

HL7 Basics: More Than Just Pipes

Welcome!

```
MSH|^~\&|ADT||ENGINE||20040301192350||ADT^A04|ADT757452230|P|2.3|||
EVN|A04|20040301192350|
PID|||H000000076||TESTCHRISTIANSEN^JOHN^||19931212|M|||1400 CHARLES ST^LOVES PARK^NL^
PV1||O|HH.ADULT^|ELE||^|DEM^DEMING,RICHARD E|^|^|||AROU|||RCR||MED|||||||||||||||||HHC||
NK1|||^^^|
PD1|||DEM^DEMING,RICHARD E
GT1|||TESTCHRISTIANSEN,JOHN||1400 CHARLES ST^LOVES PARK^NL^61111|885-2277|||SP|
DG1|||TEST
IN1|1|MCR-A||MEDICARE|P O BOX 1602^OMAHA^NE^68101||Y|||UNK|||||SP||||1|||||||||7896547
ZSR|||||||||||||||||^|^|||||UNKNOWN
```



HL7 Basics

More Than Just Pipes

Objective: Provide basic HL7 understanding
with progressively more complex topic
discussion of HL7 standards and structures.

- What is HL7?
- HL7 Messages Types: What do I need?
- HL7 Segments
- HL7 Field Format
- Data Exchange Standards
- Using NPR to create HL7 Interfaces (real-time versus batch)
- Future of HL7: HL7 version 2.x versus 3.x

What is HL7?

HL7 Organization definition: Health Level Seven is one of several American National Standards Institute (ANSI) accredited Standards Developing Organizations (SDOs) operating in the healthcare arena. Most SDOs produce standards (sometimes called specifications or protocols) for a particular healthcare domain such as pharmacy, medical devices, imaging or insurance (claims processing) transactions. Health Level Seven's domain is clinical and administrative data. www.hl7.org

HL7 provides a method for disparate systems to communicate clinical and administration information in a normalized format with acknowledgement of receipt.

HL7 Message Types

What Do I Need?

HL7 has many Message Types, which can make the entire process of determining what you need daunting.

- Admission, Discharge, Transfer (ADT)
- Order Message (ORM, ORR, RDE, etc.)
- Financial Management (DFT, BAR)
- Ancillary Data Reporting (ORU, CRM, etc.)
- Master File Notification (MEN, MEQ, etc.)
- Medical Records Information Management (MDM)
- Scheduling (SRM, SIU, SQM)
- Patient Referral (RQI, REF, RQA, etc.)
- Patient Care (PGL, PPR, PPG, etc.)

HL7 Message Types

What Do I Need?

- Fortunately when evaluating a vendor's product, you usually receive an interface specification document or a list of HL7 interfaces needed.
- Based on that list, you will select the interfaces needed for your specific integration needs.
- The most common Message Types are:
 - Admission, Discharge, and Transfer (ADT)
 - Order Entry (ORM)
 - Ancillary Data Reporting (ORU)

HL7 Message

Closer Look

```
MSH|^~\&|ADT||ENGINE||20040301192350||ADT^A04|ADT757452230|P|2.1|||
EVN|A04|20040301192350|
PID|||H000000076||TESTCHRISTIANSEN^JOHN^||19931212|M|||1400 CHARLES ST^^LOVES PARK^IL^61111|||
PV1||O|HH.ADULT^^|ELE||^^|DEM^DEMING,RICHARD E|^|^|||AROU|||^|RCR||MED|||HHC||REG
RCR|||200402251124||
PD1|||DEM^DEMING,RICHARD E||
GT1|||TESTCHRISTIANSEN,JOHN||1400 CHARLES ST^^LOVES PARK^IL^61111|885-2277|||SP|745-69-5847||
DG1|||TEST
IN1|1|MCR-A||MEDICARE|PO BOX 1602^^OMAHA^NE^68101||Y|||UNK|||SP|||1|||7896547
ZSR|||UNKNOW
```

HL7 Segments

HL7 Fields
separated by BAR
- |field|

HL7 Message
Type

HL7 Segments

```
MSH|^~\&|SEMM||PYXIS||20040301192350||ADT^A04|ADT757452230|P|2.1|| ◀  
EVN|A04|20040301192350| ◀  
PID|||H000000076||TESTCHRISTIANSEN^JOHN^||19931212|M|||1400 CHARLES ST^^LOVES PARK^IL^61111||| ◀  
PV1|O|HH.ADULT^^|ELE||^|DEM^DEMING,RICHARD E|^|^|||AROU|||^|RCR||MED|||||||||||||||||HHC||REG ◀  
RCR|||200402251124|| ◀  
PD1|||DEM^DEMING,RICHARD E|| ◀  
GT1||TESTCHRISTIANSEN,JOHN||1400 CHARLES ST^^LOVES PARK^IL^61111|885-2277|||SP|745-69-5847|| ◀  
DG1|||TEST ◀  
IN1|1|MCR-A||MEDICARE|PO BOX 1602^^OMAHA^NE^68101||Y|||UNK|||||SP||||1|||||||||7896547 ◀  
ZSR|||||||||||||||||^|^|^||||||UNKNOWN ◀
```

- Every HL7 message is made up on two or more HL7 segments.
- Every HL7 message has an MSH segment.
- Every HL7 segment ends with a carriage return ◀. Since the carriage return is a ASCII code 13 (non-printable character) you will not see it when viewing the message.

MSH Segment

Closer Look

HL7 Fields – closer look at MSH Segment:

- Every HL7 message has a **Message Segment Header (MSH)** segment.
- The MSH segment defines the intent, source, destination and some specifics of the syntax of a message.
- The MSH also contains the **Message Control ID (MCI)**. The MCI is used to acknowledge a receipt of an HL7 message. This will be discussed in more detail.

MSH|^~\&|SEM||PYX||20040301192350||ADT^A04|**ADT757452230**|P|2.3||

HL7 Segment Mapping Table (MSH)

- Mapping Table contains the following information: (Full/Optional/Required) HL7 Segment

SEQ	LEN	DT	OPT	ELEMENT NAME
1	1	ST	R	Field Separator
2	4	ST	R	Encoding Characters
3	180	HD	O	Sending Application
4	180	HD	O	Sending Facility
5	180	HD	O	Receiving Application
6	180	HD	O	Receiving Facility
7	26	TS	O	Date/Time Of Message
8	40	ST	O	Security
9	7	CM	R	Message Type
10	20	ST	R	Message Control ID
11	3	PT	R	Processing ID
12	8	ID	R	Version ID
13	15	NM	O	Sequence Number
14	180	ST	O	Continuation Pointer
15	2	ID	O	Accept Acknowledgment Type
16	2	ID	O	Application Acknowledgment Type
17	2	ID	O	Country Code
18	6	ID	O	Character Set
19	60	CE	O	Principal Language Of Message

Data Type

HL7 Fields

Closer Look at MSH Segment

MSH|^~\&|SEM||PYX||20040301192350||ADT^A04|ADT757452230|P|2.3|||||

Components: <message type (ID)> ^ <trigger event (ID)>

SEQ	LEN	DT	OPT	ELEMENT NAME
1	1	ST	R	Field Separator
2	4	ST	R	Encoding Characters
3	180	HD	O	Sending Application
4	180	HD	O	Sending Facility
5	180	HD	O	Receiving Application
6	180	HD	O	Receiving Facility
7	26	TS	O	Date/Time Of Message
8	40	ST	O	Security
9	7	CM	R	Message Type
10	20	ST	R	Message Control ID
11	3	PT	R	Processing ID
12	8	ID	R	Version ID
13	15	NM	O	Sequence Number
14	180	ST	O	Continuation Pointer
15	2	ID	O	Accept Acknowledgment Type
16	2	ID	O	Application Acknowledgment Type
17	2	ID	O	Country Code
18	6	ID	O	Character Set
19	60	CE	O	Principal Language Of Message

HL7 Message Types

Closer Look

Let's focus on the most common HL7 interfaces:

- Admission, Discharge and Transfer (ADT)
- Order Entry (ORM)
- Ancillary Data Reporting (ORU)

HL7 Message Types

Closer Look

Admission, Discharge and Transfer (ADT)

- Send patient demographic, visit, insurance and diagnosis information typically from Admissions (ADM).
- Every HL7 message is generated based on an Event trigger.
- Segments included in an ADT Message.
- The most common HL7 interface is the ADT.

HL7 Message Types

Closer Look

Let's focus on the most common HL7 interfaces:

- Admission, Discharge and Transfer (ADT)
- Order Entry (ORM)
- Ancillary Data Reporting (ORU)

HL7 Message Types

Closer Look

Order Entry (ORM)

- ORM are used to send:
 - Radiology Orders
 - Order Entry (OE) Orders
 - Laboratory Orders (MIC, BBK, PTH, LAB)
- ORM events are triggered in NEW, CANCEL, EDIT, HOLD, REACTIVATE
- Segments included in an [ORM Message](#).

HL7 Message Types

Closer Look

Let's focus on the most common HL7 interfaces:

- Admission, Discharge and Transfer (ADT)
- Order Entry (ORM)
- Ancillary Data Reporting (ORU)

HL7 Message Types

Closer Look

Order Entry (ORU)

- ORU are used to send:
 - Radiology Reports
 - Departmental Reports
 - Nursing Results
 - Laboratory Results (MIC, BBK, PTH, LAB)
- ORU events are triggered in NEW, CANCEL, or UPDATE
- Segments included in an [ORU Message](#).

HL7 Message Types

Common Segments

We just looked at HL7 ADT, ORM and ORU. They have several common segments which contain Patient Info:

ADT
Message Header
Event Type
Patient Identification
Additional Demo
Next of Kin
Patient Visit
Patient Visit - Add Info.
Disability Information
Observation/Result

Allergy Information
Diagnosis Information
Diagnosis Related Group
Procedures
Role

Guarantor

Insurance
Insurance Additional Info.
Insurance Add'l Info - Cert.

Accident Information
Universal Bill Information
Universal Bill 92 Information

ORU
Message Header
Patient Identification
Additional Demographics
Next of Kin
Notes and Comments
Patient Visit
Patient Visit - Add Info

Order common
Observations Report ID
Notes and comments

Observation/Result
Notes and comments
Clinical Trial Identification

Continuation Pointer

ORM
Message Header
Notes and Comments

Patient Identification
Additional Demographics
Notes and Comments
Patient Visit
Patient Visit- Additional Info
Insurance
Insurance Additional Info
Insurance Add'l Info - Cert.

Guarantor
Allergy Information

Common Order

Order Detail Segment OBR, etc.
Notes and Comments (for Detail)
Diagnosis

Observation/Result
Notes and Comments (for Results)

Clinical Trial Identification
Billing Segment

HL7 Messages

Common Segments

We just looked at HL7 ADT , ORM and ORU. They have several common segments which contain Patient Info:

- HL7 Messages that contain patient information MUST have at least a PID and PV1.
- PID contains general information about the patient such as medical record number, name, account number, date of birth, gender, phone number, etc.
- PV1 contains general visit information about the patient such as location, class, consulting doctor, referring doctor, etc.

HL7 Segment

Closer Look at PID

SEQ	LEN	DT	OPT	ELEMENT NAME
1	4	SI	O	Set ID - PID
2	20	CX	B	Patient ID
3	20	CX	R	Patient Identifier List
4	20	CX	B	Alternate Patient ID - PID
5	48	XPN	R	Patient Name
6	48	XPN	O	Mother's Maiden Name
7	26	TS	O	Date/Time of Birth
8	1	IS	O	Sex
9	48	XPN	O	Patient Alias
10	80	CE	O	Race
11	106	XAD	O	Patient Address
12	4	IS	B	County Code
13	40	XTN	O	Phone Number - Home
14	40	XTN	O	Phone Number - Business
15	60	CE	O	Primary Language
16	80	CE	O	Marital Status
17	80	CE	O	Religion
18	20	CX	O	Patient Account Number
19	16	ST	B	SSN Number - Patient
20	25	DLN	O	Driver's License Number - Patient
21	20	CX	O	Mother's Identifier
22	80	CE	O	Ethnic Group
23	60	ST	O	Birth Place
24	1	ID	O	Multiple Birth Indicator
25	2	NM	O	Birth Order
26	80	CE	O	Citizenship
27	60	CE	O	Veterans Military Status
28	80	CE	O	Nationality
29	26	TS	O	Patient Death Date and Time
30	1	ID	O	Patient Death Indicator

PID|||H000000076||TESTCHRISTIANSEN^JOHN^||19931212|M|||1400 CHARLES ST
^^LOVES PARK^IL^61111||885-2277||S||D000000844|745-69-5847|||^

HL7 Segment

Closer Look at PV1

SEQ	LEN	DT	OPT	ELEMENT NAME	SEQ	LEN	DT	OPT	ELEMENT NAME
1	4	SI	O	Set ID - PV1	26	12	NM	O	Contract Amount
2	1	IS	R	Patient Class	27	3	NM	O	Contract Period
3	80	PL	O	Assigned Patient Location	28	2	IS	O	Interest Code
4	2	IS	O	Admission Type	29	1	IS	O	Transfer to Bad Debt Code
5	20	CX	O	Preadmit Number	30	8	DT	O	Transfer to Bad Debt Date
6	80	PL	O	Prior Patient Location	31	10	IS	O	Bad Debt Agency Code
7	60	XCN	O	Attending Doctor	32	12	NM	O	Bad Debt Transfer Amount
8	60	XCN	O	Referring Doctor	33	12	NM	O	Bad Debt Recovery Amount
9	60	XCN	O	Consulting Doctor	34	1	IS	O	Delete Account Indicator
10	3	IS	O	Hospital Service	35	8	DT	O	Delete Account Date
11	80	PL	O	Temporary Location	36	3	IS	O	Discharge Disposition
12	2	IS	O	Preadmit Test Indicator	37	25	CM	O	Discharged to Location
13	2	IS	O	Re-admission Indicator	38	80	CE	O	Diet Type
14	3	IS	O	Admit Source	39	2	IS	O	Servicing Facility
15	2	IS	O	Ambulatory Status	40	1	IS	B	Bed Status
16	2	IS	O	VIP Indicator	41	2	IS	O	Account Status
17	60	XCN	O	Admitting Doctor	42	80	PL	O	Pending Location
18	2	IS	O	Patient Type	43	80	PL	O	Prior Temporary Location
19	20	CX	O	Visit Number	44	26	TS	O	Admit Date/Time
20	50	FC	O	Financial Class	45	26	TS	O	Discharge Date/Time
21	2	IS	O	Charge Price Indicator	46	12	NM	O	Current Patient Balance
22	2	IS	O	Courtesy Code	47	12	NM	O	Total Charges
23	2	IS	O	Credit Rating	48	12	NM	O	Total Adjustments
24	2	IS	O	Contract Code	49	12	NM	O	Total Payments
25	8	DT	O	Contract Effective Date					

PV1||I|CCU^CCU31^31|ELE||PED^300^B|DEM^DEMING,RICHARD E|^|^|CCU|||AR
 OU||Y|DEM^DEMING,RICHARD E|IN||SP|||||||||||||||SWA||ADM IN|||200402181007|^

Data Exchange Standards

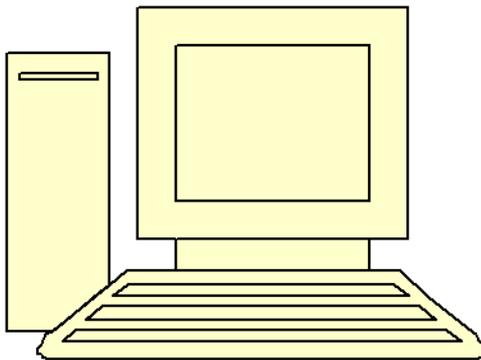
We have looked at HL7 message, segments and fields. Now let's look at how you transmit them to another vendor.

- Lower Level Protocol (LLP) is a term used when discussing the transmission of the HL7 Messages.
- Lower Levels (layers 1 through 4) support the actual transmission or movement of the data.
- The term Lower Level Protocol is referring to the portion of the ISO OSI (Open System Interconnect). The OSI is divided into seven layers or levels.

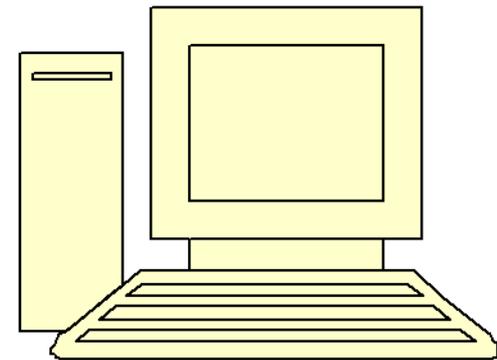
Data Exchange Standards

HL7 Messages are typically moved via a network connection between two systems that reside on the same network.

Each system has a role in the communication. One acts as the CLIENT and the other acts as the Server. Typically the one sending the data is the CLIENT, but that does not have to be.



Client

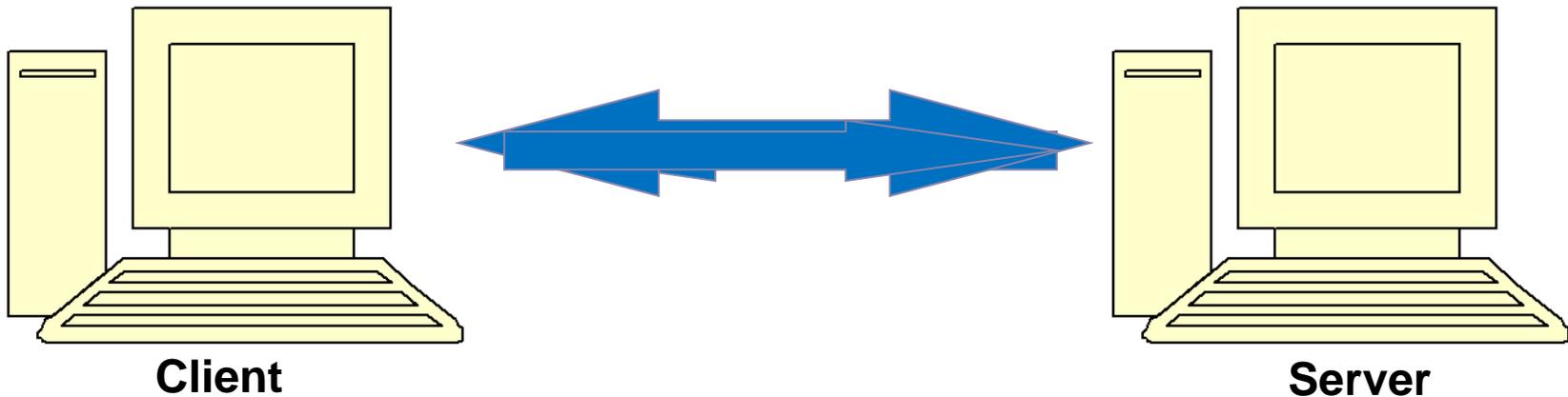


Server

Data Exchange Standards

The CLIENT will open a TCP/IP Socket with the SERVER.

- This connection will be exclusively used for these two systems to communicate.



Data Exchange Standards

- The acknowledgment of delivery of a message is a significant feature that HL7 LLP provides.
- In the MSH of the sending message, is a field called the Message Control ID (MCI).

```
MSH|^~\&||SEM|||200605221309||ADT^A04|ADT1.1.9198|P|2.1|
EVN|A04|200605221309
PID|1||M000001327||TEST^RECURRING^^^^||19680215|F|^^^^^|^^^^^||||L000029512|74
DG1|1|TX||PROTIMES
PV1|1|O|RCA^^^|||HARR^HARNER^ROBERT|HARR^HARNER^ROBERT|||||||RCR||U|||
```

```
MSH|^~\&|||SWA|200605221309||ACK|ADT1.1.9200|P|2.1|||
MSA|AA|ADT1.1.9198
```

- The acknowledgment contains the MCI of the HL7 message and confirms the message was received.

Data Exchange Standards

- Other methods can be used to deliver HL7 messages to the receiving system.
 - Send message via FTP.
 - Download and copy to shared folder.
- HL7 also has a Batch Mode for transmitting messages. This method is used to transmit several HL7 messages at one time. Message structure:

```
[FHS]                (file header segment)
{ [BHS] (batch header segment)
  { [MSH      (zero or more HL7 messages)
    .... .... ....] }
  [BTS] }           (batch trailer segment)
[FTS] (file trailer segment) Notes:
```

HL7 Message Types

Using NPR

- Creating an NPR report in the format of an HL7 message is definitely a significant task but is doable.
- The report can be scheduled to deliver the file to an FTP server.
- NPR report interfaces are more batch mode than real-time.
- Hospitals have created HL7 NPR Report Interfaces for almost all message types.

Future of HL7

Version 2.x Versus Version 3.x

- Version 2.x has been approved by an ANSI since the early 90's and is used throughout the healthcare industry almost exclusively.
- Version 3.x is a departure from the 2.x version in how the messages are formatted but does offer some advantages for Web publishing and self documenting.
- Version 3.x is based on XML, a Web-based language.
- Some movement in the market to transition to 3.x.

Future of HL7

Version 2.x Versus Version 3.x

HL7 Version 2.3.1 – 87 characters

```
MSH|^~\&|LAB^foo^bar|767543|ADT|767543|19900314130405||ACK^|XX3657|P|2.3.1  
MSA|AA|ZZ9380
```

HL7 Version 3 – 477 characters

```
<ACK>  
<MSH>  
  <MSH.1>|</MSH.1>  
  <MSH.2>^~\&amp;</MSH.2>  
  <MSH.3>  
    <HD.1>LAB</HD.1>  
    <HD.2>foo</HD.2>  
    <HD.3>bar</HD.3>  
</MSH.3>  
<MSH.4>  
  <HD.1>767543</HD.1>  
</MSH.4>  
<MSH.5>  
  <HD.1>ADT</HD.1>  
</MSH.5>  
<MSH.6>  
  <HD.1>767543</HD.1>  
</MSH.6>
```

Message Continued:

```
<MSH.7>19900314130405</MSH.7>  
<MSH.9>  
  <CM_MSG_TYPE.1>ACK</CM_MSG_TYPE.1>  
</MSH.9>  
<MSH.10>XX3657</MSH.10>  
<MSH.11><PT.1>P</PT.1></MSH.11>  
<MSH.12>  
  <VID.1>2.3.1</VID.1>  
</MSH.12>  
</MSH>  
<MSA>  
  <MSA.1>AA</MSA.1>  
  <MSA.2>ZZ9380</MSA.2>  
</MSA>  
</ACK>
```

[XML Viewing](#)

Basic HL7 Understanding

Objective: Provide basics HL7 understanding with progressively more complex topic discussion of HL7 standards and structures.

[Complimentary copy of HL7 Viewer is available.](#)

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I Can Help!

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