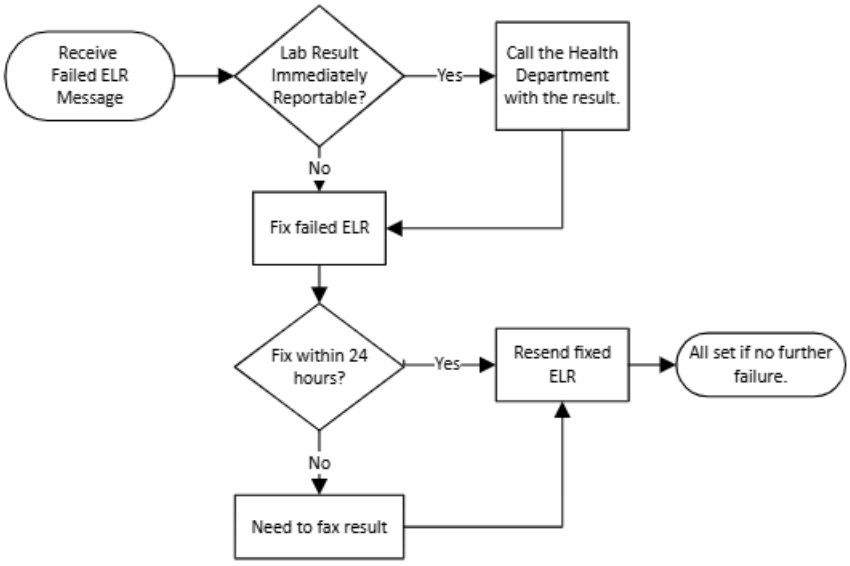
Once an HCO is in production, contact the Health Department or intermediary you are onboarded with whenever a new test is being sent or if the HCO is moving to a new EHR vendor. Additional testing will be required.

Issue Resolution in Production

When issues arise after an HCO has finished onboarding and they are in production, troubleshooting and resolution will be managed mostly through the intermediary's ticketing system, as well as through email. If an HCO is onboarded directly with the Health Department, the ELR team will reach out directly to the HCO to discuss resolution.

Expectations for failed ELR messages:

- NACK (negative acknowledgement) messages will be set up to automatically notify your HCO about message failures. These NACK messages will include information about what failed and needs to be fixed.
- Some messages fail within the Health Department, and a NACK message will not be issued for these failures. In these instances, the ELR team will reach out to the HCO either directly via email or through the intermediary ticketing system.
- If a failed message cannot be resolved within 24 hours, please fax the result to the Health Department. If the result is immediately notifiable, please ensure you are following the Vermont Reportability Rule and call the Health Department: [Infectious Disease Reporting and Data | Vermont Department of Health]



- If a specific type of failure is recurring, the HCO will be expected to research and resolve the underlying issue.

Reminders and Tips

Important Reminders

- Vermont is considered a dual report state. If an HCO is using a reference laboratory for any tests, the HCO must still send a reportable lab test result per the Vermont Reportability Rule. This redundancy ensures the Health Department does not miss an ELR critical to public health response.
- All ELRs must contain LOINC, SNOMED, and PHIN VADS codes. Map ordered and resulted tests and specimen types to applicable LOINC and SNOMED CT codes, rather than sending local codes.
- After initial onboarding, if an HCO adds a new reportable test, if a new EHR system is acquired, or any major EHR system changes are made, additional testing must be done prior to sending results to our production environment.
- If a reportable test result cannot be successfully sent within the timeframe defined in the Vermont Reportability Rule, the HCO must manually report the result to the Health Department within the required timeframe (i.e. fax, secure email, or phone.):
- Infectious Disease Reporting and Data | Vermont Department of Health

Helpful Tips for Common Errors

Please see each segment for additional tips. Here are two commonly seen issues:

- Please ensure that units for numeric or structured numeric results follow the rules and proper value set described in the National HL7 2.5.1 Implementation Guide, called UCUM or “Unified Code for Units of Measure”. The following website is an easy reference for approved codes: PHIN VADS. Please see the OBX section for more details.
- The Health Department can only receive ELR messages with a result status and an observation result status of P (Preliminary), F (Final), or C (Corrected). Please see the OBR-25 and OBX-11 sections for more details.
- If a result is corrected to not-reportable, please fax this new result and information to the Health Department.

HL7 Overview

Information in this section, the HL7 Overview, is also defined further in the HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm). We've included some high level HL7 information here for ease of reference, but please refer to the HL7 2.5.1 Implementation Guide for official message structure and guidance.

Message Segments

The following message segments must be present in the following order.

- **Message Header (MSH)**: Information describing how to parse and process the message, including information about the reporting facility.
- **Software (SFT)**: Information about the application used by the sender. Only HL7 aware sending applications may add an SFT segment.
- **Patient Identification (PID)**: Includes patient identification and demographic information.
- **Next of Kin (NK1)**: If sending, this segment includes parent, guardian, or next of kin information about the subject of testing.
- **Patient Visit (PV1 and PV2)**: These segments may be present in the ELR message; however, the information will not be ingested into the Health Department's surveillance system.
- **Common Order (ORC)**: Transmits information about the order for testing. There must only be one ORC segment per message.
- **Observation Request (OBR)**: Includes relevant ordering information for one test on a specimen.
- **Observation/Result (OBX)**: Information for a single observation (test result) relating to a single test (OBR) or specimen (SPM). There may be one or multiple OBX segments per OBR, for single or panel tests as an example.
- **Specimen (SPM)**: Describes the specimen, including type and where/how it was collected.
- **Notes and Comments (NTE)**: Notes/comments about the patient, lab order, lab result, or specimen. This segment is optional but provides flexibility for message comments and result notes.

Message Usage Rules

Required fields are described in the HL7 Segment Details section of this guide. These are either required by the HL7 2.5.1 ELR Implementation guide or the Vermont Reportability Rule. If there is a requirement discrepancy between the two, that is noted.

Additional data fields that may not be required are included as well, to add clarity and intent regarding the information. Here are the usages that appear in this guide:

- R – Required
- RE – Required but may be empty if not available.
- CE – Conditional, but may be empty if not available

Date Format Notes

Specific field requirements are described in the National HL7 2.5.1 ELR Implementation Guide, including the minimum granularity down to either the date or time. Clarity is added to date/time field sections below, if not explicit in the national guide.

The minimum granularity specifies the minimum date or time needed to pass. For example, a minimum granularity down to the day would include YYYYMMDD, whereas a minimum granularity down to minute would include YYYYMMDDHHMM.

Here is an example date time and the interpretation:

- YYYYMMDDHHMMSS = 20201025094533 = October 25, 2020 at 9:45:33 AM
- Please note - this is how the date/time should appear in the ELR message, from the above example: 20201025094533

Within Segment Details

Within each segment section below, there are comments for each field.

- **Literal Value** – Element field must contain value exactly as expressed in the comment.
- **Example** - Can contain any value similar to or that meets the descriptor within the example.
- **Acceptable Values** – Includes options that may be included.
- Additional information may be included in the comments. For example, a description of Health Department specific requirements, which may be different than HL7 requirements.

HL7 Segment Details

Message Header Segment (MSH)

Includes information about how to parse and process the message, as well as information about the sender (reporting facility), message ID, time stamps, etc.

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Field Separator	**Literal value**: |
2	R	Encoding Characters	Values used throughout the message. **Preferred Literal value**: ^~\& Also accepted if already sending: **Literal value**: ^~\&#
3	R	Sending Application	If intermediary entity is used (e.g. VITL or AIMS) and they are not altering the message, then MSH-3 must be the sending facility application. **Example:** ApplicationName^Application OID^ISO
4	R	Sending Facility	A CLIA number is preferred over the use of an OID. **Examples**: FacilityName^CLIA number^CLIA OR TestFacilityName^4D11111^CLIA
5	R	Receiving Application	**Literal value**: NBS^2.16.840.1.114222.4.1.185.1^ISO
6	R	Receiving Facility	**Literal value**: VDH^2.16.840.1.114222.4.1.185^ISO
7	R	Date/Time of Message	Date and time of the message creation. **Format Example:** YYYYMMDDHHMMSS+/-ZZZZ **Example:** 20250515094533-0500
9	R	Message Type	**Literal value**: ORU^R01^ORU_R01
10	R	Message Control ID	Unique message identifier generated by the sending application. MSH-3 (sending application) plus MSH-10 (message control ID) must be a globally unique combination.
11	R	Processing ID	“P” for Production, “T” for Training, or “D” for debug. ELRs sent to a production environment must have “P” in this field. “T” and “D” are acceptable if ELRs are being tested.
12	R	Version ID	HL7 v2.5.1 preferred. **Example**: 2.5.1

21	R	Message Profile Identifier	**Literal value:** PHLabReport-NoAck^ELR_Receiver^2.16.840.1.113883.9.11^ISO
21.1	R	Entity Identifier	**Acceptable values:** PHLabReport-NoAck OR PHLabReport-ACK
21.2	RE	Namespace ID	**Acceptable values:** ELR_Receiver, HL7, VT-ELR

Software Segment (SFT)

Information about the sending application or other applications that manipulate the message. The HCO sending the laboratory result is required to populate the first SFT segment. Any other application that transforms the message must add an SFT segment for that application, however please note, intermediaries are not required to add an SFT segment for their sending application if they are just a pass through for the message.

Seq	Usage	Element Name	Comments
1	R	Software Vendor Organization	**Example:** Lab System^ L^^^^LABS&1.2.345&ISO^XX^^^1.2.345.114350
2	R	Software Version or Release Number	**Example:** 1.2 OR November 2023
3	R	Software Product Name	**Example:** Bridges
4	R	Software Binary ID	

Patient Identification Segment (PID)

Used to provide basic demographics regarding the subject of the testing. The subject may be a person or an animal.

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Set ID – PID	**Literal value**: 1
3	R	Patient Identifier List	Patient identifiers may include a uniquely identifying number such as medical record number, license number, etc., and may include numbers and letters. An HCO may send up to four IDs, separated with ~. **Example**: ID Number ^^^ Assigning Authority Name & OID &ISO^ Identifier Type ^ Assigning Facility Name & OID &ISO
5	R	Patient Name	Patient name is a required HL7 field and per the Vermont Reportability rule. **Example**: Jones^Nancy^Elizabeth^Jr^^^L
7	R*	Date/Time of Birth	HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability rule requires this field. Minimum granularity is to the day, formatted as: YYYYMMDD. **Example**: 19701012
8	R*	Administrative Sex (Gender)	HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability rule requires this field. **Value Set**: HL70001 **Example**: F
10	R*	Race	HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability rule requires this field. **Value sets**: HL70005 or PHVS_RaceCategory_CDC from PHIN VADS. **Example**: 2106-3^White^HL70005^^^^2.5.1 **Note:** There are no unknown values within the race value sets above, however, Vermont accepts UNK (Unknown) or ASKU (Asked but not answered).
11	R*	Patient Address	HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability Rule requires this field for patient follow-up and jurisdiction assignment.

			If patient address is unknown or not available, the sending HCO must ensure the name and phone number of the ordering provider is present in ORC-12 and ORC-14. **Example:** 123 Test Street^Apartment 1^ Burlington^VT^05401^USA^H^^50001
11.4	RE	State or Province	**Value Set:** PHVS_State_FIPS_5-2 from PHIN VADS **Acceptable Values:** Two-character codes **Example**: VT
11.5	RE	Zip or Postal Code	**Examples:** United States: 05401 or 05401-0000 Canada: A9A9A9
11.6	RE	Country	**Value Sets:** PHVS_Country_ISO_3166-1 from PHIN VADS or HL7 table HL7 0399 **Acceptable Values:** Three-character codes **Examples**: USA CAN
11.7	RE	Patient Address Type	If this field is populated, generally this is populated with 'H' for Home.
11.9	RE	County/Parish Code	**Value set**: PH_County_FIPS_6-4 from PHIN Vads
13	R*	Phone Number – Home	HL7 usage is "RE" and the field will pass if not available, however, the Vermont Reportability Rule requires this field for patient follow-up. **Example**: ^PRN^PH^^^802^5555555
22	R*	Ethnic Group	HL7 usage is "RE" and the field will pass if not available, however, the Vermont Reportability Rule requires this field. **Value sets**: HL70189 or PHVS_EthnicGroup_HL7_2x from PHIN VADS **Example**: N^Non-Hispanic^HL70189^^^^2.5.1 **Note:** Vermont will accept both U and UNK as unknown values, as U is a part of the HL700189 value set and UNK is an accepted null flavor value. Vermont will also accept ASKU (asked but not answered).
35	RE	Species Code	Used for animal rabies testing related to human testing. **Value set**: PHVS_Animal_CDC from PHIN VADS **Example**: |91230005^American short haired guinea pig^LN^^^^5^PHVS_Animal_CDC|

PID Segment Tips

- Although some data are only required if available (RE) within the national HL7 V2.5.1 ELR implementation guide, many of these demographic variables are required per our Vermont Reportability Rule. Please ensure complete and accurate data for these required fields, which will assist the Health Department with attaining high quality public health data.
- Please follow the comments sections for both race (PID-10) and ethnic group (PID-22) data elements. The value sets and acceptable unknown values (for truly unknown information) differ between the two fields.

Common Order Segment (ORC)

Includes identifiers related to ordering the specimen (who placed the order, when it was placed, what action to take regarding the order, etc.).

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Order Control	**Literal value**: "RE."
2	CE	Placer Order Number	This is a conditional field. If OBR-2 is populated, ORC-2 must contain the same value as OBR-2. **Example**: 32112345678900^EHR^OID Number^ISO
3	R	Filler Order Number (Accession Number)	Identifier assigned to the order by the organization performing the test. This field must contain the same value as OBR-3. This number uniquely identifies a lab test and is often referred to as the accession number. If the reporting facility did not perform the test, this field must include a number that links results from the reporting facility to the performing facility results. The Health Department frequently utilizes accession numbers to identify ELRs that need troubleshooting. An accession number or specimen ID is required per the Vermont Reportability Rule.
12	R*	Ordering Provider	Provider who ordered the test. HL7 usage is “CE” and the field will pass if not available, however, the Vermont Reportability Rule requires this field for follow-up. Must be populated with same value as OBR-16. **Example**: 1234^Doe^John^J^II^Dr^^^Lab& OID Number&ISO^L^^^EI^^^^^^^^MD
14	R*	Call Back Phone Number	The ordering provider’s contact number. HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability Rule requires this field for follow-up. Must contain the same value as OBR-17.
21	R	Ordering Facility Name	**Example**: Main Clinic ^L^^^^County Hospital & 41D0733684&CLIA
22	R	Ordering Facility Address	
23	R	Ordering Facility Phone Number	

24	R*	Ordering Provider Address	HL7 usage is “RE” and the field will pass if not available, however, the Vermont Reportability Rule requires this field for follow-up. **Example**: UVM Medical Center^111 Colchester Ave^Burlington^VT^05401^USA^B

ORC Segment Tip

- There must only be one ORC segment per ELR message.

Observation Request Segment (OBR)

Identifies one test being performed and the type on the specimen, and links that information to the test order information. For example, this could be a single analyte test, a panel test, or a culture, etc.

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Set ID – OBR	
2	RE	Placer Order Number	Identifier assigned to the placer of the specific order and must contain the same value as ORC-2.
3	R	Filler Order Number (Accession Number)	Identifier assigned to the order by the organization performing the test. When combined with OBR-2, it must be unique and must contain the same value as ORC-3 This number uniquely identifies a lab test and is often referred to as the accession number. If the reporting facility did not perform the test, this field must include a number that links results from the reporting facility to the performing facility results. The Health Department frequently utilizes accession numbers to identify ELRs that need troubleshooting. An accession number or specimen ID is required per the Vermont Reportability Rule.
4	R	Universal Service Identifier	Coded identifier for the requested/performed test. The Vermont Reportability Rule requires the use of national standardized codes. Please see loinc.org for recommended codes and descriptions.
4.1	RE	Identifier	**Acceptable value**: National Standardized Codes, preferably LOINC. If the HCO cannot provide a national standardized code, then a local code is required to be populated in OBR-4.4 to OBR-4.6
4.2	CE	Text	Text does not have to match LOINC.org word for word.
4.3	CE	Name of Coding System	**Literal value**: LN
4.4	RE	Alternate Identifier	If local codes are included, they must be located in OBR-4.4 through OBR-4.6. Only required if the site cannot provide a national standardized code in OBR-4.1 to OBR-4.3.
4.5	CE	Alternate Text	

4.6	CE	Name of Alternate Coding System	**Literal value**: L
7	R	Observation Date/Time	The Vermont Reportability Rule also requires this field. This should be the date and time of specimen collection. The value must be the same as OBX-14 and SPM-17.1. **Example**: 201505060827
16	R*	Ordering Provider	Provider who ordered the test. HL7 usage is "RE" and the field will pass if not available, however, the Vermont Reportability Rule requires this field for follow-up. Must contain the same value as ORC-12.
17	R*	Order Callback Phone Number	The ordering provider's contact number. HL7 usage is "RE" and the field will pass if not available, however, the Vermont Reportability Rule requires this field for follow-up. Must contain the same value as ORC-14.
22	R	Results Report/Status Change – Date/Time	This field allows the receiving system a comparison time stamp, to understand if a previously received message with the same accession number needs to be updated with the current message.
25	R	Result Status	**Value sets**: HL70085 or PHVS_ObservationResultStatus_HL7_2x on PHIN VADS is recommended by the HL7 Implementation Guide, however, the Health Department system can only accept: "P" (Preliminary), "F" (Final), "C" (Corrected). Any other result status will result in a failed message. **Note**: Lab results can *only* be submitted in the following order: "P" (Preliminary) when applicable, "F" (Final), "C" (Corrected) when applicable. Multiple corrections can be submitted following a final result.
26	CE	Parent Result	Used with OBR-29 (Parent) and allows linkages with a specific OBX segment associated with another OBR.
29	CE	Parent Number	Used to link this OBR with a parent OBR. Commonly used with microbiology messages to link a susceptibility result with the parent culture that identified the Organism. For this linkage to work properly, the Placer Order Number and the Filler Order Number must uniquely identify the specific parent OBR.

OBR Segment Tips

- Please see the following section for additional information regarding OBR segments: culture and susceptibility test result reporting.
- The Health Department can only receive ELR messages with a result status and an observation result status of P (Preliminary), F (Final), or C (Corrected). Please see the OBR-25 and OBX-11 sections for more details.
    - If a result is corrected to not-reportable, please fax this new result and information to the Health Department.
- Utilize LOINC codes instead of local codes.

Observation/Result Segment (OBX)

One OBX segment includes a single observation (test result) related to a single test (described in the OBR segment) or specimen (SPM). The OBX segment includes the specific type of observation, the result for the observation, when the observation was made, etc.

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Set ID – OBX	Sequential number for each OBX segment, which must start with 1.
2	R	Value Type	This indicates the data type for information in OBX-5 and is required for the Health Department system to process result information correctly. **Value set**: HL70125 **Examples**: CE, ST, SN, etc. If the data type is CE or CWE (coded elements), then a national standard code must be used in OBX-5, such as SNOMED CT. This includes when laboratories are utilizing SNOMED CT codes for results such as positive, detected, undetected, etc.
3	R	Observation Identifier	OBX-3 must include a code for the observation/test result. OBX-3, in combination with OBX-4, must be a unique identifier for the test result compared to any other test results associated with the same OBR. **Acceptable value**: LOINC is used as the coding system. If a LOINC code does not exist for the test result, then a local code may be used and populated in OBX-3.4 to OBX-3.6. **Example**: 625-4^Bacteria identified^LN
3.1	R	Identifier	Expecting a LOINC code for the observation/result, if an appropriate LOINC code exists.
3.2	R	Text	May include text from LOINC.org, which is useful from a public health perspective.
3.3	R	Name of Coding System	**Literal value**: LN
3.4	RE	Alternate Identifier	Only required if the site cannot provide a national standardized code in OBX-3.1 to OBX-3.3.
3.5	CE	Alternate Text	The text description for the local code in OBX-3.4.
3.6	CE	Name of Alternate Coding System	Identifies the type of code in OBX-3.4.

4	CE	Observational Sub- ID	This ID is not necessarily sequential and is a link for all OBX segments reporting information on a related observation/test result. **Example** – A blood culture may have 3 different organisms to report from the one request. For the first organism, there may be two OBX segments where one segment identifies the organism as the result and another identifies a count of that organism as the result. However, both of those OBX segments include an OBX-4 value equal to "1" to represent the first organism.
5	R*	Observation Value	This is the test result. Although HL7 usage is "CE", the Vermont Reportability Rule requires this field. The value in OBX-5 must correspond to the data type entered in OBX-2. When OBX-2 indicates a coded element, for example, utilize the SNOMED CT standard. When OBX-2 indicates a structured numeric element, for example, a specific comparator and separator/suffix must be used. Please refer to both the OBX segment guidance and the specific data type guidance in section 2.3 Data Types of the HL7 2.5.1 national guide, for more information. **Coded Examples**: 66543000^Campylobacter jejuni^SCT 10828004^POSITIVE^SCT **Numeric Example:** >=^32
6	CE	Unified Code for Units of Measure (UCUM)	Required if OBX-2 is a numeric data type. **Value set**: PHVS_UnitsOfMeasure_CDC Please note that messages often fail because UCUM is not populated with a unit of measure on the approved value set list. If an HCO needs assistance determining the appropriate unit of measure, test information on LOINC.org often includes unit suggestions or APHL may be contacted for guidance. **Example**: ug/mL^ MicroGrams Per MilliLiter [Mass Concentration Units]^UCUM
7	RE	Reference Ranges	Interpretation range that applies to OBX-5. Please note that this range should assist the receiver with interpreting abnormal flags found in OBX-8 and is important for understanding a numeric result. Interpretation of results is required per the Vermont Reportability Rule, and this field may assist with that if available.

8	R*	Abnormal Flags	Although HL7 usage is “CE”, the Vermont Reportability Rule requires this field as it indicates normalcy of OBX-5 and assists with result interpretation. **Value sets**: HL70078 or PHVS_AbnormalFlag_HL7_2x. **Example**: A^Abnormal^HL70078
11	R	Observation Result Status	Indicates observation result status. As with OBR-25, please note the accepted values for this field below by the Health Department. **Value sets**: HL70085 or PHVS_ObservationResultStatus_HL7_2x on PHIN VADS is recommended by the HL7 Implementation Guide, however, the Health Department system can only accept: “P” (Preliminary), “F” (Final), “C” (Corrected) Any other result status will result in a failed message. **Example**: F **Note**: Lab results can *only* be submitted in the following order: “P” (Preliminary) when applicable, “F” (Final), “C” (Corrected) when applicable. Multiple corrections can be submitted following a final result.
14	R*	Date/Time of the Observation	Indicates the specimen collection date. HL7 usage is “CE” and the field will pass if not available, however, specimen collection date is required per the Vermont Reportability Rule. The value must be the same as OBR-7 and SPM-17.1. Minimum granularity to the day. **Example**: 20251210
19	RE	Date/Time of the Analysis	The date and time the test was actually performed. This is different information than OBX-14. Minimum granularity to the minute. **Example**: 202506051700
23	R	Performing Organization Name	The laboratory that produced the test result in this OBX. **Value set**: HL70204 **Example**: SomeLab^L^^^^CLIA&2.16.840.1.111234.19.4.6 &ISO^XX ^^^1D1236
24	R	Performing Organization Address	Address of the lab that performed the test. **Example**: 111 Colchester Ave^^Burlington^VT^05401^ USA

OBX Segment Tips –

- Please be mindful of the data type in OBX-2 and ensure that the entry in OBX-5 corresponds to that data type. For example, if the data type is ST (or string), please do not include a SNOMED code. Even though this will technically not fail the message, our system cannot interpret the SNOMED code for our staff to utilize. SNOMED codes are a coded element and must use a coded element data type in OBX-2.
- OBX-5 must include the actual test result. Please do not include other reference values. For example, "Sent to Ref Lab" is not a reportable test result.
- When dual reporting, please review the performing laboratory field for accuracy. We often see an incorrect facility in this field with dual reported tests.
- Antibody titers must be a structured numeric data type. They must also include an interpretation to aid in the public health response. Both a reference range (OBX-7) and an abnormal flag (OBX-8) are preferred, for instance, as a reference range alone is not always helpful with interpreting results.
- Specimen source information must be included in the SPM segment, and not as an additional OBX segment.
- The Health Department can only receive ELR messages with a result status and an observation result status of P (Preliminary), F (Final), or C (Corrected). Please see the OBR-25 and OBX-11 sections for more details.
    - If a result is corrected to not-reportable, please fax this new result and information to the Health Department.
- Performing laboratory information must be reflected in OBX-15 (if sending), OBX-23 (required), and OBX-24 (Required). Ordering and Reporting (submitting) facility information must not be included in these fields.
- Utilize LOINC and SNOMED codes instead of local codes.

Notes and Comments (NTE)

Used to convey additional information regarding the associated segment. While one or more NTE segments can be associated with PID and OBR segments and will not fail a message, it is preferred that only NTE segments associated with OBX segments are sent. The contents of the NTE segment are primarily intended for human use and therefore should not be used to relay relevant clinical information.

Seq	Usage	Element Name	Comments
1	R	Set ID – NTE	Only required if the NTE segment is present. Sequential number for each NTE segment must start with 1.
2	RE	Source of Comment	Only RE if the NTE segment is present. Specifies where the comment came from. **Value Set**: HL70105 or PHVS_SourceOfComment_HL7_2x on PHIN VADS. **Example**: L
3	R	Comment	Only required if the NTE segment is present and cannot be blank. **Acceptable Value:** 2,000 character limit. **Example**: A comment with relevant information to the segment goes here.
4	RE	Comment Type	Only RE if the NTE segment is present. **Value set**: HL70364

NTE Segment Tips -

- Comments will only enter the data system as free text and cannot be automated (i.e. LOINC or SNOMED codes in a comment field will not be automatically assessed by the system).
- An NTE segment may not be blank if sent or it will fail at the Health Department's system. An HCO may remove the NTE segment if blank or if they are unable to remove the NTE segment, they may include a single character, such a '.' or a '-'.

Specimen (SPM)

Describes the characteristics of a single sample, including where and how it was collected, who collected it and some basic characteristics of the specimen.

*Indicates the usage is different in Vermont compared to the national guide.

Seq	Usage	Element Name	Comments
1	R	Set ID – SPM	Sequential number for each SPM segment. Must start with 1.
2	R	Specimen ID	Unique identifier for the specimen as referenced by the Placer application, the Filler application, or both (but is not the same thing as the placer or filler order number). The specimen id may be the same as an accession number, depending on how the particular lab assigns accession numbers **Example**: 12345&EHR&.2.123.1.34.789&ISO OA20120000199&EHR&1.2.123.1.34.789&ISO
4	R	Specimen Type	This is the type of specimen collected and is required per the Vermont Reportability Rule. **Value sets**: HL70487, SNOMED CT **Example**: 119297000^Blood^SCT
8	R*	Specimen Source Site	The Vermont Reportability Rule requires the use of national standardized codes and requires this field, although the national guide is “RE” and the message will not fail if this is not sent. For biological samples, describe the anatomical site from which the specimen was collected. **Value set**: PHVS_BodySite_HITSP from PHIN VADS **Example**: 49852007^Structure of median cubital vein (body structure)^SCT
17	R	Specimen Collection Date/Time	This is also required by the Vermont Reportability Rule. Component 1 must match OBR-7 and OBX-14. **Example**: 201212130810
18	R	Specimen Received Date/Time	Date and time the specimen was received by the laboratory. Minimum granularity to the day. **Example**: 20251213

SPM Segment Tips –

- A message should only have one SPM segment and it must be located at the end of the message.

Susceptibility Results

Culture and susceptibility results require a more complicated setup, including parent and child codes.

Please see Appendix A of the National HL7 2.5.1 ELR Implementation Guide for details and guidance.

Tips -

- These two guidelines have been mentioned above as well but become more critical to follow when susceptibility results are included in the message.
- There must be only one ORC segment.
- There must be only one SPM segment and it must be located at the end of the message.
- This is an example of how susceptibility results appear in the Health Department system. Following the guidance in the National 2.5.1 ELR Implementation Guide ensures the correct susceptibility results appear associated to the correct organism:

Resulted Test	Coded Result / Organism Name
Bacteria Bld Cult	Streptococcus pneumoniae (organism) (LOCAL) Show Reflex Tests • **Penicillin Parenteral Islt.mening MIC**: <=0.06 ug/mL - (Susceptible) • **Penicillin Parenteral Islt MIC**: <=0.06 ug/mL - (Susceptible) • **cefTRIAXone Islt MIC**: <=0.12 ug/mL - (Susceptible) • **cefTRIAXone Islt MIC**: <=0.12 ug/mL - (Susceptible) • **Clindamycin Islt MIC**: <=0.25 ug/mL - (Susceptible) • **Erythromycin Islt MIC**: <=0.12 ug/mL - (Susceptible) • **levoFLOXacin Islt MIC**: 1 ug/mL - (Susceptible) • **Tetracycline Islt MIC**: <=0.25 ug/mL - (Susceptible) • **TMP SMX Islt MIC**: <=10 ug/mL - (Susceptible) • **Vancomycin Islt MIC**: 0.5 ug/mL - (Susceptible)

Contact Information

For any questions on this guide or any of the contents within, please contact the ELR Support team at the Health Department.

Email:

AHS.VDHELRSupport@vermont.gov

Website:

Healthvermont.gov

Lab Result Reporting | Vermont Department of Health

Location:

Vermont Department of Health

280 State Drive

Waterbury, VT 05671-8370

Resources and Links

APHL (Association of Public Health Laboratories)

https://www.aphl.org/Pages/default.aspx

CDC Electronic Laboratory Reporting (ELR)

Electronic Laboratory Reporting (ELR) | Electronic Laboratory Reporting (ELR) | CDC

Centers for Medicare & Medicaid Services Promoting Interoperability Program:

https://www.cms.gov/medicare/regulations-guidance/promoting-interoperability-programs

National HL7 Version 2.5.1 Implementation Guide for ELR

HL7 Version 2.5.1 Implementation Guide: Electronic Laboratory Reporting to Public Health, Release 1 (US Realm)

NIST Message Validator

ELR Validation Tool @ NIST

Vermont Department of Health Lab Result Reporting:
https://www.healthvermont.gov/disease-control/infectious-disease-reporting-and-data/lab-result-reporting

Vermont Department of Health Promoting Interoperability Program:

https://www.healthvermont.gov/systems/hospitals-health-systems/promoting-interoperability-program

Vermont Reportable Disease Rule

Infectious Disease Reporting and Data | Vermont Department of Health

VITL (Vermont Information Technology Leaders)

VITL - Vermont Health Information Exchange - VITL

Revision History

February 6, 2026 (Version 4.0/Katie Jones)
Updated document to new format and rewrote the onboarding/testing process to align with current practice. Added more detail for required data fields, clarifying where the Health Department differs from national guidance.

December 4, 2023 (Version 3.0/Katie Jones and Amanda Jones)
Updated document to new format, meaningful use/promoting interoperability information, corrected links, updated VDH contact information to AHS.VDHELRSupport@vermont.gov, and clarified use of VHIE as an intermediary.

October 27, 2015 (Version 2.0/Kimberly Jones)
Update all references in document.

August 28, 2012 (Version 1.0/Kimberly Jones)
Initial draft created, reviewed, and published.