

Installation and Maintenance of Health IT Systems

Unit 7

System Interfaces and Integration

What We'll Cover...

- Define Interface and Integration
- Why are Integration Capabilities important
- What is an interface?
- Types of protocols
- Interoperability standards, e.g. HL7
- How HL7 Works
- Talking beyond the EHR system

What are Interface and Integration?

- Interface – A point of interaction between components
- Integration – The process of combining various subsystems into one larger system and ensuring that the subsystems function together as a whole

Why are Integration Capabilities Important?

- Many different isolated systems currently exist within healthcare infrastructures.
- Many are too expensive to replace.
- Many are tailored to meet specific departmental needs and not easily duplicated.

Pre-existing Systems to Consider with an EHR

- Clinical information
 - Intake and output
 - Patient education
 - Vital sign measurements
 - Order management
 - Results reporting
 - Clinical documentation
 - Computerized provider order entry (CPOE)
 - Consults tracking
 - Clinical rules engine
 - Clinical alerts and reminders

Pre-existing Systems to Consider with an EHR

- Patient management
 - Patient registration
 - Admission/discharge/ transfer (ADT)
 - Scheduling
- Labs
 - Chemistry
 - Microbiology
 - Anatomic pathology

Pre-existing Systems to Consider with an EHR

- Pharmacology/Medications
 - Inpatient and outpatient
 - Barcoding and electronic medication administration record (MAR)
 - Adverse drug reaction (ADR) tracking
- Radiology
 - General radiology
 - Nuclear medicine
 - Clinical image viewing (PACS)
- Nutrition and food service
 - Food service management
 - Clinical nutrition

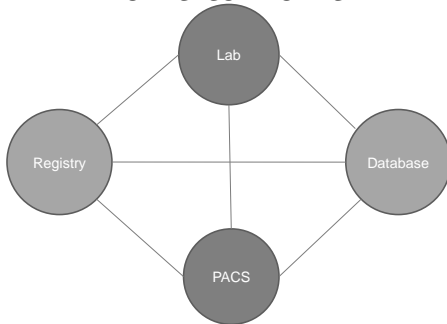
Common Interface Methods

- Point to point
- Interface engine

Interface Method: Point-to-Point

- Traditional method
- Requires that each component have direct connection points to other components
- Disadvantage: Labor-intensive to set up and maintain; can require a large number of connections
- Advantage: direct, secure linkage

Point-to-Point



Component&Unit 7

Health IT Workforce Curriculum
Version 1.0 Fall 2010

10

Interface Method: Interface Engine

- Routes data through centralized location
- Advantages:
 - Reduces number of separate connectivity points
 - More flexible and scalable
 - Easier to install and maintain

Component&Unit 7

Health IT Workforce Curriculum
Version 1.0 Fall 2010

11

Types of Interface Protocols

- Extensible Markup Language (XML)
- Fixed-length formats
- Variable-length delimited formats
- Java
- Health Level 7 (HL7)

Component&Unit 7

Health IT Workforce Curriculum
Version 1.0 Fall 2010

12

What is the HL7 Standard?

- Defines a method of moving clinical data between independent medical applications in near real time
- A structured, message-oriented framework for communicating between healthcare application systems
- Acknowledged to be the latest healthcare industry standard
- Not “plug and play” but designed to be customizable

HL7 as a Protocol

- A reference to the seventh, or “application”, layer of the ISO OSI reference model.
- HL7 is based on the messaging protocol.
- Each message is comprised of many purposed segments, each on its own line, that comprise the entire message body.
- Each segment is denoted by a three-letter notation indicating its purpose.

How does HL7 Work?

- HL7 messages are sent and received by various EHR applications as requests and updates are made.
- A three-letter acronym in the beginning of the first line denotes the message type.
- A single segment (line) contains many different fields, or even sub fields, each separated by a delimiter. Some delimiters include:

	Pipe	Field delimiter
^	Carrot	Sub-field delimiter
~	Tilde	Repeating field delimiter
\	Backslash	Escape character
&	Ampersand	Sub-sub-field delimiter

How does HL7 Work? Examples

What can we tell from this segment?

```
NR1||Smith^John^^^|SPO|| (919) 555-5555 |EC|||||||||||||||||
```

- “NK1” denotes a “Next of Kin” segment.
- “John” would be a subfield in the third field of this segment.
- Five fields contain data in first 8 fields of this segment.

How does HL7 Work? Examples

Sample full HL7 message:

```
MSH|^~\&||GA0000||MA0000|199705221605||VXQ^V01|19970522GA40|T|2.3.1||AL  
QRD|199705221605|R|I|19970522GA05||25^RD|^SMITH^JOHN^FITZGERALD^JR|VXI^VACCINE INFORMATION^HL70048|^SIIS  
QRF|MA0000|||256946789-19900607~MA-MA99999999-88888888~SMITH^JACQUELINE^LEE~BOUVIER~898666725~SMITH^JOHN^FITZGERALD~822546618
```

- A lot can be gleaned from the fist line:
MSH|^~\&||GA0000||MA0000|199705221605||VXQ^V01|19970522GA40|T|2.3.1||AL

How does HL7 Work? Examples

From the first line:

```
MSH|^~\&||GA0000||MA0000|199705221605||VXQ^V01|19970522GA40|T|2.3.1||AL
```

- “MSH” denotes “New Message”.
- The ninth field always tells what the message will be. In this case, VXQ^V01 indicates a vaccination history query message.

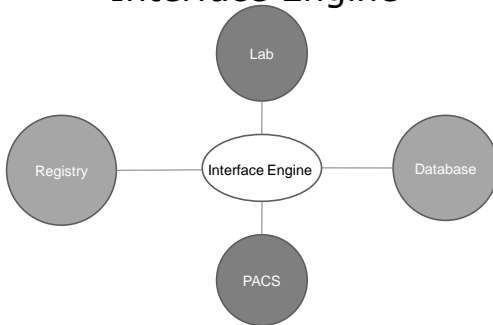
How does HL7 Work? Examples

Sample HL7 Message:

```
MSH|^~\&||GA0000||MA0000|199705221605||VXQ^V01|19970522GA4
0|T|2.3.1||AL
QRD|199705221605|R|I|19970522GA05|||25^RD|^SMITH^JOHN^FITZ
GERALD^JR|VXI^VACCINE_INFORMATION^HL70048|^SIIS
QRF|MA0000|||256946789~19900607~MA~MA99999999~88888888~SM
ITH^JACQUELINE^LEE~BOUVIER~898666725~SMITH^JOHN^FITZGERA
LD~822546618
QRD|199705221605|R|I|19970522GA05|||25^RD|^SMITH^JOHN^FITZ
GERALD^JR|VXI^VACCINE_INFORMATION^HL70048|^SIIS
QRF|MA0000|||256946789~19900607~MA~MA99999999~88888888~SM
ITH^JACQUELINE^LEE~BOUVIER~898666725~SMITH^JOHN^FITZGERA
LD~822546618
```

- There are literally dozens of these segment headers.

Interface Engine



Why is HL7 Important?

- Represents the first standard protocol for communication between EHR components
- Allows for “open system architecture”

Integration Between EHRs

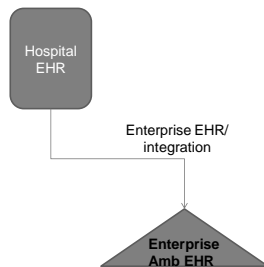
- EHR integration is a growing trend that is important for:
 - Enabling hospitals to share patient information to other healthcare entities
 - Enhancing billing/payment and reform initiatives
 - Streamlining workflows between hospitals and clinics
 - Meeting the HITECH “meaningful use” criteria
- Integration is still in its infancy, and more standards and practices are being developed.

Integration Between EHRs

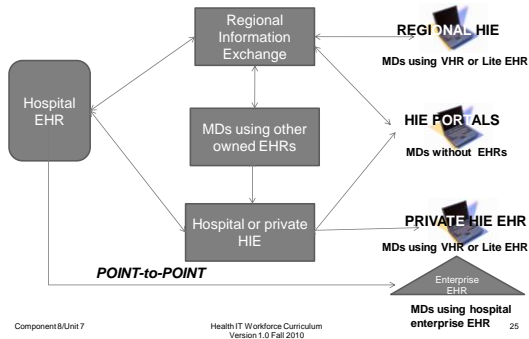
- To demonstrate “meaningful use”, EHRs must be able to exchange information with other certified EHR systems beyond their own environments.
- Two methods:
 - Point-to-point
 - Health Information Exchange (HIE)

Point-to-Point

- Traditional connection method
- Can connect through a variety of media
- Drawbacks include customization and high maintenance



Point-to-Point vs. HIE



Summary

- Interface – A point of interaction between components
- Integration – The process of combining various subsystems into one larger system and ensuring that the subsystems function together as a whole
- Disparate systems require some way to connect to newer EHR systems to ensure interoperability.
- Point-to-point connectivity - Traditional method requiring that each component have direct connection points to other components
- Interface Engines - Allow disparate systems to connect to each other more efficiently through the use of an interface that can decipher information from each of the various components
- HL7 has emerged as the messaging standard of choice for communication between different EHR components.
- HL7 is based on the messaging standard and uses groupings of segments to relay information throughout the EHR system in near real time.
- HL7 promotes "open architecture", which allows anyone to interface systems using appropriate protocols, independent of vendor.
- Health Information Exchanges act as interface engines for healthcare institutions for an entire region.
