HL7 version 2 Message Conversion to OMOP using OMOPonFHIR

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Abstract

OMOP CDM has been providing a common storage schema to hold health data for data research and study. The data sources vary depending on the users. Georgia Tech has been providing a solution to convert HL7 standard FHIR data to OMOP with OMOPonFHIR so that OMOP can take data from those who are using FHIR as a data content. Furthermore, OMOPonFHIR provides a platform for developing and testing health apps. For this research, we extended the OMOPonFHIR to have one of the most successful interoperability standards, HL7 v2 messages, to be converted to OMOP. This allows the OMOP to store lab data contents. As an example, using this extended capability, we created a new mortality reporting platform where electronic lab reports can be stored in OMOP and exchanged with any systems with FHIR. This paper shows how the HL7 v2 messages are staged to FHIR and mapped to OMOP.

Introduction

OMOP is a common data model where data providers can store their data for their data analytics. By using common data model, data can be aggregated, and tools can be shared. In previous years, we have been developing mapping technology between FHIR and OMOP and implementing service instances called OMOPonFHIR[1]. With OMOPonFHIR, the health data could be easily available for application and tool development.

OMOPonFHIR now has been more mature and added more FHIR features. One of the critical additions is an operation to consume FHIR messages. With the HL7v2 to FHIR message mapping, this operation allows OMOPonFHIR to store HL7 v2 messages in OMOP.

HL7v2 is one of the most successful interoperability standards. We have demonstrated that NMS lab sends lab results in electronic lab report (ELR) messages, and then that the ELR is parsed and mapped to FHIR message to be stored in OMOP CDM.

FHIR Message to OMOP Mapping

FHIR Message is in a Bundle resource. The FHIR message is parsed as specified in FHIR Spec[2]. We used the spec to parse the message for OMOP CDM. Figure 1 shows how the data flows.

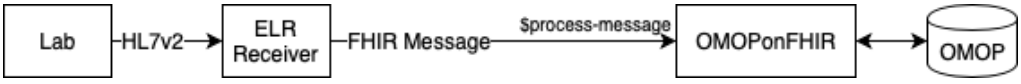

Figure 1. HL7v2 to OMOP Data Flow.

Since we are mapping ELR message of HL7v2, person, note, and measurement tables are used. For measurement table, the FHIR observation resources are mapped as described in our FHIR to OMOP

mapping document[1]. However, the ELR's observation resource has a data element called, method. Unfortunately, we do not have a column for the method. Methods are sometimes defined with coding systems or text. To support both, we used fact_relationship table to map the method and comments in FHIR. We used domain_concept_ids of 21 and 26 (Measurement and Note Type). And for relationship_concept_id, we used 44818800 and 44818721 for *method* and *contains*. The *contains* is to store a comment for the measurement in the note table. Poster will have the examples of FHIR and OMOP tables mapped from HL7v2.

HL7v2 to FHIR Mapping

Both ELR and FHIR are sharing the same (or similar) context format. Thus, the mapping between them is pretty straight forward. Table 1 shows some of data mapping example. This mapping was created to support toxicology lab report generated by NMS Lab. Some of notes are also parsed for more data acquisition.

Figure 1 shows the data work flow. The HL7v2 can be sent over MLLP or HTTP over HL7v2 transport protocol. When the ELR message is received by ELR Receiver, ELR Receiver will parse and map the HL7v2 to FHIR message, the FHIR message is sent to $process-message operation in OMOPonFHIR.

HL7 v2.3		**FHIR STU3**		
LAB ORU_R01 (Observation Message)		*Bundle* * Each RESPONSE in ORU_R01 generate a Bundle resource.		
MSH-9-1	ORU	type	message	
MSH-9-2	R01			
MSH-9-3	ORU_R01			
MSH-9-2	R01	entry[0].resource	*MessageHeader*	
			MessageHeader.event.system	http://hl7.org/fhir/message-events
			MessageHeader.event.code	observation-provide
OBX-5	<Observation Value>		Observation.valueQuantity.value	<Observation Value>
OBX-6-1	<Unit Code>		Observation.valueQuantity.code	<Unit Code>
OBX-6-2	<Unit Text>		Observation.valueQuantity.unit	<Unit Text>
OBX-6-3	<Unit System>		Observation.valueQuanity.system	<Unit Coding System Name>
NTE-2	if equal to "METHOD"		Observation.method.text	NTE-3 Comment
NTE-3	if NTE-2 is not called,		Observation.comment	NTE-3 Comment

Table 1. Example of HL7v2 to FHIR

Conclusion

We described how we developed the HL7v2 to OMOP mapping. In fact, we also developed and deployed this service using an ELR Receiver and OMOPonFHIR server. We could show that the actual NMS Lab data was received by the ELR receiver and mapped to FHIR data to be stored in OMOP CDM. The stored data was later being pulled by a service entity to aggregates data from multiple sources and deliver to case management system in coroner's office.

We are planning to extend OMOPonFHIR further to support more features with OMOP database.

References

1. OMOPonFHIR, http://omononfhir.org
2. FHIR Message, https://www.hl7.org/fhir/STU3/messaging.html