**HL7 Data Transmission (Using LOINC and SNOMED) Example and Explanation**

With the adoption of data standardization, it is no surprise that standards for electronic transmission of data are also being adopted. Data transmission refers to computer-mediated communication among system users, and with other systems. In order to ensure and optimize information transmission from one computer to another, data must be encoded into certain formats using data transmission standards. Data transmission standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for seamless integration between systems.

Currently, one of the main data transmission standards in use is the Health Level Seven International (HL7), which provides a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services. Adopting and implementing data transmission standards provides a platform for data interoperability that improves care delivery, optimizes workflow, reduces ambiguity, and enhances knowledge transfer among various stakeholders.

Here we provide an example of a comprehensive laboratory HL7 data transmission message and the dissection of the two most relevant segments of the data transmission message: **Observation Request Segment (OBR) and Observation Result Segment (OBX).**

The OBR and OBX segments within the HL7 message contain various coding nomenclature (a system of names or terms and codes, and rules for forming these terms) that indicate requested laboratory tests and the relaying of corresponding test results. The usual sets of coherent test coding and naming standards (nomenclatures) used to increase interoperability and to relay laboratory test codes and names are: LOINC, SNOMED CT, and Local.

Logical Observation Identifiers Names and Codes, or LOINC is a rich catalog of universal codes and structured names to unambiguously identify items that can be measured or observed, and that which enables the exchange and aggregation of clinical results for care delivery, outcomes management, and research. SNOMED Nomenclature of Medicine – Clinical Terms (SNOMED CT) is a systematically organized computer processable collection of medical terms providing codes, terms, synonyms and definitions used in clinical documentation and reporting. Local test codes and names are laboratory-defined codes and names for specific tests.

LOINC and SNOMED can be thought of this way: LOINC reflects various tests and methodologies used, that is to say, LOINC is the ‘question’, whereas SNOMED CT reflects the results of the tests and methodologies, or can be considered the ‘answer.’

**Specific OBR & OBX Segments:**

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OBR|1||1111111111|^^^083824^Panel
083824^L|||201403190927|||201403192354||1234567899^SMITH^JAMES^B^JR^^MD^^^^^^NPI|^^^^^55^5313245|||1111111111

OBX|1|CE|29893-5^HIV 1 Ab^LN^083861^HIV 1 Ab^L||11214006^REACTIVE^SCT^REA^Reactive^L||Non Reacti|A|||20140321181641|45D0435768^LabName Portland^CLIA||^EIA
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**Observation Request Segment (OBR):** The OBR segment is used to capture information about one test being performed on the specimen. Most importantly, the OBR identifies the type of testing to be performed on the specimen.
specimen and ties that information to the order for the testing. In the example below, the sequence of elements are delimited by a single or multiple ‘|’.

OBR/1/|1111111111|^^^^083824^Panel
083824^L|||201403190927|||1403192354||1234567899^SMITH^JAMES^B^JR^MD^^^^^^NPI|^^^^^5
55^5313245|||||F|/|/|/

1. OBR = Signifies that this segment is OBR
2. Set ID = 1; identifies the first occurrence of the OBR segment
3. Placer Order Number = 1111111111; identifier assigned by the placer of the order being fulfilled by this request message
4. Local Test Code and Local Test Name = 083824^Panel^083824^L; identifies the test code and name specific to the laboratory performing the tests; the ^L signifies that this test code and name are local
5. Requested date/time = 201403190927; reflects?
6. Observation date/time = 201403192354; reflects the specimen collection date/time when test involves a specimen
7. Collector Identifier = 1234567899; unique identifier for specimen collector
8. Ordering provider = Smith^James^B^JR^^^^^NPI; identifies the provider who ordered the testing being performed. The National Provider Identifier (NPI) may be used as the identifier
9. Order call-back phone number = 555^5313245; identifies phone number of ordering provider

Observation Result Segment (OBX): The OBX segment contains information regarding a single observation related to a single test (OBR) or specimen (SPM). This includes identification of the specific type of observation, the result for the observation, when the observation was made, etc. In the example below, the sequence of elements are delimited by a single or multiple ‘|’.

OBX/1|CE|29893-5^HIV 1 Ab^LN^083861^HIV 1 Ab^L||11214006^REACTIVE^SCT^REA^Reactive^L||Non Reacti|A|||/201403211181641|45D0435768^LabName Portland^CLIA||^EIA

1. OBX = Signifies that this segment is OBX
2. Set ID = 1; identifies the first occurrence of the OBX segment
3. Coded Element = CE; identifies the data type used
4. Observation Identifier = Includes LOINC test code and name and Local test code and name:
   a. LOINC = 29893-5^HIV 1 Ab^LN; identifies LOINC test code and name
   b. Local = 083861^HIV 1 Ab^L; identifies local (laboratory specific) test code and name
5. Observation Value = 11214006^Reactive^SCT; identifies SNOMED CT result code and expanded result text
6. Local Observation Value = REA^Reactive^L; identifies local result code (REA) and expanded result text
7. Reference Range = Non Reacti; identifies interpretation range that applies to the value reported in OBX-5
8. Abnormal Flag = A; indicator of the normalcy of the result found in OBX-5 (i.e., A = Abnormal)
9. Date/Time of the Analysis = 201403211181641; identifies time at which the testing was performed
10. Producer’s Reference = 45D0435768
11. Performing Organization Name = LabName Portland^CLIA
12. Observation Method = EIA; identifies method of laboratory testing
Comprehensive HL7 Example:

MSH|^~\&|LABNAME-CORP|LABNAME*45D0435768^CLIA|NCDOH|OR|201404210129||ORU^R01|20140421021345066147|P|2.3.1|
PID|1|JAMROB0001|22222222222|^~\&|LabName
Portland&45D0435768&CLIA||TEST^PATIENT^B||19010101|M||U|154 OAK
AVE|^~\&|421^8746574|||1112233333|||U|154 OAK
NK1|1|421^3654567|||F|154 OAK
ORC|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
NTE|1|LabName Portland
NTE|2|LabName Portland
OBR|1|22222222222|^~\&|LabName Portland||^~\&|5324567|4115 THE PLAZA
OBX|1|SN|24467‐3^Cells.CD3+CD4+^LN^059526^Absolute CD 4 Helper|^61|^uL|359‐1519|L|F|20140417191164|45D0435768^LabName Portland
OBX|2|SN|8123‐2^Cells.CD3+CD4+/100 cells^LN^059543^% CD 4 Pos. Lymph.|5.5|^30.8‐58.5|L|F|201404181211136|45D0435768^LabName Portland
OBX|1|CE|48345‐3^HIV 1+O+2 Ab^LN^001725^HIV 1/O/2 Abs, Qual|^G‐A497|REACTIVE|SNM^RER|Repeatedly Reactive|^L|Non React|A|F|20140418142928|45D0435768^LabName Portland
OBX|2|CE|29893‐5^HIV 1 Ab^LN^083861^HIV 1 Ab|^G‐A497|REACTIVE|SNM^REA|Reactive|^L|Non React|A|F|20140418192345|45D0435768^LabName Portland
NTE|1|LabName Portland
NTE|2|LabName Portland
OBR|3|SN|20447‐9^HIV 1 RNA^LN^550413^HIV‐1 RNA by PCR|^127900.0000|copies/mL|F|20140419084245|45D0435768^LabName Portland
NTE|1|LabName Portland
NTE|2|LabName Portland
NTE|3|LabName Portland

References:

   http://www.hl7.org/index.cfm?ref=nav
   https://loinc.org/background/loinc‐highlights
   on April 22, 2014 from: http://www.ihtsdo.org/snomed‐ct/