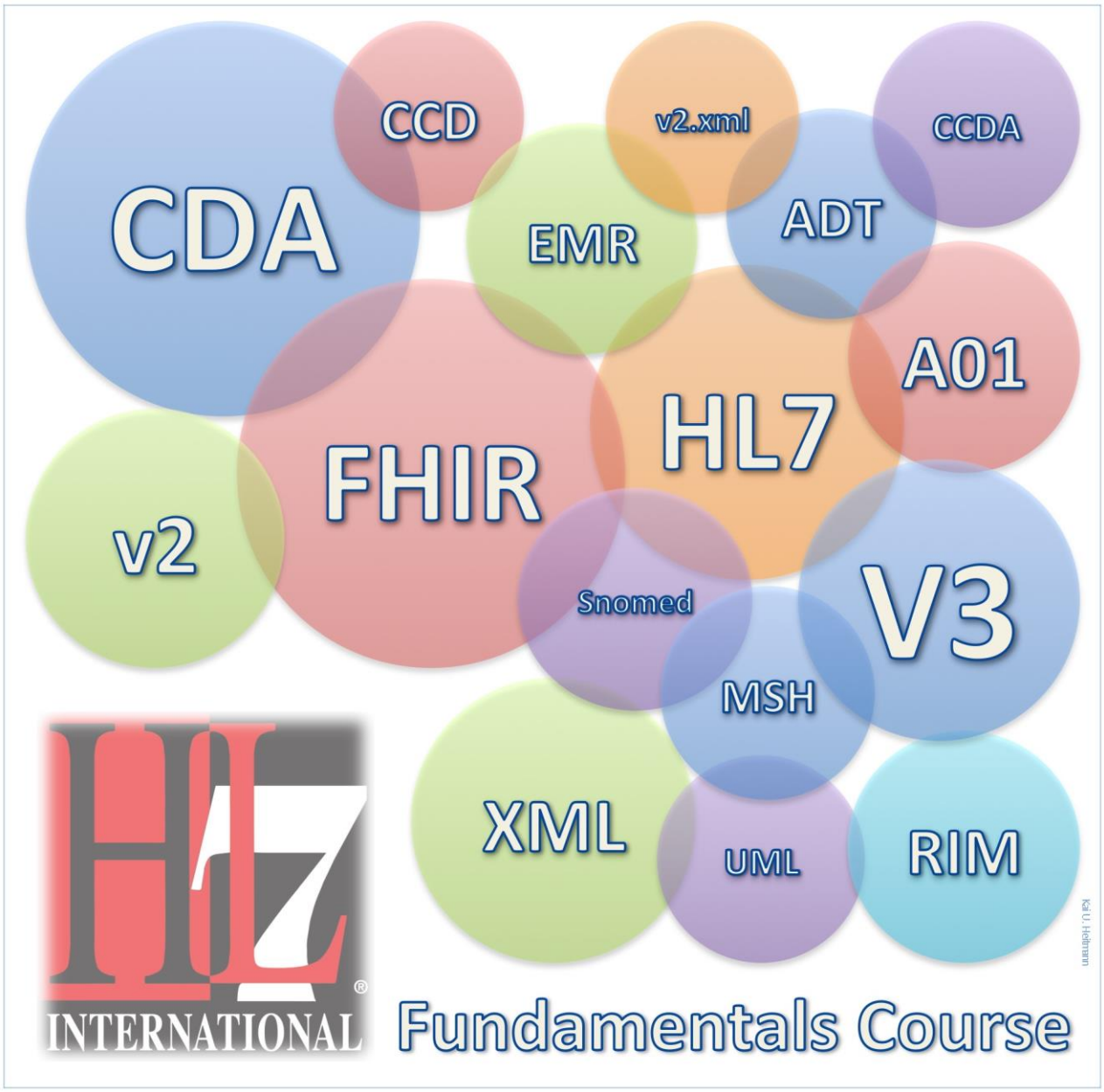


V2.x Module, Unit 2:

Patient Admin & Orders/Results

Reading Material

Table of Contents

Unit Content and Learning Objectives

This Unit introduces the HL7 V2.x messages in detail with a special focus on ADT (Admission, Discharge & Transfer) as well as Orders & Results messaging and an introduction to the HL7 Implementation Process. After completing this Unit, the student will be able to understand and process the most often used HL7 V2.x messages.

1. Introduction

After the introduction to the HL7 V2.x Standard, the HL7 V2.x chapters for Patient Administration (3), Orders (4 & 4A) and Results (7) will now be explored in more detail.

We focus on these four chapters because they are the most widely used in HL7 Version 2.x implementations around the world. These three chapters by themselves could be considered the "core" of standardization in healthcare interoperability messaging and in some countries, their use is mandatory in some settings because of government regulations.

The messages in these chapters were originally mainly used to communicate within hospitals but today they are exchanged with every type of healthcare organization.

We will see what they are about, and then explain them in more detail.

Patient Administration / ADT: Chapter 3 describes data exchange on patient movements and demographics (not only for inpatients, but also for outpatients and emergency).

Orders / Order Entry: Chapter 4 defines order messages for Laboratory, Dietary, Supply, Blood Transfusion and general use; Chapter 4A defines messages for Pharmacy, Treatment and Vaccination use.

Results / Observation Reporting: Chapter 7 defines messages that can be used to send results of any kind (laboratory, radiology, cardiology, nuclear medicine, etc.)

Chapter 3 is administered by the HL7 International Patient Administration Work Group, whereas chapters 4, 4A and 7 are administered by the Orders and Observations Work Group.[1]

[1] To find out what these Work Groups are doing, go to www.HL7.org/Special/committees/pafm/index.cfm and www.HL7.org/Special/committees/orders/index.cfm

Patient Administration

Introduction

The transactions included in this chapter are used to communicate location, demographic or visit information for the patient.

Chapter 3 is one of the most used chapters, since almost all health information applications require access to patient information (personal data, insurance, attending physician, location, etc.).

Usually this information is processed through an admission system, generically called "ADT - Admission/Discharge/Transfer" (or ATD - Admission/Transfer/Discharge in some countries) and then transferred to other systems of the organization.

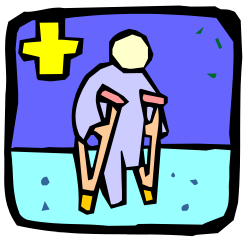
Trigger Events and Associated Messages

In the previous Unit, we explained that each message has one of several possible trigger events. The trigger events more commonly used are:

- **Admit/visit notification (event A01):** to communicate the admission of a patient
- **Patient transfer (event A02):** to communicate the transfer of a patient - for example, from a bed in the Intensive Care Unit (ICU) to a bed in a regular ward.
- **Discharge/end visit (event A03):** to communicate the discharge of a patient
- **Update patient information (event A08):** to communicate updated information for a patient - for example a change in attending physician.

Here is more detail on each of these events and their messages.

The Admit/Visit Notification Message



The A01 trigger event is used to communicate an inpatient admission. When communicating outpatient registrations or other registration events that do not (yet) involve bed assignments for patients, the A04 trigger event (Register a patient) is used.

For example, an Admit/Visit Notification (ADT^A01^ADT_A01) message can be sent to any of the following systems to communicate that a patient has been admitted:

- A pharmacy system so drugs can be administered
- A nursing system to qualify the patient to receive a care plan
- A billing system to begin invoicing
- A nutrition or diet system to enter a nutrition plan
- The laboratory, anatomic pathology and radiology systems in order to authorize the patient to receive diagnostic services.

As can be seen in Figure 1, ADT systems usually act as "broadcasters" for this kind of transaction: They send a notification to all other applications, which in turn use this information for whatever purpose they need to:

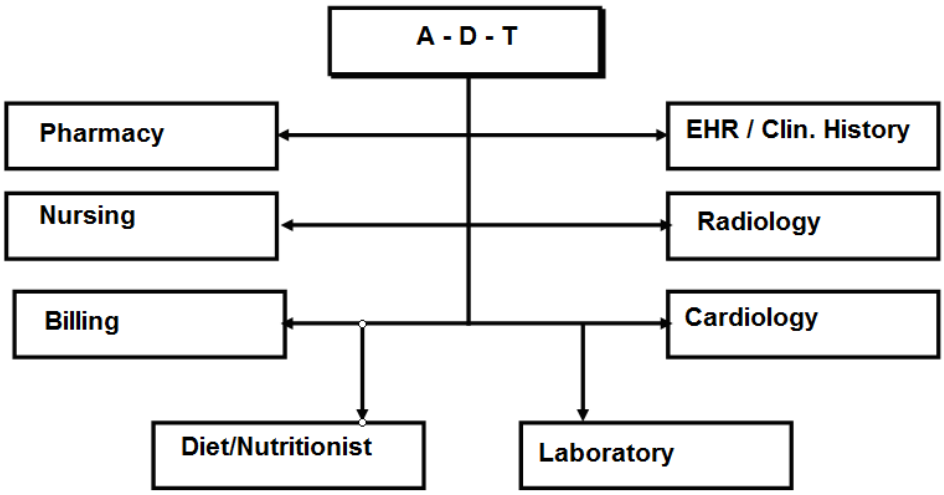


Figure 1: ADT system as the "broadcaster" of patient admission information

Each message and each segment is identified with a 3-character ID. This is the V2.8 abstract message format of the "Admit/Visit Notification" A01 message (ADT^A01^ADT_A01):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
EVN	Event Type	3
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ NK1 }]	Next of Kin / Associated Parties	3
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info.	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ DB1 }]	Disability Information	3
[{ OBX }]	Observation/Result	7
[{ AL1 }]	Allergy Information	3
[{ DG1 }]	Diagnosis Information	6
[DRG]	Diagnosis Related Group	6
[{	--- PROCEDURE begin	
PR1	Procedures	6
[{ ROL }]	Role	15
}]	--- PROCEDURE end	
[{ GT1 }]	Guarantor	6
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Info.	6
[{ IN3 }]	Insurance Additional Info - Cert.	6
[{ ROL }]	Role	15
[{ AUT }]	Authorization Record	11

Segments	Description	Chapter
[{ RF1 }]	Referral Information	11
}]	--- INSURANCE end	
[ACC]	Accident Information	6
[UB1]	Universal Bill Information	6
[UB2]	Universal Bill 92 Information	6
[PDA]	Patient Death and Autopsy	3

Figure 2: Abstract message format of the "Admit/Visit Notification" A01 message

Any system that receives an A01 message returns a general acknowledgement (ACK) message:

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
MSA	Message Acknowledgment	2
[{ ERR }]	Error	2

Figure 3: Abstract message format of the "General Acknowledgement" ACK message

The Transfer a Patient message

The Transfer a Patient (ADT^A02^ADT_A02) trigger event is used when a patient's location changes. For example, a patient could be transferred from a bed to the operating room or from an intensive care unit to a clinical care ward.

For other changes (not involving the patient location) it is recommended to use a generic message like ADT^A08 or some of the specific messages (to change identification, to change account number, to change doctor, etc.).

The patient's new location is in field "PV1-3 Assigned Patient Location" and the previous location is in field "PV1-6 Prior Patient Location".

In cases where a patient moves to a temporary location (*e.g.*, a radiology unit), it is recommended to use trigger events A09 (patient departing-tracking) and A10 (patient arriving-tracking).

The Transfer a Patient (A02) message must only be used when a patient changes from one bed to another.
For other changes, not involving the patient location, it is recommended to use the Update Patient Information (A08) message.

This is the V2.8 abstract message format of the "Transfer a Patient" A02 message (ADT^A02^ADT_A02):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2

Segments	Description	Chapter
EVN	Event Type	3
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info.	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ DB1 }]	Disability Information	3
[{ OBX }]	Observation/Result	7
[PDA]	Patient Death and Autopsy	3

Figure 4: Abstract message format of the "Transfer a Patient" A02 message

Any system that receives an A02 message returns a general acknowledgement (ACK) message:

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
MSA	Message Acknowledgment	2
[{ ERR }]	Error	2

Figure 5: Abstract message format of the "General Acknowledgement" ACK message

The Discharge/End Visit message ADT^A03^ADT_A03)

Trigger event A03 is sent when the patient visit ends -- that is to say, the patient is discharged (or the outpatient visit ends). In this message, if the patient was an inpatient, the last location of the patient is sent in field "PV1-3 Assigned Patient Location".

The field "PV1-45 Discharge Date/Time" is used to specify the time either of discharge or the end of the outpatient visit.

The sending or broadcast of the Discharge/End Visit (A03) message event to the other applications can mean that no more new orders can be placed and no more services can be delivered!

This is the V2.8 abstract message format of the "Discharge/End Visit" A03 message (ADT^A03^ADT_A03):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
EVN	Event Type	3
PID	Patient Identification	3

Segments	Description	Chapter
[PD1]	Additional Demographics	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ NK1 }]	Next of Kin / Associated Parties	3
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info.	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ DB1 }]	Disability Information	3
[{ AL1 }]	Allergy Information	3
[{ DG1 }]	Diagnosis Information	6
[DRG]	Diagnosis Related Group	6
[{	--- PROCEDURE begin	
PR1	Procedures	6
[{ ROL }]	Role	15
}]	--- PROCEDURE end	
[{ OBX }]	Observation/Result	7
[{ GT1 }]	Guarantor	6
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Info.	6
[{ IN3 }]	Insurance Additional Info - Cert.	6
[{ ROL }]	Role	15
[{ AUT }]	Authorization Record	11
[{ RF1 }]	Referral Information	11
}]	--- INSURANCE end	
[ACC]	Accident Information	6
[PDA]	Patient Death and Autopsy	3

Figure 6: Abstract message format of the "Discharge/End Visit" A03 message

Any system that receives an A03 message returns a general acknowledgement (ACK) message:

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
MSA	Message Acknowledgment	2
[{ ERR }]	Error	2

Figure 7: Abstract message format of the "General Acknowledgement" ACK message

The Update Patient Information message ADT^A08^ADT_A01)

The Update Patient Information message A08 message event is sent to communicate that the data of a patient has changed and no other event has occurred.

This is the V2.8 abstract message format of the "Update Patient Information" A08 message (ADT^A08^ADT_A08):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
EVN	Event Type	3
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ NK1 }]	Next of Kin / Associated Parties	3
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info.	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ DB1 }]	Disability Information	3
[{ OBX }]	Observation/Result	7
[{ AL1 }]	Allergy Information	3
[{ DG1 }]	Diagnosis Information	6
[DRG]	Diagnosis Related Group	6
[{	--- PROCEDURE begin	
PR1	Procedures	6
[{ ROL }]	Role	15
}]	--- PROCEDURE end	
[{ GT1 }]	Guarantor	6
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Info.	6
[{ IN3 }]	Insurance Additional Info - Cert.	6
[{ ROL }]	Role	15
[{ AUT }]	Authorization Record	11
[{ RF1 }]	Referral Information	11
}]	--- INSURANCE end	
[ACC]	Accident Information	6
[UB1]	Universal Bill Information	6
[UB2]	Universal Bill 92 Information	6
[PDA]	Patient Death and Autopsy	3

Figure 8: Abstract message format of the "Update Patient Information" A08 message

Any system that receives an A08 message returns a general acknowledgement (ACK) message:

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
MSA	Message Acknowledgment	2
[{ ERR }]	Error	2

Figure 9: Abstract message format of the "General Acknowledgement" ACK message

ADT Main Segments

The abstract message formats above show how the messages are built from "segments", e.g. groups of fields/data items/elements that convey information about the patient, person, client or subject of care.

The messages in Chapter 3 are built using a combination of the segments below.
Note that some segments can repeat, eg the AL1 can repeat to communicate multiple allergies.
However, each message will only pertain to one patient.

The most commonly used segments in Chapter 3 are:

Event Type (EVN): This mandatory segment contains information on the event: date of the event, type, location, etc.

Patient Identification (PID): This (usually) mandatory segment contains the demographics and identification of the patient and his/her contact information.

Patient Visit (PV1): This (usually) mandatory segment contains the visit details, e.g. the patient visit/encounter ID, the type of episode (outpatient, inpatient, emergency, etc.), the patient's doctors (admitting doctor, attending doctor, referring doctor, consultant, etc.) and the location of the patient.

Patient Visit - Additional Information (PV2): This optional segment contains the reason for admission or transfer, the location of valuable objects for the patient, estimates of date and time of hospitalization, special privacy codes, indicators for newborns, etc.

Patient Additional Demographics (PD1): This optional segment contains additional patient demographic data (living arrangements, student status, organ donors, vaccines, degree and/or military status, etc.)

Patient Allergy Information (AL1): This segment contains the allergies of the patient; it is optional and may be repeated.

Next of Kin/Family Contacts/Associated Parties (NK1): This segment includes the contact details of one of more relatives of the patient or person(s) responsible for the patient. It is optional and may be repeated.

Patient Disability (DB1): This optional segment contains information on disabilities of the patient

Merge Patient Information (MRG): This segment is used in patient record merge messages to communicate the patient records that are to be merged.

Patient Death and Autopsy (PDA): This optional segment contains information on the patient's death: cause and date of death, location, death certificates, autopsy details, etc.

Patient Identification (PID) segment definition:

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	1..4		SI	O			00104	Set ID - PID
2				W			00105	Patient ID
3			CX	R	Y		00106	Patient Identifier List
4				W			00107	Alternate Patient ID - PID
5			XPN	R	Y	0200	00108	Patient Name
6			XPN	O	Y		00109	Mother's Maiden Name
7			DTM	O			00110	Date/Time of Birth
8			CWE	O		0001	00111	Administrative Sex
9				W			00112	Patient Alias
10			CWE	O	Y	0005	00113	Race
11			XAD	O	Y		00114	Patient Address
12				W			00115	County Code
13			XTN	B	Y		00116	Phone Number - Home
14			XTN	B	Y		00117	Phone Number - Business
15			CWE	O		0296	00118	Primary Language
16			CWE	O		0002	00119	Marital Status
17			CWE	O		0006	00120	Religion
18			CX	O		0061	00121	Patient Account Number
19				W			00122	SSN Number - Patient
20				W			00123	Driver's License Number - Patient
21			CX	O	Y	0061	00124	Mother's Identifier
22			CWE	O	Y	0189	00125	Ethnic Group
23		250#	ST	O			00126	Birth Place
24	1..1		ID	O		0136	00127	Multiple Birth Indicator
25		2=	NM	O			00128	Birth Order
26			CWE	O	Y	0171	00129	Citizenship
27			CWE	O		0172	00130	Veterans Military Status
28				W			00739	Nationality
29			DTM	O			00740	Patient Death Date and Time
30	1..1		ID	O		0136	00741	Patient Death Indicator
31	1..1		ID	O		0136	01535	Identity Unknown Indicator
32			CWE	O	Y	0445	01536	Identity Reliability Code
33			DTM	O			01537	Last Update Date/Time
34			HD	O			01538	Last Update Facility
35			CWE	O			01539	Taxonomic Classification Code
36			CWE	B		0447	01540	Breed Code
37		80=	ST	O			01541	Strain
38			CWE	O	2	0429	01542	Production Class Code
39			CWE	O	Y	0171	01840	Tribal Citizenship
40			XTN	O	Y		02289	Patient Telecommunication Information

Figure 10: Segment attributes of the "Patient Information" PID segment

Examples

Here are some examples of typical Chapter 3 ADT messages:

Admit a Patient Message ADT^A01^ADT_A01

This V2.6 ADT message (ADT^A01^ADT_A01) admits patient William A. Jones, male, born 15 June 1961. His contact person is his wife Barbara K. Jones. His surgeon is Sidney Lebauer.

```
MSH|^\&|ADT1|MCM|LABADT|XYZ|201402151112|SECURITY|ADT^A01^ADT_A01|MSG00001|P|2.6|12
  345678||AL|NE<cr>
EVN|A01|201402091109<cr>
PID|1||PATID1234^5^M11^ADT1^MR^MCM123456789^^^USSSA^SS||JONES^WILLIAM^A^III||1961061
  5|M||C|1200 N ELM STREET^^GREENSBORO^NC^27401-1020|GL|(919)379-1212|(919)271-
  3434||S||PATID12345001^2^M10^ADT1^AN^A|123456789|987654^NC<cr>
NK1|1|JONES^BARBARA^K|WI^WIFE||||NK^NEXT OF KIN<cr>
PV1|1|I|400^402^3||||004777^LEBAUER^SIDNEY^J.|||SUR||||ADM|A0<cr>
```

Example of Message ADT^A02^ADT_A02

```
MSH|^\&|ADT1|MCM|LABADT|XYZ|201402151112|SECURITY|ADT^A02^ADT_A02|MSG00001|P|2.5|12
  345678||AL|NE<cr>
EVN|A02|201402091109||<cr>
PID|1||PATID1234^5^M11^ADT1^MR^MCM123456789^^^USSSA^SS||JONES^WILLIAM^A^III||1961061
  5|M||C|1200 N ELM STREET^^GREENSBORO^NC^27401-1020|GL|(919)379-1212|(919)271-
  3434||S||PATID12345001^2^M10^ADT1^AN^A|123456789|987654^NC|<cr>
NK1|1|JONES^BARBARA^K|WI^WIFE||||NK^NEXT OF KIN<cr>
PV1|1|I|400^402^3|R||420^427^2|004777^LEBAUER^SIDNEY^J.|||SUR||||ADM|A0|<cr>
```

Example of Message ADT^A03 ADT_A03

```
MSH|^\&|ADT1|MCM|LABADT|XYZ|201402151112|SECURITY|ADT^A03^ADT_A03|MSG00001|P|2.5|12
  345678||AL|NE<cr>
EVN|A03|20140215120759<cr>
PID|1||PATID1234^5^M11^ADT1^MR^MCM123456789^^^USSSA^SS||JONES^WILLIAM^A^III||1961061
  5|M||C|1200 N ELM STREET^^GREENSBORO^NC^27401-1020|GL|(919)379-1212|(919)271-
  3434||S||PATID12345001^2^M10^ADT1^AN^A|123456789|987654^NC|<cr>
NK1|1|JONES^BARBARA^K|WI^WIFE||||NK^NEXT OF KIN<cr>
PV1|1|I|400^402^3||||004777^LEBAUER^SIDNEY^J.|||SUR||||ADM|A0|N|1026^LEBAUER^MICHAEL^J.|O
  B|H0100240|||||||||||||||ALV|||||||20010823095130|20010823102455 <cr>
```

2. HL7 V2.x Chapters 4 and 7 Orders and Results

Chapters 4 & 4A - Orders

This chapter includes messages and constituent structures used to communicate orders. An order is a request for laboratory services (testing), dietary services (food), immunization or drug administration (pharmacy), diagnostic imaging (radiology, EMR, etc.), materials, etc.

Chapter 7 - Observation Reporting

This chapter includes messages for reporting results and observations for general laboratory, microbiology, pathological anatomy, cardiology, imaging, vital signs, EKG studies, etc.

General Concepts

These are the general concepts that are necessary to understand the Orders and Results chapters.

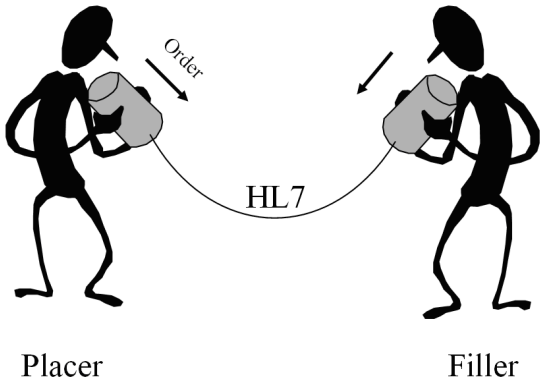


Figure 11: Placer and Filler

Order: Request of materials or services

Observation: Completion of the service, including results if available.

Placer: Application that generates or initiates the order: for example, the CPOE[2] or billing systems.

Filler: Application that provides the observation. In addition, it can offer information on the order status as it goes through the different stages (scheduled, in process, discontinued, retained, etc.)

In "HL7-Speak", Orders are placed by the "Placer" and sent to the "Filler" for action. Then the "Filler" returns the results or status of the order to the "Placer". Sometimes - for example when a lab test with multiple results is ordered - the "Filler" responds multiple times to the Placer!

[2] Computerized Physician Order Entry

Communication between Placer and Filler

The following Figure shows a typical communication between placer and filler:

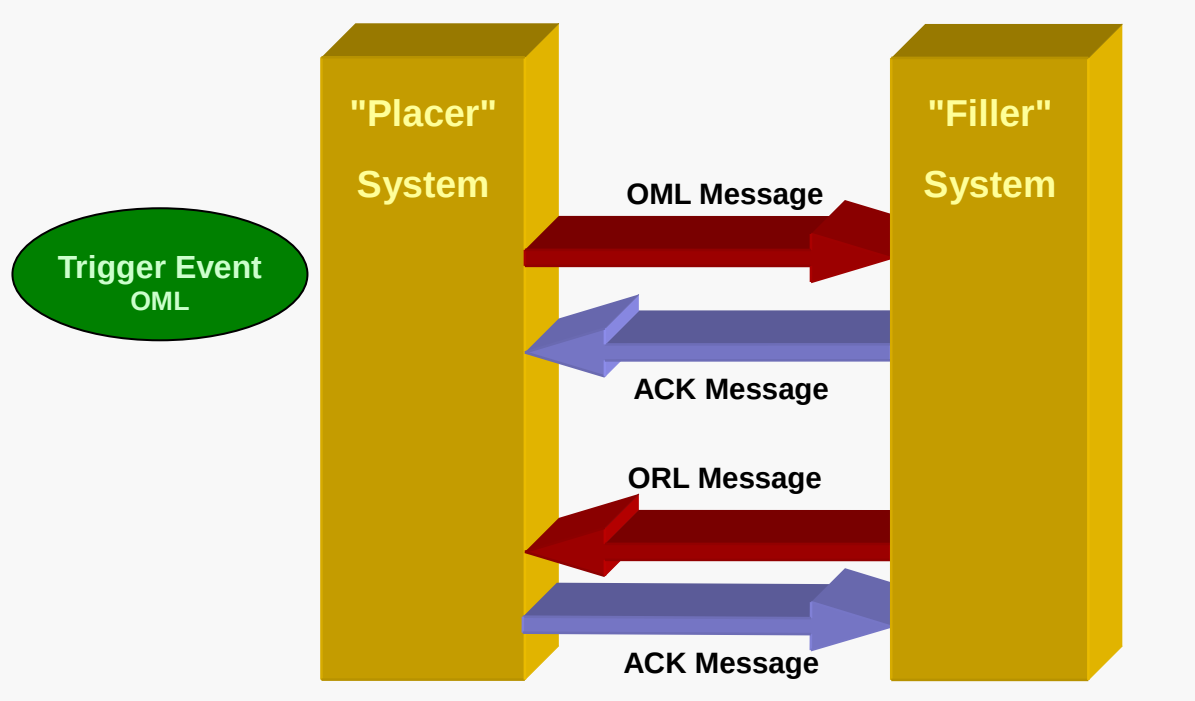


Figure 12: Communication between Placer and Filler

A doctor requests a laboratory test for a patient. The CPOE application (Placer) sends an ORM /OML message to the lab system (Filler) and an acknowledgement is sent back to the Placer through an ORR/ORL message indicating, for example, that the message was received and the order is in process.

As an example that demonstrates the forward and backward compatibility of HL7 V2.x, the Laboratory Order message (OML) message was introduced in V2.4 to replace the ORM message when used for laboratory ordering. Both co-existed in parallel until V2.7, when the ORM message was withdrawn. However, the ORM message is still popular and many systems still use it!

Both message pairs are shown below to illustrate the type of changes that laboratory messaging implementers will encounter.

General Order Messages (ORM/OMG) & Acknowledgment Messages (ORR and ORG)

The ORM & OMG messages send patient, order number, order code and related information. There are specialized types of messages for the laboratory, for example, to consider the information about the samples that are to be analyzed.

The ORR and ORG messages communicates a response back the sender of the order message and includes the order number assigned by the receiver and the status that the order was assigned (scheduled, fulfilled, etc).

This is the V2.4 abstract message format of the General Order (ORM) message (ORM^O01^ORM_O01):

ORM^O01^ORM_O01	General Order Message	Chapter
MSH	Message Header	2
[{ NTE }]	Notes and Comments (for Header)	2
[	--- PATIENT begin	
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{ NTE }]	Notes and Comments (for Patient ID)	2
[	--- PATIENT_VISIT begin	
PV1	Patient Visit	3
[PV2]	Patient Visit- Additional Info	3
]	--- PATIENT_VISIT end	
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Information	6
[IN3]	Insurance Additional Information, Certification	6
}]	--- INSURANCE end	
[GT1]	Guarantor	6
[{ AL1 }]	Allergy Information	3
]	--- PATIENT end	
{	--- ORDER begin	
ORC	Common Order	4
[	--- ORDER_DETAIL begin	
<OBR|	Order Detail Segment OBR, etc.	4
RQD|		
RQ1|		
RXO|		
ODS|		
ODT>		
[{ NTE }]	Notes and Comments (for Detail)	2
[CTD]	Contact Data	11
[{ DG1 }]	Diagnosis	6
[{	--- OBSERVATION begin	
OBX	Observation/Result	7
[{ NTE }]	Notes and Comments (for Results)	2
}]	--- OBSERVATION end	
]	--- ORDER_DETAIL end	
[{ FT1 }]	Financial Transaction	6
[{ CTI }]	Clinical Trial Identification	7
[BLG]	Billing Segment	4
}	--- ORDER end	

Figure 13: Abstract message format of the V2.4 "General Order" (ORM) message

Any system that receives an ORM message returns a General Order Acknowledgement (ORR) message:

ORR^O02^ORR_O02	General Order Acknowledgment Message	Chapter
MSH	Message Header	2
MSA	Message Acknowledgment	2
[ERR]	Error	2

ORR^O02^ORR_O02	General Order Acknowledgment Message	Chapter
[{NTE}]	Notes and Comments (for Header)	2
[		
[PID	Patient Identification	3
[{NTE}]]	Notes and Comments (for Patient ID)	2
{		
ORC	Common Order	4
<OBR|	[Order Detail Segment] OBR, etc.	4
RQD|		
RQ1|		
RXO|		
ODS|		
ODT>		
[{NTE}]	Notes and Comments (for Detail)	2
[{CTI}]	Clinical Trial Identification	7
}		
]		

Figure 14: Abstract message format of the V2.4 "General Order Acknowledgement" Message" (ORR)

This is the V2.8 abstract message format of the General Clinical Order (OMG) message (OMG^O19^OMG_O19) that replaced the ORM:

Segments	Description	Chapter
MSH	Message Header	2
[{SFT}]	Software	2
[UAC]	User Authentication Credential	2
[{NTE}]	Notes and Comments (for Header)	2
[	--- PATIENT begin	
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{PRT}]	Participation (for Patient)	7
[{NTE}]	Notes and Comments (for Patient ID)	2
[{NK1}]	Next of Kin/Associated Parties	3
[{ARV}]	Access Restrictions	3
[	--- PATIENT_VISIT begin	
PV1	Patient Visit	3
[PV2]	Patient Visit- Additional Info	3
[{PRT}]	Participation (for Patient Visit)	7
]	--- PATIENT_VISIT end	
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Information	6
[IN3]	Insurance Additional Information, Certification	6
}]	--- INSURANCE end	
[GT1]	Guarantor	6
[{AL1}]	Allergy Information	3
]	--- PATIENT end	
{	--- ORDER begin	
ORC	Common Order	4
[{PRT}]	Participation (for Common Order)	7
[{	--- TIMING begin	
TQ1	Timing/Quantity	4
[{TQ2}]	Timing/Quantity Order Sequence	4
}]	--- TIMING end	

Segments	Description	Chapter
OBR	Observation	4
[{NTE}]	Notes and Comments (for Detail)	2
[{PRT}]	Participation (for Order)	7
[CTD]	Contact Data	11
[{DG1}]	Diagnosis	6
[{	--- OBSERVATION begin	
OBX	Observation/Result	7
[{PRT}]	Participation (for Observation)	7
[{NTE}]	Notes and Comments (for Results)	2
}]	--- OBSERVATION end	
[{	--- SPECIMEN begin	
SPM	Specimen	7
[{	--- SPECIMEN_OBSERVATION begin	
OBX	Observation/Result	7
[{PRT}]	Participation (for Specimen Observation)	7
}]	--- SPECIMEN OBSERVATION end	
[{	--- CONTAINER begin	
SAC	Specimen Container	13
[{	--- CONTAINER_OBSERVATION begin	
OBX	Observation/Result	7
[{PRT}]	Participation (for Container Observation)	7
}]	--- CONTAINER OBSERVATION end	
}]	--- CONTAINER end	
}]	--- SPECIMEN end	
[{	--- PRIOR_RESULT begin	
[	--- PATIENT PRIOR begin	
PID	Patient Identification - previous result	3
[PD1]	Additional Demographics - previous result	3
[{ARV}]	Access Restrictions	3
[{PRT}]	Participation (for Patient Prior)	7
]	--- PATIENT_PRIOR end	
[	--- PATIENT VISIT PRIOR begin	
PV1	Patient Visit - previous result	3
[PV2]	Patient Visit Add. Info - previous result	3
[{PRT}]	Participation (for Patient Visit Prior)	7
]	--- PATIENT VISIT PRIOR end	
[{AL1}]	Allergy Information - previous result	3
{	--- ORDER PRIOR begin	
ORC	Common Order - previous result	4
[{PRT}]	Participation	7
OBR	Order Detail - previous result	4
[{	--- TIMING PRIOR begin	
TQ1	Timing/Quantity	4
[{TQ2}]	Timing/Quantity Order Sequence	4
}]	--- TIMING_PRIOR end	
[{NTE}]	Notes and Comments - previous result	2
[{PRT}]	Participation (for Order Prior) - previous result	7
[CTD]	Contact Data - previous result	10
{	--- OBSERVATION_PRIOR begin	
OBX	Observation/Result - previous result	7
[{PRT}]	Participation (for Oservation Prior)	7
[{NTE}]	Notes and Comments - previous result	2
}	--- OBSERVATION_PRIOR end	
}	--- ORDER_PRIOR end	
}]	--- PRIOR_RESULT end	
[{FT1}]	Financial Transaction	6

Segments	Description	Chapter
[{CTI}]	Clinical Trial Identification	7
[BLG]	Billing Segment	4
}	--- ORDER end	

Figure 15: Abstract message format of the V2.8 "General Clinical Order" message (OMG)

Any system that receives an OMG message returns a General Order Acknowledgement (ORG) message:

Segments	Description	Chapter
MSH	Message Header	2
MSA	Message Acknowledgment	2
[{ERR}]	Error	2
[{SFT}]	Software	2
[UAC]	User Authentication Credential	2
[{NTE}]	Notes and Comments (for Header)	2
[	--- RESPONSE begin	
[	--- PATIENT begin	
PID	Patient Identification	3
[{NTE}]	Notes and Comments (for Patient ID)	2
[{PRT}]	Participation (for Patient)	7
[{ARV}]	Access Restrictions	3
]	--- PATIENT end	
{	--- ORDER begin	
ORC	Common Order	4
[{PRT}]	Participation	7
[{	--- TIMING begin	
TQ1	Timing/Quantity	4
[{TQ2}]	Timing/Quantity Order Sequence	4
}]	--- TIMING end	
[	--- OBSERVATION GROUP begin	
OBR	Observation	4
]	--- OBSERVATION GROUP end	
[{PRT}]	Participation (for Order)	7
[{NTE}]	Notes and Comments (for Detail)	2
[{CTI}]	Clinical Trial Identification	7
[{	--- SPECIMEN begin	
SPM	Specimen	7
[{SAC}]	Specimen Container Details	13
}]	--- SPECIMEN end	
}	--- ORDER end	
]	--- RESPONSE end	

Figure 16: Abstract message format of the V2.8 "General Order Acknowledgement" message (ORG)

The ORR and ORG messages are issued in response to a received order message (ORM/OMG). The response message usually returns in field ORC-1 an order control code "OK - Order Order/service accepted & OK" and assigns an order number that is sent in "ORC-3 Filler Order Number" and "OBR-3 Filler Order Number". If the receive cannot fulfill the request, it returns an order control code "UA - Unable to Accept Order".

Frequently Used Order Segments

The following sections outline the most commonly used segments in Chapters 4 and 4A:

The Order Control Segment (ORC)

The ORC segment contains information that is common to the orders that follow in that message. It is a required segment in the ORM message. The ORC segment must precede any order detail (OBR) segment(s). This is the V2.8 segment attribute table for the ORC segment:

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	2..2		ID	R		0119	00215	Order Control
2			EI	C			00216	Placer Order Number
3			EI	C			00217	Filler Order Number
4			EIP	O			00218	Placer Group Number
5	1..2		ID	O		0038	00219	Order Status
6	1..1		ID	O		0121	00220	Response Flag
7				W	Y			Quantity/Timing
8			EIP	O			00222	Parent Order
9			DTM	O			00223	Date/Time of Transaction
10			XCN	B	Y		00224	Entered By
11			XCN	B	Y		00225	Verified By
12			XCN	B	Y		00226	Ordering Provider
13			PL	O			00227	Enterer's Location
14			XTN	O	Y/2		00228	Call Back Phone Number
15			DTM	O			00229	Order Effective Date/Time
16			CWE	O		9999	00230	Order Control Code Reason
17			CWE	B		9999	00231	Entering Organization
18			CWE	B		9999	00232	Entering Device
19			XCN	B	Y		00233	Action By
20			CWE	O		0339	01310	Advanced Beneficiary Notice Code
21			XON	B	Y		01311	Ordering Facility Name
22			XAD	B	Y		01312	Ordering Facility Address
23			XTN	B	Y		01313	Ordering Facility Phone Number
24			XAD	B	Y		01314	Ordering Provider Address
25			CWE	O		9999	01473	Order Status Modifier
26			CWE	C		0552	01641	Advanced Beneficiary Notice Override Reason
27			DTM	O			01642	Filler's Expected Availability Date/Time
28			CWE	O		0177	00615	Confidentiality Code
29			CWE	O		0482	01643	Order Type
30			CNE	O		0483	01644	Enterer Authorization Mode
31			CWE	B			02287	Parent Universal Service Identifier
32			DT	O			02301	Advanced Beneficiary Notice Date
33			CX	O	Y		03300	Alternate Placer Order Number
34			CWE	O	Y	0934	03387	Order Workflow Profile

Figure 17: Segment attributes of the "Order Control" ORC segment

Of course not all 34 fields with be used in most implementations. Only one field, ORC-1, must always be sent in the segment and fields 2, 3 and 26 must be sent in some situations.

These are the most important fields in the ORC segment:

Order Control (ORC-1): Defines the event: request (new order, cancel order), acknowledgement (order accepted, order cancelled) or notification.

Placer Order Number (ORC-2): Unique Order number - identification for the order assigned by the placer (usually EHR, CPOE, Billing, etc.)

Filler Order Number (ORC-3): Order number - identification for the order assigned by the filler (usually the ancillary service's application: LIS, RIS, Pharmacy, etc.).

Placer Group Number (ORC-4): Identifier for a group of orders (it can be shared by several items).

Order Status (ORC-5): Conveys information about what stage of processing the order has reached: In Process, Cancelled, Discontinued, Completed, etc.

Parent Order (ORC-8): Identifies parent/child relationships in an order (such as a microbiology test identified here within its associated antibiotic susceptibility test).

Entered By (ORC-10): Person who entered the order into the ordering application.

Ordering Provider (ORC-12): Person who requested the test, e.g. "ordering physician"

Enterer's Location (ORC-13): Where the order was entered (ward, clinic, etc.).

Call Back Phone Number (ORC-14): Contact phone if a problem arises with the order.

Entering Device (ORC-18): Identification of the PC, workstation, terminal or electronic device on with which the order was entered

Action by (ORC-19): The person who initiated the event represented by the order control code (ORC-1).

The Order Control Codes

The code in the ORC-1 field indicates what purpose the Order message has.

An order control code of "NW" is sent in the Order Control (ORC-1) field of the ORM message when a new order is generated.

If the receiving system can accept the order, it will reply with an ORR message with an "OK" code in ORC-1 and the number assigned to the order in Filler Order Number (ORC-3).

If the order is cancelled by the sender, the sender will send a message requesting its cancellation with an order control code of "CA" in the Order Control (ORC-1) field. The receiver will reply with a status for the order of either "CR - Canceled as requested" or "UC - Unable to Cancel".

The most widely used value for Order Control (ORC-1) is "SC - Status Change". This allows the filler application to inform the placer of the changes in the order status through the order lifecycle:

Example: **Scheduled → In progress → Some results available → Completed**

These specific order statuses will be communicated in the "Order Status" field (ORC-5).

Order replacement (RE): request or notification of the substitution of some orders by one or more new orders.

Parent/Child orders (PC): creating of additional/new orders from a related parent order, *e.g.* for microbiological susceptibilities, etc.

For the complete list of Order Control coded, please see HL7 V2.8 Table 0119 - Order Control Codes in Chapter 2C!

The General Order Detail Segment (OBR)

This segment carries specific details about the requested service (code, type, etc.):

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
1	1..4		SI	O			00237	Set ID – OBR
2			EI	C			00216	Placer Order Number
3			EI	C			00217	Filler Order Number
4			CWE	R		9999	00238	Universal Service Identifier
5				W				Priority
6				W				Requested Date/Time
7			DTM	C			00241	Observation Date/Time #
8			DTM	O			00242	Observation End Date/Time #
9			CQ	O			00243	Collection Volume *
10			XCN	B	Y		00244	Collector Identifier *
11	1..1		ID	O		0065	00245	Specimen Action Code *
12			CWE	O		9999	00246	Danger Code
13		300=	CWE	O	Y	0916	00247	Relevant Clinical Information
14				W				Specimen Received Date/Time *
15				W				Specimen Source
16			XCN	B	Y		00226	Ordering Provider
17			XTN	O	Y/2		00250	Order Callback Phone Number
18		199=	ST	O			00251	Placer Field 1
19		199=	ST	O			00252	Placer Field 2
20		199=	ST	O			00253	Filler Field 1 +
21		199=	ST	O			00254	Filler Field 2 +
22			DTM	C			00255	Results Rpt/Status Chng – Date/Time +
23			MOC	O			00256	Charge to Practice +
24	2..3		ID	O		0074	00257	Diagnostic Serv Sect ID
25	1..1		ID	C		0123	00258	Result Status +
26			PRL	O			00259	Parent Result +
27				W	Y			Quantity/Timing
28			XCN	B	Y		00260	Result Copies To
29			EIP	O			00261	Parent Results Observation Identifier
30	4..4		ID	O		0124	00262	Transportation Mode
31			CWE	O	Y	9999	00263	Reason for Study
32			NDL	B			00264	Principal Result Interpreter +
33			NDL	B	Y		00265	Assistant Result Interpreter +
34			NDL	B	Y		00266	Technician +
35			NDL	B	Y		00267	Transcriptionist +
36			DTM	O			00268	Scheduled Date/Time +
37		16=	NM	O			01028	Number of Sample Containers *
38			CWE	O	Y	9999	01029	Transport Logistics of Collected Sample *
39			CWE	O	Y	9999	01030	Collector's Comment *
40			CWE	O		9999	01031	Transport Arrangement Responsibility
41	1..1		ID	O		0224	01032	Transport Arranged
42	1..1		ID	O		0225	01033	Escort Required

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
43			CWE	O	Y	9999	01034	Planned Patient Transport Comment
44			CNE	O		0088	00393	Procedure Code
45			CNE	O	Y	0340	01316	Procedure Code Modifier
46			CWE	O	Y	0411	01474	Placer Supplemental Service Information
47			CWE	O	Y	0411	01475	Filler Supplemental Service Information
48			CWE	C		0476	01646	Medically Necessary Duplicate Procedure Reason
49			CWE	O		0507	01647	Result Handling
50			CWE	B			02286	Parent Universal Service Identifier
51			EI	O			02307	Observation Group ID
52			EI	O			02308	Parent Observation Group ID
53			CX	O	Y		03303	Alternate Placer Order Number
54			EIP	O		0119	00222	Parent Order

Figure 18: Segment attributes of the "General Order" OBR segment

Some of the fields in this segment are duplicated in the ORC segment; HL7 V2.x requires that the data in the ORC-2/OBR-2 and ORC-3/OBR-3 segments is identical.

This segment also contains data on collected samples (date of collection, type, etc.) as well as several fields (OBR-18 through OBR-21) whose use can be negotiated for each implementation.

When a new order is placed, an OBR segment must be sent for each ORC segment transmitted.

Dietary Order and Nutrition Segments (ODS & ODT)

The optional ODS & ODT segments include fields describing the type of diet, the period (lunch, dinner, etc.), the diet code and text instructions.

For more information, see section 4.8 in the HL7 V2.8 standard.

Supply Requisition Segments (RQD & RQ1)

The optional RQD segment contains the Hospital Item Code, the associated cost center and the required date. The optional RQ1 segment contains the anticipated price and information about the manufacturer and supplier.

For more information, see section 4.11 in the HL7 V2.8 standard.

Definition of Timing/Quantity ("TQ")

The Timing/Quantity data type "TQ" allows specification of scheduling, quantity and associated information for an order.

Because of the complexity of data type TQ, it was replaced by the segments TQ1 and TQ from V2.5 onwards, but has been retained for backward compatibility with systems that use earlier versions of HL7.

These are the components of data type TQ in HL7 Version 2.4:

- Quantity - including units

- Interval - repeat pattern and/or explicit interval time(s)
- Duration - e.g. X3 (no. of times), H6 (6 hours), etc.
- Start Date/Time
- End Date/Time
- Priority - Urgent, Routine, etc.
- Condition when a drug should be given
- Text - narrative of the order, before coding; for example: "500 mg Polycillin Q6H for 10 days, dispense 40 tablets"
- Conjunction
- Order Sequence
- Occurrence Duration
- Total Occurrences

Other Order Messages

Laboratory Order Message (OML) & Laboratory Acknowledgment Message (ORL)

Imaging Order Message (OMI) & Imaging Acknowledgment Message (ORI)

Diets Order Message (OMD) & Diets Acknowledgment Message (ORD)

Stock Requisition Message (OMS) & Stock Requisition Acknowledgment Message (ORS)

Non-Stock Requisition Message (ONS) & Non Stock Acknowledgment Message (ONN)

Pharmacy Order Message (OMP) & Pharmacy Treatment Acknowledgment Message (ORP)

Order Status Query message (OSQ) & Order Status Response (OSR). This message pair allows inquiry on the status of an order. The OSQ search filter(s) can vary: order number, patient, code of analysis, benefit or service, etc. The use of this message requires some negotiation between the communicating parties. The OSR message returns information matching the parameters of the OSQ query message.

3. Pharmacy Messages

The pharmacy section in HL7 V2.8 has a number of messages that track the various stages of the life cycle in medication management.

Note that since HL7 V2.4 a number of transactions have been obsoleted and withdrawn since V2.7. For more information, see chapter 4A in the HL7 V2.8 standard.

Communications Diagram

This Figure shows a typical interchange between an ordering system, the pharmacy and nursing:

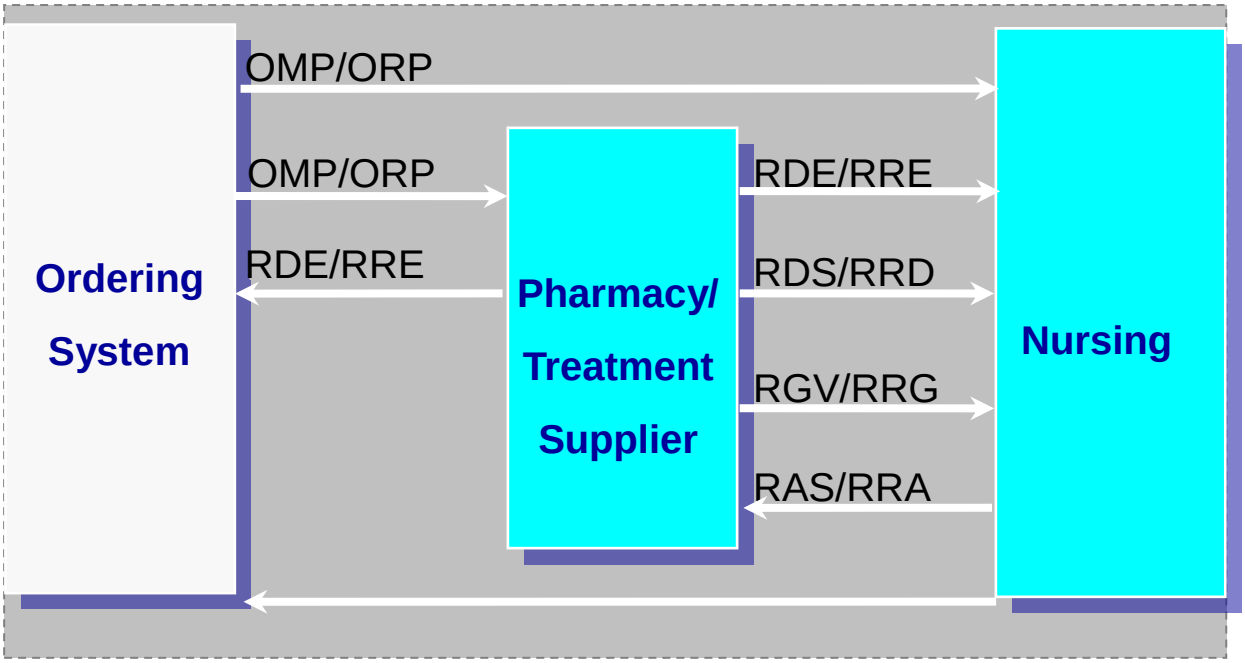


Figure 19: Medication Management Workflow and Message Flow

Medication/Treatment Message (RXO)

This specific segment for medication allows identification of the product, the amount to give, the form of the dose (oral, intravenous, etc.), special administration instructions, whether substitutions are allowed, the total daily dose, etc.

Pharmacy Order Encoding Message (RDE/RRE)

Encoded order message and acknowledgement: message codified for pharmacy orders.

Pharmacy Order Dispensing Message (RDS/RRD)

Message acknowledgment: message to ask for drug delivery.

Pharmacy Order Administration Message (RAS/RRA)

Administration message and acknowledgement: message to announce the drug administration

4. Result Messages

Message types and trigger events for the transmission of results are defined in chapter 7 of HL7 Version 2.x.

The most commonly used results message is the Unsolicited Observation (ORU) message ("ORU^R01"). Chapter 7 also defines special messages for laboratory that permit identification and grouping by sample, association of results with clinical trials, and transmission of waveform results.

The chapter also describes in narrative form, how microbiology results are to be sent.

Detail of Segments of Message ORU^R01^ORU_R01

This is the V2.8 abstract message format of the Unsolicited Observation (ORU) message (ORU^R01^ORU_R01):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
{	--- PATIENT_RESULT begin	
[	--- PATIENT begin	
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{PRT}]	Participation (for Patient)	7
[{NTE}]	Notes and Comments	2
[{NK1}]	Next of Kin/Associated Parties	3
[{ARV}]	Access Restrictions	3
[{	--- PATIENT_OBSERVATION begin	
OBX	Observation (for Patient ID)	7
[{PRT}]	Participation (Observation Participation)	7
}]	--- PATIENT OBSERVATION end	
[	--- VISIT begin	
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info	3
[{PRT}]	Participation (for Patient Visit)	7
]	--- VISIT end	
]	--- PATIENT end	
{	--- ORDER_OBSERVATION begin	
[	--- COMMON ORDER begin	
ORC	Order common	4
[{PRT}]	Participation (for Observation)	7
[	--- ORDER DOCUMENT begin	
OBX	Observation containing Document	7
[{PRT}]	Participation	7
TXA	Transcription Document Header	9
]	--- ORDER DOCUMENT end	
]	--- COMMON ORDER end	
OBR	Observations Request	7
{[NTE]}	Notes and comments	2
[{PRT}]	Participation (for Observation)	7
[{	--- TIMING QTY begin	
TQ1	Timing/Quantity	4
[{TQ2}]	Timing/Quantity Order Sequence	4

Segments	Description	Chapter
}]	--- TIMING_QTY end	
[CTD]	Contact Data	11
[{	--- OBSERVATION begin	
OBX	Observation related to OBR	7
[{PRT}]	Participation (Observation Participation)	7
{[NTE]}	Notes and comments	2
}]	--- OBSERVATION end	
[{FT1}]	Financial Transaction	6
{[CTI]}	Clinical Trial Identification	7
[{	--- SPECIMEN begin	
SPM	Specimen	
[{	--- SPECIMEN OBSERVATION begin	
OBX	Observation (for Patient ID)	7
[{PRT}]	Participation (Observation Participation)	7
}]	--- SPECIMEN_OBSERVATION end	
}]	--- SPECIMEN end	
}	--- ORDER_OBSERVATION end	
}	--- PATIENT RESULT end	
[DSC]	Continuation Pointer	2

Figure 20: Abstract message format of the "Unsolicited Observation" ORU message

Any system that receives an ORU message returns a general acknowledgement (ACK) message:

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
MSA	Message Acknowledgment	2
[{ ERR }]	Error	2

Figure 21: Abstract message format of the "General Acknowledgement" ACK message

The structure of the ORU results message is somewhat similar to that of the order message, with the order control code in ORC-1 = "RE" (= Results) and one or more OBX segments communicating the results of each test, observation and/or service.

These are most important fields in the ORC segment:

Set ID (OBX-1): Holds the sequence number of this OBX segment within the set of all OBX segments included in the message.

Value type (OBX-2): This field must be defined according to the data type of the result. Examples: NM (Numeric), TX (Text), ED (encapsulated image or document data - this may be in MIME or Base 64 encoding), etc.

Observation Identifier (OBX-3): Code/description of the observation.

Observation Value (OBX-5): Numeric, narrative, binary or other value of the observation or result. The data type of this field depends on the value specified in OBX-2.

Units (OBX-6): The units of measure of the value in OBX-5, where appropriate.

References Range (OBX-7): The lower and upper bounds of the normal range of the observation, where appropriate.

Abnormal Flags (OBX-8): For values outside the reference range or otherwise abnormal, this field can contain a descriptive code from the extensive list in the user-defined Table 0078 "Interpretation Codes":[3]

Value	Description
L	Below low normal
H	Above high normal
LL	Below lower panic limits
HH	Above upper panic limits
<	Below absolute low-off instrument scale
>	Above absolute high-off instrument scale
N	Normal (applies to non-numeric results)
A	Abnormal (applies to non-numeric results)
AA	Very abnormal (applies to non-numeric units, analogous to panic limits for numeric units)
null	No range defined, or normal ranges don't apply
U	Significant change up
D	Significant change down
B	Better-use when direction not relevant
W	Worse-use when direction not relevant
S	Susceptible. Indicates for microbiology susceptibilities only.
R	Resistant. Indicates for microbiology susceptibilities only.
I	Intermediate. Indicates for microbiology susceptibilities only.
MS	Moderately susceptible. Indicates for microbiology susceptibilities only.
VS	Very susceptible. Indicates for microbiology susceptibilities only.
POS	Positive
NEG	Negative
IND	Indeterminate
DET	Detected
ND	Not Detected
AC	Anti-complementary substances present
TOX	Cytotoxic substance present
QCF	Quality Control Failure
RR	Reactive
WR	Weakly reactive
NR	Non-reactive
OBX	Interpretation qualifiers in separate OBX segments
HM	Hold for Medical Review

Observation Result Status (OBX-11): Status code of the individual result as per HL7 Table 0085 "Observation Result Status Codes Interpretation":

Value	Description
A	Amended based on adjustments provided by the Placer (Physician) regarding patient demographics (such as age and/or gender or other patient specific information
B	Appended Report – Final results reviewed and further information provided for clarity without change to the original result values.
C	Record coming over is a correction and thus replaces a final result

[3] This table was formerly known as "Abnormal Flags"

Value	Description
D	Deletes the OBX record
F	Final results
I	Specimen in lab; results pending
N	Not asked; used to affirmatively document that the observation identified in the OBX was not sought when the universal service ID in OBR-4 implies that it would be sought.
O	Order detail description only (no result)
P	Preliminary results
R	Results entered -- not verified
S	Partial results. Deprecated. Retained only for backward compatibility as of V2.6.
V	Verified – Final results reviewed and confirmed to be correct, no change to result value, normal range or abnormal flag
X	Results cannot be obtained for this observation
U	Results status change to final without retransmitting results already sent as 'preliminary.' E.g., radiology changes status from preliminary to final
W	Post original as wrong, e.g., transmitted for wrong patient

Date/Time of the Observation (OBX-14): This data item communicates a timestamp with a high degree of accuracy; it includes time-zone information.

5. HL7 V2.x Message Examples

Here are some HL7 V2.x example messages for Admission, Discharge, Transfer, Laboratory Orders and Results.

IHE RADIOLOGY EXAMPLES

Patient Registration

Admit / Visit Notification (ADT^A01)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090131-
  0500||ADT^A01|01052901|P|2.3.1
EVN|A01|200105290900||||200105290900
PID|||56782445^^^UAReg&2.3.4.5.99999&ISO^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q
  ^JR||19620910|M||6^^HL70005^R-11030^^SNM3|260 GOODWIN CREST
  DRIVE^^BIRMINGHAM^AL^35209^^H|||||||0105I30001
PV1||I|W^389^1^UABH^^^^3||||12345^MORGAN^REX^J^^^MD^^^UAMC^L||67890^GRAINGER^LUCY^
  X^^^MD^^^UAMC^L|MED|||||A0||13579^POTTER^SHERMAN^T^^^MD^^^UAMC^L
OBX|1|NM|HT^HEIGHT^99LOC1||71|in^inches^ANSI+|||||F
OBX|2|NM|WT^WEIGHT^99LOC1||175|lb^pounds^ANSI+|||||F
AL1|1|DA|ASP^ASPIRIN^99LOC2|MO^Moderate^HL70128|GI DISTRESS
```

Admit/Visit Notification Acknowledgment (ACK^A01)

```
MSH|^~\&|ImgOrdMgr|UABImgCtr|MegaReg|UABHospC|20010529090132-
  0500||ACK^A01|3944441|P|2.3.1
MSA|AA|01052901
```

Register a Patient (ADT^A04)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090132-
  0500||ADT^A04|01052902|P|2.3.1
EVN|A04|200105290900||||200105290900
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||19620910|M||C
  |260 GOODWIN CREST DRIVE^^BIRMINGHAM^AL^35209^^H|||||||0105I30001
PV1||O|||||24680^CASEY^BEN^Z^^^MD^^^UAMC^L|67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L||||
  ||A0
OBX|1|NM|HT^HEIGHT^99LOC||71|in^inches^ANSI+|||||F
OBX|2|NM|WT^WEIGHT^99LOC||175|lb^pounds^ANSI+|||||F
AL1|1|DA|ASP^ASPIRIN^99LOC2|MO|GI DISTRESS
```

Pre-Admit a Patient (ADT^A05)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090133-
  0500||ADT^A05|01052903|P|2.3.1
EVN|A05|200105290900||||200105290900
```

```
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||19620910|M||C
  |260 GOODWIN CREST DRIVE^^BIRMINGHAM^AL^35209^^H|||||||0105I30001
PV1||I|||||||67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L||||||A0
OBX|1|NM|HT^HEIGHT^99LOC||71|in^inches^ANSI+|||||F
OBX|2|NM|WT^WEIGHT^99LOC||175|lb^pounds^ANSI+|||||F
AL1|1|DA|ASP^ASPIRIN^99LOC2|MO|GI DISTRESS
```

Cancel Admit/Visit Notification (ADT^A11)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090134-
  0500||ADT^A11|01052904|P|2.3.1
EVN|A11|200105290900||||200105290900
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
PV1||I
```

Cancel Pre-Admit (ADT^A38)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090135-
  0500||ADT^A38|01052905|P|2.3.1
EVN|A38|200105290900||||200105290900
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
PV1||I
```

Orders

New Order from Placer (ORM^O01)

```
MSH|^~\&|MegaReg|UABHospC|ImgScheduler|UABImgCtr|20010529090136-
  0500||ORM^O01|01052906|P|2.3.1
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
PV1||I
ORC|NW|U123456|||||1^^^200105291100||200105290900|54321^SOMETECH^AGNES^Z^^^MT^^^UA
  MC^L||67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L
OBR||U123456||71020^RIGHT ARM X-RAY^CPT4||||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L||||||||||1^^^200105291100
```

New Order from Filler (ORM^O01)

```
MSH|^~\&|ImgScheduler|UABImgCtr|MegaReg|UABHospC|20010529090146-
  0500||ORM^O01|3345912|P|2.3.1
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
PV1||I
ORC|SN||GG3234093||||1^^^200105291100||200105290900|54321^SOMETECH^AGNES^Z^^^MT^^^U
  AMC^L||67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L
```

```
OBR|||GG3234093|71099.99^RIGHT SHOULDER X-RAY^CPT4|||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L|||||||||||1^^^200105291100
```

Cancel Order from Placer (ORM^O01)

```
MSH|^~\&|MegaReg|UABHospC|ImgScheduler|UABImgCtr|20010529090136-
  0500||ORM^O01|01052906|P|2.3.1
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
PV1||I
ORC|CA|U123456|||||1^^^200105291100||200105290900|54321^SOMETECH^AGNES^Z^^^MT^^^UAM
  C^L||67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L
OBR||U123456||71020^RIGHT ARM X-RAY^CPT4|||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L|||||||||||1^^^200105291100
```

New Order Acknowledgment Message from Order Placer (ORR^O02)

```
MSH|^~\&|MegaReg|UABHospC|ImgScheduler|UABImgCtr|20010529090147-
  0500||ORR^O02|01052918|P|2.3.1
MSA|AA|3345912
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
ORC|NA|U123457|GG3234093||||1^^^200105291100||200105290900|54321^SOMETECH^AGNES^Z^^
  ^MT^^^UAMC^L||67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L
OBR||U123457|GG3234093|71099.99^RIGHT SHOULDER X-RAY^CPT4|||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L|||||||||||1^^^200105291100
```

Procedure Scheduled (ORM^O01)

```
MSH|^~\&|ImgScheduler|UABImgCtr|ImgManager|UABImgCtr|20010529090137-
  0500||ORM^O01|01052907|P|2.3.1
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||19620910|M||C
  |260 GOODWIN CREST DRIVE^^BIRMINGHAM^AL^35209^^H|||||||0105I30001
PV1||I|||||12345^MORGAN^REX^J^^^MD^^^UAMC^L|24680^CASEY^BEN^Z^^^MD^^^UAMC^L|67890^
  GRAINGER^LUCY^X^^^MD^^^UAMC^L|||||A0||13579^POTTER^SHERMAN^T^^^MD^^^UAMC^L
ORC|SC|U123456|||||1^^^200105291100|||54321^SOMETECH^AGNES^Z^^^MT^^^UAMC^L||67890^G
  RAINGER^LUCY^X^^^MD^^^UAMC^L||(205)555-2368|UAMC
OBR||U123456|D7910334|71020^RIGHT ARM X-
  RAY^CPT4^12345^SAMPLEPROC^SPSDESCPROTOCODE|R||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L|(205)555-
  2368|ACCNO|REQPROCID|SCHPROCSTEPID||||DICOMMODALITY|||1^^^200105291100
ZDS|1.2.3.4.5^SuperImgApp^Application^DICOM
```

Patient Update

Patient Information Update (ADT^A08)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090140-
  0500||ADT^A08|01052910|P|2.3.1
EVN|A08|200105290900||||200105290900
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||19461223|||||||
  |||0105I30001
```

```
PV1||I
```

Patient Merge (ADT^A40)

```
MSH|^~\&|MegaReg|UABHospC|ImgOrdMgr|UABImgCtr|20010529090138-
  0500||ADT^A40|01052908|P|2.3.1
EVN|A40|200105290900||||200105290900
PID|||90128423^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||||||||||||0105I3
  0001
MRG|56782445^^UAReg^PI~999855750^^^USSSA^SS
```

Procedure Update

Procedure Update (ORM^O01)

```
MSH|^~\&|ImgScheduler|UABImgCtr|ImgManager|UABImgCtr|20010529090139-
  0500||ORM^O01|01052909|P|2.3.1
PID|||56782445^^^UAReg^PI~999855750^^^USSSA^SS||KLEINSAMPLE^BARRY^Q^JR||19620910|M||C
  |260 GOODWIN CREST DRIVE^^BIRMINGHAM^AL^35209^^H|||||||0105I30001
PV1||I|||||12345^MORGAN^REX^J^^^MD^^^UAMC^L|24680^CASEY^BEN^Z^^^MD^^^UAMC^L|67890^
  GRAINGER^LUCY^X^^^MD^^^UAMC^L|||||A0||13579^POTTER^SHERMAN^T^^^MD^^^UAMC^L
ORC|CA|U123456|D7910334||||1^^^200105291100|||54321^SOMETECH^AGNES^Z^^^MT^^^UAMC^L|
  |67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L||(205)555-2368|UAMC
OBR||U123456|D7910334|71020^RIGHT ARM X-
  RAY^CPT4^12345^SAMPLEPROC^SPSDESCPROTOCODE|R||||||||||
  67890^GRAINGER^LUCY^X^^^MD^^^UAMC^L|(205)555-
  2368|ACCNO|REQPROCID|SCHPROCSTEPID||||DICOMMODALITY|||1^^^200105291100
ZDS|1.2.3.4.5^SuperImgApp^Application^DICOM
```

Miscellaneous

Admit / Visit Notification Acknowledgment (ACK^A01)

(Prototype - Using the MSA-6 as an "exception code" rather than as an "error code")

```
MSH|^~\&|ImgOrdMgr|UABImgCtr|MegaReg|UABHospC|20010529090132-
  0500||ACK^A01|3944441|P|2.3.1
MSA|AA|01052901||||234^DUPLICATE ID—IMPLICIT MERGE PERFORMED^L
```

IHE LAB EXAMPLES

(All of these IHE examples are based on HL7 v2.5)

T1 (OP → OF): Message "New order" with one specimen

A new placer order sent to the Order Filler:

```
MSH|^~\&|OP|Nephrology|OF|Chemistry|200310060820||OML^O21|001|T|2.5|||||USA||EN
```

```
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I||||||||||||||||9998888
ORC|NW|9876543||777|||||200310060710|^NURSE^JANET||||||||||Nephrology //clearance battery
TQ1|1|||||||R                                    //priority "routine"
OBR|1|9876543||82575^Creatinine clearance^CPT4|||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR
OBX|1|NM|13362-9^URINE COLLECTION DURATION^LOINC ||24|hr|||||F|||200309060735
OBX|2|NM|19153-6^URINE SPECIMEN VOLUME^LOINC ||2500|ml|||||F|||200309060735
SPM|1|||SER|||||||P||||||200310060735|||||||||1          //the serum specimen
SPM|2|||UR|||||||P||||||200310060735|||||||||1           //the urine specimen
```

T4 (OF → AM): Message "New order"

A new work order is sent to the Automation Manager:

```
MSH|^~\&|OF|Chemistry|AM|Automation|200310060825||OML^O21|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I||||||||||||||||9998888
ORC|NW|||777|||||200310060710|^NURSE^JANET||||||||||Nephrology // clearance battery
TQ1|1|||||||R
OBR|1|654||82575^Creatinine clearance^CPT4|||||^COLLECT^JOHN|S|||||^NEPHRO^^^^DR
OBX|1|NM|13362-9^URINE COLLECTION DURATION^LOINC||24|hr|||||F|||200309060735
OBX|2|NM|19153-6^URINE SPECIMEN VOLUME^LOINC ||2500|ml|||||F|||200309060735
SPM|1|654_1||SER|||||||P||||||200310060735|200310060821|||||||1  // identified specimen
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821|||||||1   // identified specimen
```

T1 (OF → OP): Message "Status changed"

The placer order has been assigned a filler order number, the specimen is available and identified by the laboratory:

```
MSH|^~\&|OF|Chemistry|OP|Nephrology|200310060825||OML^O21|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I||||||||||||||||9998888
ORC|SC|9876543||777|IP||||200310060710|^NURSE^JANET||||||||||Nephrology // status changed
TQ1|1|||||||R
OBR|1|9876543|654|82575^Creatinine clear-
  ance^CPT4|||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR|||||||||I
SPM|1|654_1||SER|||||||P||||||200310060735|200310060821||Y||||||1 // specimen available
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821||Y||||||1  // specimen available
```

T3 (OF->ORT): Message "Status Changed"

The clinical expert has performed the clinical validation at 09h29. The order is completed. The results are final:

```
MSH|^~\&|OF|Chemistry|ORT||200310060931||OUL^R24|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I|||||||||||||||9998888
ORC|SC|9876543||777|CM||||200310060710|^NURSE^JANET||||||||||Nephrology
TQ1|1|||||||R
OBR|1|9876543|654|82575^Creatinine clear-
  ance^CPT4||||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR|||||||200310060929|||F|||||||&CYTO&JANE^20
  0310060929
SPM|1|654_1||SER|||||||P||||||200310060735|200310060821||Y||||||1
OBX|1|NM|15045-8^SERUM CREATININE^LOINC||93|umol/l|50-100|N|||F|||200310060830
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821||Y||||||1
OBX|2|NM|13362-9^URINE COLLECTION DURATION^LOINC||24|hr|||||F|||200309060735
OBX|3|NM|19153-6^URINE SPECIMEN VOLUME^LOINC||2400|ml|||||F|||200309060735
OBX|4|NM|14684-5^24H URINE CREATININE^LOINC||7.06|mmol|8-16 (/24hr)|L|||F|||200310060830
OBX|5|NM|2164-2^CREATININE CLEARANCE^LOINC||52.7|ml/min|88-174|L||S|F|||200310060830
```

T3 (OF->ORT): Message "New Order"

The Order Result Tracker is notified with the creation of the filler order:

```
MSH|^~\&|OF|Chemistry|ORT||200310060825||OUL^R24|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I|||||||||||||||9998888
ORC|NW|9876543||777|IP||||200310060710|^NURSE^JANET||||||||||Nephrology // new order
TQ1|1|||||||R
OBR|1|9876543|654|82575^Creatinine clear-
  ance^CPT4||||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR|||||||||I
OBX|1|NM|13362-9^URINE COLLECTION DURATION^LOINC||24|hr|||||F|||200309060735
OBX|2|NM|19153-6^URINE SPECIMEN VOLUME^LOINC||2500|ml|||||F|||200309060735
SPM|1|654_1||SER|||||||P||||||200310060735|200310060821||Y||||||1
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821||Y||||||1
```

T5 (AM->OF): Message "New Results"

The Automation Manager sends the final results for the work order:

```
MSH|^~\&|AM|Automation|OF|Nephrology|200310060900||OUL^R24|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I|||||||||||||||9998888
ORC|SC||||CM||||200310060710|^NURSE^JANET||||||||||Nephrology // order completed
OBR|1|654||82575^Creatinine clearance^CPT4||||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR|
  ||||||200310060832|||F|||||||&TECHOS&MARC^200310060833
SPM|1|654_1||SER|||||||P||||||200310060735|200310060821||Y||||||1
OBX|1|NM|15045-8^SERUM CREATININE^LOINC||93|umol/l|50-100|N|||F|||200310060830
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821||Y||||||1
OBX|4|NM|14684-5^24H URINE CREATININE ^LOINC||7.06|mmol|8-16 (/24hr)|L|||F|||200310060830
```

```
OBX|5|NM|2164-2^CREATININE CLEARANCE^LOINC||52.7|ml/min|88-174|L||S|F|||200310060830
```

T1 (OF->OP): Message "Status Changed"

The clinical expert has performed the clinical validation at 09h29. The order is completed:

```
MSH|^~\&|OF|Nephrology|OP|Nephrology|200310060930||OML^O21|001|T|2.5|||||USA||EN
PID|1||6543210||ILL^JOHN^^^^^L||19810101|M
PV1|1|I|||||||||||||||9998888
ORC|SC|9876543||777|CM||||200310060710|^NURSE^JANET||||||||||Nephrology // status changed
TQ1|1|||||||R
OBR|1|9876543|654|82575^Creatinine clear-
  ance^CPT4|||||^COLLECT^JOHN|P|||||^NEPHRO^^^^DR|||||
  |||F|||||||&CYTO&JANE^200310060929SPM|1|654_1||SER|||||||P||||||200310060735|200310060821||Y|
  |||||1
SPM|2|654_2||UR|||||||P||||||200310060735|200310060821||Y||||||1
```

DUTCH EXAMPLES

All based on HL7 v2.2

Laboratory Results

```
MSH|^~\&|LABDCR||WebMed|WebMed|20000324142600||ORU^R01|58157000077|P|2.2||
PID|1||0000011||Voorbeeld^^V^^||||||
PV1|1|K^KLINISCH||
OBR|1||19960509100077^LABOSYS||||199605100700||||||""|||ART12^Naam arts
  12||||199605091617||200003241426||Z|C||^^^^^R
OBX|1|ST|BSE^Bezinking^L^102||12|mm/uur|3 - 12|""|||C
OBX|2|ST|HB^Hemoglobine^L^107||8.5|mmol/l|7.4 - 9.9|""|||C
OBX|3|ST|HT^Hematocriet^L^110||0.41|l/l|0.35 - 0.48|""|||C
OBX|4|ST|LEU^Leucocyten^L^7||17.7|x10\S\9/l|4.0 - 10.0|H|||C
OBX|5|ST|THR^Thrombocyten^L^122||303|x10\S\9/l|180 - 350|""|||C
OBX|6|ST|GNU^Glucose n^L^245||2.7|mmol/l|4.0 - 6.6|L|||C
OBX|7|ST|GL11^Glucose 11u^L^32||5.6|mmol/l|""|""|||C
OBX|8|ST|GL16^Glucose 16u^L^33||9.2|mmol/l|""|""|||C
OBX|9|ST|NA^Natrium^L^1||136|mmol/l|136 - 146|""|||C
OBX|10|ST|K^Kalium^L^255||4.2|mmol/l|3.6 - 5.0|""|||C
OBX|11|ST|UR^Ureum^L^313||14.1|mmol/l|2.8 - 7.5|H|||C
OBX|12|ST|KREA^Kreatinine^L^266||58|umol/l|62 - 94|L|||C
OBX|13|ST|AF^Alk. Fosf.^L^38||72|U/l|25 - 90|""|||C
OBX|14|ST|GGT^Gamma-GT^L^241||45|U/l|10 - 30|H|||C
OBX|15|ST|LD^LD (pl)^L^1531||326|U/l|140 - 280|H|||C
OBX|16|ST|TEHP^Tot.Eiw.(pl)^L^1524||62|g/l|64 - 85|L|||C
OBX|17|ST|PHC^pH^L^880||7.355|""|7.35 - 7.45|""|||C
OBX|18|ST|PCOC^pCO2^L^883||81.2|mm Hg|34 - 46|HH|||C
OBX|19|ST|PO2C^pO2^L^881||35.1|mm Hg|75 - 100|LL|||C
OBX|20|ST|ABCC^Bicarbonaat^L^882||44.6|mmol/l|22 - 29|HH|||C
OBX|21|ST|TCOC^Tot. CO2^L^884||47.1|mmol/l|23 - 30|HH|||C
OBX|22|ST|ABEC^Act base exc^L^999||14.6|mmol/l| -3 - 3|HH|||C
OBX|23|ST|SBCC^St. bicarb.^L^885||37.6|mmol/l|22 - 29|H|||C
```

```
OBX|24|ST|SO2C^Zuurstofsat.^L^886||64.4|%|95 - 99|LL|||C
```

ADT Message (event A08)

```
MSH|^~&|XCARE|ZIS|SERIMBA|SERIMBA|200411200820||ADT^A08|X|P|2.2|31
EVN|A08|20041117192311
PID|||25492521||TWIDDEL^""^PTG^^""^||19460219|M|||Tweede Dwarsstraat^27b^NIEUWERKERK AD
  IJSSEL^^2911TR^NL||0180-555123|||||||||NIEUWERKERK
  ADY|NZPI||N||""^^^^""^||V25^||||IN1|||||||||||||||P|||||||||||||||||||
NK1|1
PV1||O|""^""^||||""^""^^""^^""|||||||||||||P|0|||||||||||||||||||""|""
```

ADT Message (event A03)

```
MSH|^~&|XCARE|ZIS|SERIMBA|SERIMBA|200311200822||ADT^A03|X|P|2.2|76
EVN|A03|20031118111615
PID|||2817265354||PIETERSEN^""^KPJ^^""^||19451229|M|||Pieter Nelstraat^11^OUDERKERK
  ADY^^2911HG^NL||0180-555897|||||||||OUDERKERK ADY|NZPI||N||""^^^^""^||K40^||||
IN1|||TRIASZ|TRIASZF|||||||||||Z|||||||||||||||||||9876543121
PV1||I|CC5^B534^||||5888^Vries^^KP^^de
  ||||||||||||K3736353|Z|3|||||||||||||||||||||200311011202|200311181030
```

SAUDI ARABIAN EXAMPLE

ADT Update Message (A08)

, v2.3 based, note the Arabic text

```
MSH|^~\&|HNAM|KFSHRCRIYADH|CL|CL|20021012130024+0300||ADT^A04|||2.3
EVN|A04|20021012125946+0300|||1883204
PID|1||534177^^^KFSH_MRN^MRN||AL TEST^AHMAD^ALI EID^^^^L^P~عيد^علي^احمد^الزهراني^^^^L^A
  ||19670701000000+0300|M|||السعودي^^^المنطقة الغربية^^^الباحة^H^^N
  ~P.O.  BOX NNN^^^02^00000^^A^^N~^^ALBAHA^^^^F|
  |055554034^H|||M|M|1914^^^JKFSH_FIN^FinNbr|4959||||||0|||SA||N
NK1|1|SAEED^AHMAD^^^^^Current|R|JEDDAH^^^SA|026795687|026931182|Emergency Contact
PV1|1|O|Oncology EW- J^^^J^^Ambulatory(s)^MJ||||^Kelta^Mohammed^^^^^^^Current|||||||||
```

GREEK EXAMPLE

Result Message, v2.3 based

```
MSH|^~\&|CC345||OxygenHIS||20031204130055||ORU^R01|5572|P|2.3
PID||00004941200|84||Μαρίνος^Στάθης||196505050000|M
PV1|1|I|||||||||||||||||0000749/02^^^OxygenHIS
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4001^Γλυκόζηορού^CCSAPP^152|||||||||20020425075205||||||||||F
OBX|1|NM|TG4001^Γλυκόζη ορού^^152||97|^mg/dL|70- 115||||F
ORC|OK|0000749/02|0000749||CM
```

```
OBR|1|0000749/02|0000749|TG4002^Ουρίαορού^CCSAPP^153|||||||||20020425075205|||||||||F
OBX|1|NM|TG4002^Ουρία ορού^^153|||^mg/dL|10 - 50||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4003^Ουρικόοξύορού^CCSAPP^155|||||||||20020425075205|||||||||F
OBX|1|NM|TG4003^Ουρικό οξύ ορού^^155|||^mg/dL|3.4 - 7.0||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4004^Χοληστερόλη^CCSAPP^1047|||||||||20020425075205|||||||||F
OBX|1|NM|TG4004^Χοληστερόλη^^1047||216|^mg/dL|140 - 220||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4005^HDLχοληστερόλη^CCSAPP^161|||||||||20020425075205|||||||||
  F
OBX|1|NM|TG4005^HDL χοληστερόλη^^161|||^mg/dL|>55||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4006^Τριγλυκερίδια^CCSAPP^160|||||||||20020425075205|||||||||F
OBX|1|NM|TG4006^Τριγλυκερίδια^^160||146|^mg/dL|60 - 150||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4007^ΟλικάΛιπίδια^CCSAPP^1471|||||||||20020425075205|||||||||F
OBX|1|NM|TG4007^Ολικά Λιπίδια^^1471||678|^mg/dL|< 800||||F
ORC|OK|0000749/02|0000749||CM
OBR|1|0000749/02|0000749|TG4008^LDLχοληστερόλη^CCSAPP^162|||||||||20020425075205|||||||||
  F
OBX|1|NM|TG4008^LDL χοληστερόλη^^162||159|^mg/dL|0 - 162||||F
```

UK EXAMPLE

ADT Message (A31)

```
MSH|^~\#|TC-PAS|TC|||20020201112136|| ADT^A31|588362056|P|2.4|||AL|NE||||||2.4
EVN|A31|20020201||||||
PID|1||6483247332^10^^NHS^NH~ F143624^^^TCPAS^MR|
  |Kennedy^Ann^F^^Ms^^L||19280524^Y|F|||~22 Stable Road^Whitstable^Kent^^CR5 1EL^^^^P|
  |277543^PRN|||U|9A|||||9|||||||N
PD1|||^^G82060^^^^^^CR5 6WL^4RA95^19990318~^ ^V79452^^^^^^CR5 2PD^49998|
  G8913724~D7379463|||||||
```

BELGIAN EXAMPLES

ADT Message (events A03 and A08), 2.2 based

```
MSH|^~\&|GVA|OPN03|ACC|OPN03|200411150010||ADT^A03|1573190|P|2.2
EVN|A03|200411141335
PID||2004929292^^^8267252|0837373^^^8267252||VAN GROTEGEM^PAUL||19851027|M
PV1||O|9383^2928^08|||||||||||||||03055528282|||||||||||||||01|01^Thuis
```

```
MSH|^~\&|GVA|OPN03|ACC|OPN03|200411150012||ADT^A08|1573191|P|2.2
```

```
EVN|A08|200411140735
PID||0800080999^^^8267252|0728282^^^8267252||LEBLANC^PIERRE||19730511|F|||KEIZERLEI
  12^^ANTWERPEN 1^^2012^170||0392929
  CT||N|S|CAT|||I=00292827342|||FRANKRIJK|||BENTE|1|PATIENT
ZPA|72|02923^HINAULT^BERNARD^^^DR
PV1||I|9383^3929^07|X0|||00501^VERMEER^HENRY^^^DR|||2209|||J|01|||||030555987
ZVI||09|05|A|01|0|5||0||||||000
GT1|0027||DKV-INDIV.POLIS||BISCHOFFSHEIMLAAN 1-8^^BRUSSEL STAD
  (1)^^1000IN1|0|2|50807|||||||||19980101|20051231||1| LEBLANC^PIERRE |1|19730511| KEIZERLEI
  12^^ANTWERPEN 1^^2012^170
ZIN||002383736354|100|100|||0|0|||||||N
ZSI|20041128|00038473834|01|0|0QSA67823GHFT6239839275WQZPJ7766622
```

6. Other Chapters of HL7 V2.x

Several other chapters exist within HL7 V2.x, including the following:

Query (Chapter 5): Defines several query mechanisms between applications: embedded query, stored procedure calls, virtual table requests and a specific way of documenting the specification of the query and its results. Examples: "send all imaging studies for patient Edward Everyman," "Send the list of patients attended by Dr. Eric Emergency", etc. The results can be returned in different formats; e.g. as HL7 message structures, as collections of rows and columns, etc.

Financial Management (Chapter 6): Defines the exchange of information about patient billing accounts (opening and closing) and their transactions (charges, payments, adjustments, etc.).

Master Files (Chapter 8): Defines messages for the loading and synchronization of tables or registries common to multiple applications in a healthcare environment: healthcare personnel (see also Chapter 15), locations (wards, beds, etc.), service definitions (for lab, imaging, etc.) and others. This chapter includes transactions for creating, updating ("synchronizing") and deleting records in these tables.

Medical Records Management (Chapter 9): Defines messages for the exchange of information on the creation, location and movement of paper document information. For example: "*A new document is available for Peter Patient's chart*", "*Sam Smith's patient file has just been moved from Intensive Care bed 7 to Ward 15, Room 6, Bed 2*", etc.

Scheduling (Chapter 10): Allows for the exchange of information on schedules and allocation of resources (equipment, people or locations).

Referrals (Chapter 11): Service requests between doctors or health providers, authorizations, etc.

Patient Care (Chapter 12): Information about goals, problems (healthcare issues) and clinical pathways related to patient care.

Lab Automation (Chapter 13): Information about events related to the management of samples, reagents and equipment in an automated laboratory system environment.

Applications Management (Chapter 14): Communicates the state of applications involved in a complex healthcare setting.

Personnel Management (Chapter 15): Information about individual healthcare practitioners and support staff; allows adding/updating of personnel records, activation/deactivation of records, etc.

Claims & Reimbursement (Chapter 16): Communicates claims for healthcare product and services to third parties outside the system, usually public (government) and private insurance companies.

Materials Management (Chapter 17): Information about transactions derived from supply chain management within a healthcare facility.

7. Introduction to the HL7 Implementation Process

Overview

This section outlines the key activities that should be included in any project plan when developing and/or implementing an HL7 V2.x interface.

As a standard, HL7 provides guidelines for developing and implementing interfaces between various applications. The implementation of these interfaces will be specific to the site and applications involved. Therefore, it is necessary for any organization implementing HL7 interfaces to create specific detailed plans for the implementation.

An HL7 interface may be implemented to replace an existing custom interface, to interoperate with a newly installed application, or as part of a total system replacement.

This Unit takes a "broad-brush stroke" approach by attempting to cover a wide variety of possible implementations. Whoever implements an HL7 interface should consider the core issues that are appropriate to their particular situation.

8. Project Planning

Identify Tasks

The initial planning activity is to determine the tasks that are to be completed during the implementation phase of the project and the interdependencies among tasks to assist in scheduling and resource allocation.

Depending on the number of interrelated projects underway in your organization, including external projects (*e.g.* network design and its installation), the HL7 implementation may have a direct impact both on your application and on ancillary projects.

Ensure that interdependencies between the projects are well understood and that resource requirements and deadlines are determined with these dependencies in mind.

Identify Resources

Identify those resources necessary to complete the tasks defined, including both direct reports (*e.g.* staff reporting directly to you) and those from other internal or external areas (*e.g.* IT or communications departments, technical services, and consultants).

Develop a Project Schedule

Within the context of the overall project, and relative to resource availability and task interdependencies, determine the due dates and/or duration times for all tasks. With this information, develop the implementation schedule and publish it.

Distribute this schedule to everyone involved in the project, including all the vendors for the implementation so they are aware of the deliverable deadlines. Any changes that arise must be communicated to everyone in the same way. One way to accomplish this is to set up a shared, web based project management resource and/or a wiki-style forum.

Review / Revise Internal Standards

Review, and revise as necessary any internal standards or guidelines regarding interface development including migration, conversion, change control, restart/recovery and backup.

Plan for Unexpected Situations

Procedures to handle downtime situations, system and interface restart, information recovery, resynchronization of the systems and disasters must be developed and documented. If an interface does not work, this does not imply that the underlying system has stopped working although often this also requires attention. Consider establishing a redundancy plan or other mechanism to minimize the impact of interface downtime.

Develop Failure Mode/Response Approach

Review the ability of each system to detect and correct errors and report each error to the system that generated it. The errors can be encoded and you can set the actions to be taken for each case. The failure condition that is represented by each code must be understood by the intervening systems. The systems must be updated to manage new errors.

Develop a Migration Approach

If you are upgrading or replacing an interface that is currently in production, you must develop a migration plan outlining when the existing interface will be removed, when to update the data and when the new system will be implemented. A migration plan should include testing time and allow for rollback to the previous interface if the launch is not successful.

Develop User Access / Security Approach

Define an overall plan for user access to, and the security of, interfaced systems. Include single versus multiple point of entry and the number of logins and passwords.

Document and present for approval the entire functional design documentation, including applied HL7 specifications, new/modified manual procedures, and any vendor code modifications.

9. Functional Design

Develop Interface Descriptions

Document general functional descriptions of the interfaces to be developed, including the applications, systems, departments and vendors involved. List the expected benefits of the interface.

It is very important that decisions made during the interface design are thoroughly and clearly documented as they occur. Interface programming, testing, support, maintenance and upgrades will all be facilitated by detailed, accurate design documentation.

Complete HL7 Transaction Checklists for each Interface

HL7 maintains a checklist of transactions, which documents the events and HL7 messages that will be used for the interface. It includes:

a) An initial work sheet describing the product being developed, e.g. a description of the general features of the interface.

b) Then a checklist that lets you capture:
- What HL7 transactions will be used in the interface?
- Who is going to generate each one of the messages to be sent, who will be the source of them?
- Which will be the optional and required segments of each one of the messages to be sent?

c) A detailed list that captures all fields in each segment, including:
- Sequences
- Numbers
- Name of the field
- Required / Optional Indicator
- Data type
- Length of the field, maximum and minimum
- Indicator if the field does or does not allow repetitions and, if so, the maximum number allowed
- Name of the field assigned by the system that sends the message
- Name of the field assigned by the system that receives the message
- Complementary notes or observations

Checklist Transactions Detail

This checklist can be used during the development of an HL7 interface. Once the system knows the flow of data, all HL7 messages to be used would be listed.

Each transaction must be reviewed to determine the optional fields that will be included in the messages. The required ones must be included and should be marked with an "R".

Describe the information contained in the field and its variables such as maximum length, whether it allows repetitions, type or precision of dates and numbers, etc.

This checklist should also provide the necessary space for documenting the names assigned by each system.

Both the initial summary page and the detailed checklist should be completed for each interface.

Some messages may include different segments depending on the event (for example, if pharmacy and laboratory use the same order message). Complete as many checklists as may be necessary for all of the events, and share them with whoever is administering the interfaces for each of the messages to be implemented.

These checklists do not replace the standard specification. Remember the documentation of the standard for designing each process. Keep in mind that the checklist and the standard itself may be interpreted in different ways by organizations or vendors depending on their needs and perspective. It is essential that all the parties involved in the implementation of the interface agree on all details.

Define the Trigger Events

Using the agreed-upon version of the HL7 Standard, define all trigger events to be used throughout the interface.

Decisions on the trigger events to be implemented should result directly from functional descriptions and analysis of current work and data flow as well as the trigger events supported by the vendor.

For example, an ADT vendor that does not provide "Leave of Absence" functionality in their registration system will not support triggers A21 (Patient Goes on a Leave of Absence) and A22 (Patient Returns from a Leave of Absence).

Also, make sure to document what action in the originating system triggers specific transactions over the interface.

Identify the Required HL7 Segments

For each trigger event transaction, identify the HL7 segments that will be required for the interface.

The following table shows the abstract message format of the V2.8 "Admit a Patient" ADT message (ADT^A01^ADT_A01):

Segments	Description	Chapter
MSH	Message Header	2
[{ SFT }]	Software Segment	2
[UAC]	User Authentication Credential	2
EVN	Event Type	3
PID	Patient Identification	3
[PD1]	Additional Demographics	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ NK1 }]	Next of Kin / Associated Parties	3
PV1	Patient Visit	3
[PV2]	Patient Visit - Additional Info.	3
[{ ARV }]	Access Restrictions	3
[{ ROL }]	Role	15
[{ DB1 }]	Disability Information	3

Segments	Description	Chapter
[{ OBX }]	Observation/Result	7
[{ AL1 }]	Allergy Information	3
[{ DG1 }]	Diagnosis Information	6
[DRG]	Diagnosis Related Group	6
[{	--- PROCEDURE begin	
PR1	Procedures	6
[{ ROL }]	Role	15
}]	--- PROCEDURE end	
[{ GT1 }]	Guarantor	6
[{	--- INSURANCE begin	
IN1	Insurance	6
[IN2]	Insurance Additional Info.	6
[{ IN3 }]	Insurance Additional Info - Cert.	6
[{ ROL }]	Role	15
[{ AUT }]	Authorization Record	11
[{ RF1 }]	Referral Information	11
}]	--- INSURANCE end	
[ACC]	Accident Information	6
[UB1]	Universal Bill Information	6
[UB2]	Universal Bill 92 Information	6
[PDA]	Patient Death and Autopsy	3

Identify Data Elements / Characteristics.

For each segment, identify the data elements that will be utilized and indicate whether they are required or optional. Reconcile naming differences, lengths, data types, table values and internal segmentation between the HL7 standard and your internal requirements for each element.

Here is the V2.8 definition of the "Message Header" (MSH) segment:

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
1	1..1		ST	R			00001	Field Separator
2	4..5		ST	R			00002	Encoding Characters
3			HD	O		0361	00003	Sending Application
4			HD	O		0362	00004	Sending Facility
5			HD	O		0361	00005	Receiving Application
6			HD			0362	00006	Receiving Facility
7			DTM	R			00007	Date/Time of Message
8		40=	ST	O			00008	Security
9			MSG	R			00009	Message Type
10	1..199	=	ST	R			00010	Message Control ID
11			PT	R			00011	Processing ID
12			VID	R			00012	Version ID
13			NM	O			00013	Sequence Number
14		180=	ST	O			00014	Continuation Pointer
15	2..2		ID	O		0155	00015	Accept Acknowledgment Type
16	2..2		ID	O		0155	00016	Application Acknowledgment Type
17	3..3		ID	O		0399	00017	Country Code
18	5..15		ID	O	Y	0211	00692	Character Set
19			CWE	O			00693	Principal Language Of Message
20	3..13		ID	O		0356	01317	Alternate Character Set Handling Scheme
21			EI	O	Y		01598	Message Profile Identifier

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
22			XON	O			01823	Sending Responsible Organization
23			XON	O			01824	Receiving Responsible Organization
24			HD	O			01825	Sending Network Address
25			HD	O			01826	Receiving Network Address

10. Technical Design

Define the Required Hardware Platforms

Document the existing hardware environment for applications to be interfaced and any modifications that might be needed for each system.

Select the Lower Level Protocol

HL7 interfaces exist at the seventh, or application, layer of the OSI model. However, they also require support from some lower level protocol (LLP), often referred to as the transport layer. It is important for each site to select an LLP that meets the needs of the interface and fits into the overall telecommunications strategy and architecture of the company.

Things to consider include the time frame for installation, existing staff experience /expertise, and the cost. Some options are the Minimum Lower Layer Protocol (MLLP, defined by HL7), HTTP, File Transfer (FTP), Web Services, Messaging Queues, Message Brokers, etc. In most current interfaces, TCP/IP already provides a reliable set of protocols at OSI levels 3 and 4.

Select the Communications Hardware

Once the lower level protocol has been identified, define any additional communications hardware required. This may include network adapters, wiring hubs, routers, or specialized communications equipment.

Define the Workstation Requirements

Determine requirements for the workstations that will use the interfaced systems.

Define Application / Facility Names

Define and document application names for identification during interface development, testing and implementation. These names may be used for allocation of permissions, institutional communication, interface lookup tables, etc.

Design Programs / Lower Level Protocol

Design and/or acquire software to interact with the lower level protocol. This may include programs at the transport level that communicate with the hardware, or the application program interface of third party lower level protocol software.

Design the HL7 Messaging Applications

Design and/or acquire software to encode or translate messages into HL7 format. The details of the encoding to be done will come directly from the analysis of the trigger events, segments and data elements. The design should include specifications how the system should react when receiving and sending messages regarding message acknowledgment procedures. Review and select the Original Acknowledgment or the Enhanced Acknowledgment protocol.

Define / Document Specifications

Develop detailed specifications, including design and analysis. This should include who (vendor/staff/consultant) will be involved and what each party should accomplish. Design specifications and responsibilities should be formally approved by all parties.

Develop Implementation and Testing Approach

Define high-level implementation and testing strategies. These should be reviewed with all parties (users, internal and external resource people, etc.). This document should include all procedures, processes, criteria, data and documentation to be used. The testing approach should be finalized as part of the implementation phase of the project.

Define the Testing Methodology

1. Approach
2. Documentation required
3. Procedures
4. End user system performance (response time parameters)
5. Test model

Define/Create the Test Data

1. Test databases
2. Test files
3. Methods of test data creation
4. Storage and recovery of test data

Obtain Testing Software

1. Emulators if required
2. Editors
3. Test data generators
4. Results analyzers

Testing Environment

d) Isolated hardware

e) Use of live system (be extremely CAREFUL with this option)

11. Testing

Testing Support

Identify the resources and skills necessary for the test team and assign resources appropriately.

Test Conditions

Outline the requirements for each possible condition to be tested. Potential conditions may arise throughout the interface development process and should also be documented and included in the testing process. The same applies to unanticipated condition that arise. Fault-insertion testing procedures should be documented.

Expected Results

Document the expected outcomes of each test, including output to other processes and performance of the interface.

Finalize Migration Approach

Review and finalize the high-level migration plan defined during the functional design. Detail the processes and timetable for parallel testing, identify pilot users and all the processes involved in the migration.

Finalize User Access / Security Approach

Review and finalize the user access and security plan. This includes technical requirements to provide single or multiple points of entry, and resolution of logins and passwords.

System Acceptance

Conduct a formal review and obtain acceptance for technical design and functional performance.

Document and present for approval the entire technical design, including lower level protocols, communications hardware, programs, testing, migration and access plans. Assess the functional performance of the system, including the following factors:

f) End user response time

g) Data integrity / data flow

h) Availability

i) User access acceptance

12. Application Development

The following section applies to those persons involved with application development, which begins only after the technical design has been completed and approved.

If an interface engine is being installed, the application development plan should account for the development of site-specific configuration and supporting documentation. Documentation, though often overlooked, is an important tool for both supporting and upgrading your system. Update the documentation to reflect any program changes that may occur.

Software Architecture

The architecture of a software system requires identification of all the functions that the system must fulfill. This will be used for the detailed design of the software.

The design may indicate multiple modules or subroutines to handle specific functions.

Minimal functionality, either directly or through invocation of external modules, should include:

j) Building HL7 messages

k) Parsing HL7 messages

l) Interface to program handling the lower level protocol

m) Interface to program handling the application

n) Error handling / error reporting

This may involve the use of third party products or libraries, providing various levels of functionality including building, parsing, handling of message queues, low level processing, routing, etc.

13. Implementation

Physical

Document any physical changes necessary to implement the interface, including modifications to physical workspaces or computer rooms, additional furniture or equipment racks, and reservation of space for training or testing.

Technical

Document changes to the existing technical environment, such as the addition of or modifications to cabling, communications closets and lighting or power/electrical requirements.

Install Lower Level Protocol

Interfaces can be implemented in a number of environments, including among applications on a single processor, point-to-point between systems or over a network. In most cases, the interface will be built on top of some media and access method. HL7 interfaces exist at the seventh, or application, layer of the OSI model. As such, they usually require the support of some lower level protocol (LLP). Things to consider include the current environment, time frame for installation, existing staff experience/expertise, long-range communications strategy and cost.

Install Hardware

Hardware includes upgrades to and/or purchases of new hardware components such as memory or disk, CPU, communications boards, networking hardware (e.g. bridges, routers, gateways, modems, etc). Make sure to consider delivery and installation lead times when planning your order dates for any hardware components.

Install Software

Software includes not only HL7 interface code for each application, but also additions or modifications to system or application software, communications software, etc. After the installation you should report and document all errors and operational issues.

Network & Communications Testing

After selecting and installing the hardware, you may need to install software and lower level protocols necessary for the interface and the basic communications environment. It is fundamental in this stage to verify the integrity of communications and test all point-to-point connections, virtual circuits, concurrent access and volume stress.

Devices such as line monitors and network "sniffers" should be employed to generate and monitor basic (lower level protocol) traffic.

14. Policies & Procedures

o) Develop manuals and instructional materials that specify the policies and procedures for interfaces within the institution.

p) Consider procedures for maintenance of interface code, installation of new HL7 versions, and modifications to application software. Maintain a separate, controlled testing environment in which you can fully test new releases or updates.

q) Define procedures to handle downtime situations, system and interface restart, recovery and re-synchronization, and disaster or contingency planning.

r) Do not neglect backup and restore procedures. These should be developed or modified as needed to ensure data integrity and recoverability.

s) The addition of new application systems may increase the number of duplicate tables or dictionaries stored in multiple systems. Develop procedures to control the order and frequency of table maintenance in application systems.

t) Define procedures to control, update and monitor security at each entry point (e.g. application systems, operating system, network and database).

u) Review the new data flow and interface with users in light of current user procedures. Modify these procedures as needed. Typically, this will require changing manual procedures.

15. Training

User Training

An HL7 interface implementation may have little impact on application system users, or may require significant changes in workflow and operation.

To minimize surprises and maximize end-user support:

v) Review operational changes in the various user departments that are related to new or redefined user procedures. This review should be made from a training perspective in order to develop classes or materials to assist in the transition to the interfaced system.

w) Develop necessary training material to instruct personnel in areas such as the detail of user procedures.

x) Once training materials are available, schedule the training. Training should be scheduled at a convenient time for users. Plan to allow time between sessions for users to get comfortable with the changes and develop a deep understanding.

Training should be conducted close to the actual implementation date so any new methods are still fresh when new systems are brought into production.

As a final step in the training process, each department should receive a user manual. This manual should cover standard, daily operations, departmental specific procedures, and a reference to support resources such as the help desk.

Support Staff Training

In many cases, support staff must be introduced to HL7 concepts and environments. They must understand the change in philosophy and direction and how HL7 fits into the long-term strategy of the organization. Support staff should include a group specifically in charge of HL7 interoperability, they must be able to look into messages, understand them and diagnose problems.

Once the support staff has become oriented to HL7 interfacing at a high level, they must become familiar with the use of HL7 in application domains. In most cases, this support team works closely with the end users and the vendors, and will become an essential element both for specification and for ongoing support.

Develop a manual for support staff detailing the more common problem situations and approaches for resolving them. The manual should include an escalation plan for unexpected situations or problems in the application. It should also explain how to report problems to the development staff or to vendors so they can be resolved.

16. Go-Live

Go-Live Planning

Complete the training of the support team and develop a list of the support responsibilities for the new system and the interfaces, including items such as end-user help desk support, routine maintenance, and interface monitoring. Identify the personnel who will be responsible for support, and develop training programs as needed to address any skill gaps. Develop a checklist to be used during each stage of implementation of the new system. Plan the dates to install any needed equipment for monitoring and support during that stage.

Testing/Acceptance

Alert all vendors beforehand of your testing dates so that they can schedule the required resources to support you during the testing phase(s).

Perform a stress/volume test in the production atmosphere. Simulate the process of system failure, resumption and recovery, and "parallel processing" (old system vs. new system). Document the testing results in a summarized fashion. This document may be used to review the testing results and determine whether additional testing is required.

Obtain a final acceptance of the interface from all the parties once the users are in agreement with the performance and stability of the system. It may take several meetings with those involved before you have the final OK from everyone.

Go-Live

The system is ready for production following the successful completion of all of the previous tasks.

Consider the need for any conversion of data types, update of tables, etc.

Using the conversion checklist, disconnect the existing system and implement full production with the new interfaces.

Post-implementation Support

Establish a help desk to support users. The help desk should assist users, troubleshoot problems and answer general questions. The same support should be provided when maintenance of the interfaces and/or hardware is being done.

Review of Benefits

The cost/benefit analysis completed at the start of the project should be reviewed in order to determine the degree to which each anticipated benefit has been realized. A cost/benefit analysis should include:

y) How the benefits were achieved (or not).

z)The realized benefits should be quantified.

aa) Summarize intangible benefits (or costs) such as improved (or diminished) employee morale.

bb) Define a mechanism for ongoing review and evaluation of the project. This may include periodic meetings with staff and end users to discuss changes in operations.

17. Conformance - Messaging Profiles

This concept was introduced in HL7 V2.5; it defines a way to constrain an HL7 V2.x message specification to reduce optionality and ambiguity, revealing assumptions ("How do we use the standard?") and making the specification more directly interoperable.

Conformance vs. Compliance

Compliance is adherence to a certain version of the standard specification.

Conformance is adherence to the standard as expressed by a rigorously CONSTRAINED specification or message profile. This specification, to be considered implementable, must be precise and unambiguous.

A **Conformance statement** is the confirmation by an application provider that an application conforms to one or more message profiles.

Message Profile

Message Profile: an unambiguous specification of one or more messages for a use case

Implementable Profile: a specification that contains NO optionality. This also means that the specification is computable: you can develop a direct test for message validation – in the case of V3 usually with just an XML Schema or DTD.

Parts of a Message Profile: The parts of a message profile are the Use Case analysis (UC), the Dynamic Definitions (DD) and the Static Definitions (SD).

Use Case Analysis

The use case analysis documents the scope, involved applications (actors), the situation when a particular exchange is triggered and the flow of events. It can combine text and a simple use case diagram:

Name: Goodhealth Hospital Patient Administration System

Scope: The Patient Administration System at the Goodhealth Hospital allows entering of the patient demographics at admission and the patient discharge at the end of the episode. This information is transmitted to the ancillary systems.

Actors: GHH Patient Registration System - Transmits demographic information and also the assigned bed and attending physician to ancillary systems every time a patient is admitted. It also transmits the date and final status of the patient when the discharge is registered.

GHH Laboratory Information System - Receives the information about the admitted patients and registers discharges to disallow new services.

GHH Billing System - - Receives information about the admitted and discharged patients. This allows charging of services to their accounts and closing the accounts at the end of the episode.

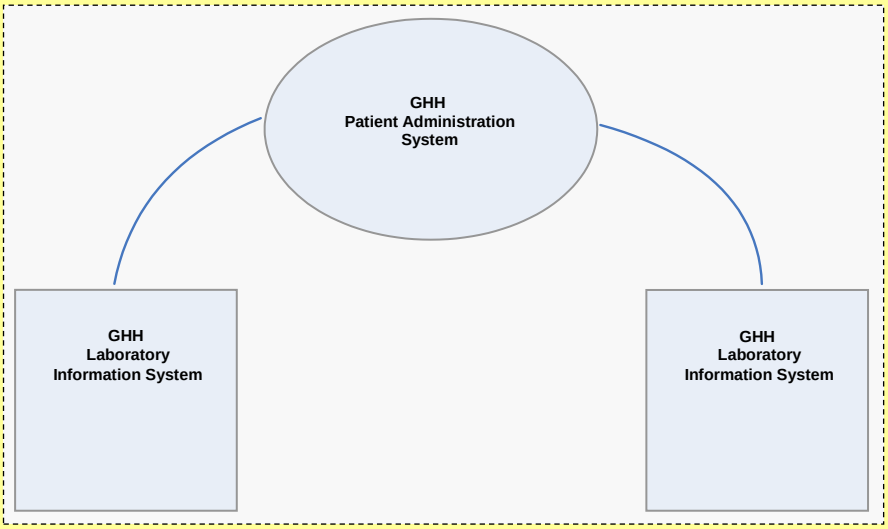


Figure 22: Use Case Analysis Diagram for a V2.x Message Profiles

Dynamic Definition

The dynamic definition is a specification for the conversation between the applications. It tells us when messages will be issued, and how the recipients are expected to respond to them (accept or application acknowledgement)

Dynamic Definition Example:

Trigger Event: Patient Registration

Definition: The GHH PRS will broadcast an ADT^A01 message to both ancillary systems. The receiving systems will send an application ACK only in case of errors.

Trigger Event: Patient Discharge

Definition: The GHH PRS will broadcast an ADT^A03 message to both ancillary systems. The receiving systems will send an application ACK only in case of errors.

Static Definition

The static definition is an exhaustive specification for a message structure, at all three levels: message, segment and field.

This definition must exactly define minimum and maximum cardinality. In some cases, the maximum cardinality might be unlimited, but if there is any limitations on how many segment/field repetitions an application can send or receive, it must be stated in this definition.

As you can see in this example, there is a new column for each segment or field, defining its usage in the message profile.

Usage values can be:

Value	Description
R	(required)
X	(not supported)
RE	(required but could be empty – this occurs when an element is required only if the sending application has any value for it)
O	(optional – caution: cannot be tested)
C	(conditional on another elements' value)
CE	(conditional but could be empty – this occurs when an element is conditionally required only if the sending application has any value for it)

Static Definition Example (Message Level):

(*We can see in this example that although HL7's canonical definition of the message allows infinite repetitions of the NK1 segment, this profile allows only a single occurrence, and it's required; we need this information!)*

Segment	Description	Usage	Cardinality
MSH	Message Header	R	1..1
EVN	Event Type	R	1..1
PID	Patient Identification	R	1..1
[PD1]	Additional Demographics	X	0..0
[{NK1}]	Next of Kin	R	1..1
PV1	Patient Visit	R	1..1
[PV2]	Patient Visit -Add	X	0..0
[{ROL}]	Role	X	0..0
…	…	…	…

SD Example (Segment Level):

(We can see in this example that although HL7's canonical definition of the segment declares the Patient Address to be optional and allows repetitions, this profile allows only a single occurrence and it's required; we need this information and we only support a single value for it!)

SEQ	LEN	DT	USAGE	CARDINALITY	TBL#	ITEM#	Element Name
…							…
11	250	XAD	R	[1..1]		00114	Patient Address
12	4	IS	X	[0..0]	0289	00115	County Code
13	40	XTN	RE	[0..2]		00116	Phone Number – Home
14	40	XTN	RE	[0..2]		00117	Phone Number – Work
15	50	CE	X	[0..0]	0298	00118	Primary Language
…							**…**

HL7 V2.x Implementation Tools and Resources

Tools and Resources

The Messaging Workbench (MWB) is a very useful tool for defining an HL7 messaging profile. With MWB you can design a message profile for any HL7 V2.x standard version, either from scratch or based upon a sample message. Download the latest version of the HL7 messaging workbench free from the following link: www.HL7.org/Special/committees/conformance/docs.cfm

Tools & Resources Library: www.HL7.com.au/HL7-Tools.htm

HL7 profile-based message testing systems:

www.itl.nist.gov/div897/ctg/messagemaker/

www.AHML.org.au

Implementation Guides

Implementation guides can be as strict as a conformance profile, but usually (at least before the publication of the conformance section in V2.5), they were locally defined documents containing a specific interpretation or usage detail of a group of HL7 messages for a realm (a specific HL7 Affiliate, a specific hospital or group of hospitals).

Implementation guides also contain reference to the specific vocabulary used in each coded field, depending on the master file tables or registries available locally.

The difference between an implementation guide and a V2.x implementable message profile is that the latter has no optional elements. Implementation guides, being broader in scope, sometimes contain many optional elements giving rise to significant ambiguity in implementation.

Some examples of HL7 V2.x implementation guides in English can be found at the following links.

cc)USA CDC Lab, Pharmacy and Supply Orders based on HL7 V2.3.1
http://cdc.gov/phin/library/documents/pdf/PHIN_Lab_Pharmacy_Supply_Orders_v231.pdf

dd) USA ELINCS (Laboratory Orders and Results) based on HL7 V2.5.1
www.hl7.org/implement/standards/product_brief.cfm?product_id=31

Unit Summary and Conclusion

In this Unit, we have examined the most important chapters of the HL7 V2.x family of standards and we learned the key activities that must be considered when developing and/or implementing a V2.x messaging interface and key implications of HL7 V2.x message profiles.

Additional Reference Material

HL7 Version 2.2 (ANSI/HL7 V2.2-1996)
HL7 Version 2.3 (ANSI/HL7 V2.34-1997)
HL7 Version 2.3.1 (ANSI/HL7 V2.3.1-1999)
HL7 Version 2.4 (ANSI/HL7 V2.4-2000)
HL7 Version 2.5 (ISO/HL7 27931, ANSI/HL7 V2.5-2003)
HL7 Version 2.5.1 (ANSI/HL7 V2.5.1-2007)
HL7 Version 2.6 (ANSI/HL7 V2.6-2007)
HL7 Version 2.7 (ANSI/HL7 V2.7-2011)
HL7 Version 2.7.1 (ANSI/HL7 V2.7.1-2012)
HL7 Version 2.8 (ANSI/HL7 V2.8-2014)

Note: You can download the HL7 V2.x standards free from the above URLs on the HL7 International Web site (www.HL7.org) after you create a free log-in account.