Slide 1

Networking and Health Information Exchange

Unit 5a

Health Data Interchange Standards

Slide 2

Objectives

- Understand linking and aggregating data at all levels
- Understand how data may be interchanged among heterogeneous settings without loss of information
- Understand HL7 v2.x messaging communication standard
- Understand HL7 v3.0 messaging standards
- Understand other data interchange standards including DICOM, IEEE, and IHE

Slide 3

Why Use Data Interchange Standards?

- Concept of patient-centric EHR requires aggregation of data from across all sites of care
- Secondary use of data likely requires the movement of data
- When sender and receiver are not known in advance of data exchange, standard is mandatory

Slide 4

Core Requirements for Date Exchange

- **Nouns** – items we wish to communicate
  - Typically physical **things** (persons, places) and **actions**
- **Phrases** – essential bindings between nouns
  - An action **happens to** a person
  - One action **causes** another
  - A person **performs** an action
- **Vocabulary & model** – common definitions
  - Assume common perspective
  - Prescribe the nouns and phrases we can use

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Choices for Data Interchange

- HL7 v2.n and v3 messaging standards for clinical data
- Document standards
  - HL7 Clinical Document Architecture
  - HL7 Continuity of Care Document
  - ASTM Continuity of Care Record
- DICOM for images and other media
- Claims standards
- Prescription standards

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HL7 v2.n messaging standard

- Easy to use and understand
- Based on an implicit information model
- Focused initially on needs of HIS, later versions expanded horizontally into other areas including ambulatory care
- Most widely used data exchange standard (>95% provider organizations)
- Saves money on cost of interfaces
- Events not tightly coupled to profiles
- Makes no formal attempt to define process

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HL7 v2.n Messaging Standard

- Works well within a single enterprise where both sender and receiver are tightly coupled
- Does not work well when sender and receiver are not connected
- Available with delimiter or with XML syntax
- Messages initiated by trigger events
- Clinical data sent as name-value pairs

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HL7 v2.x Messaging Standard

- Message composed of segments whose content is defined by position
- Segments are made up of data fields which are made up of data elements
- Fields may be repeating
- Accommodates HL7 registered terminology expressed as code, name, terminology ID triplet
- Local tailoring using Z-segments

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Version 2

- Messages composed of
  - Segments composed of
    - Fields composed of
      - Components
- Delimiters
  - **|** field separator
  - **^** component separator
  - **~** repetition separator
  - **** escape character
  - **&** subcomponent
  - <**cr**> segment terminator

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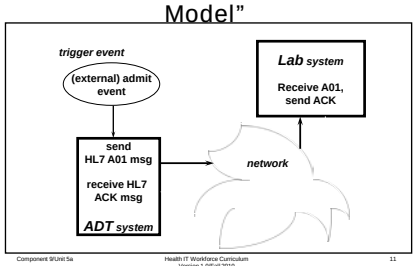
HL7 Messages

- Composed of reusable segments, each identified by a 3-letter mnemonic
- All messages must start with header segment MSH which includes sender, receiver, date-time, message type and trigger event
- Segments used in a message are determined by message type

Slide 11

HL7 basic "Transaction Model"



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Patient Admission Scenario, Inform Lab System

- Trigger event is admission – A01
- Message type is ADT
- Messages composed of:
  - MSH (message header)
  - PID (patient identification)
  - PV1 (visit data)

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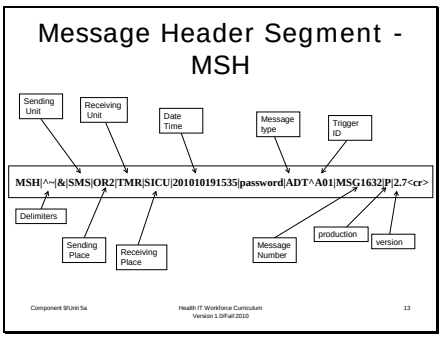
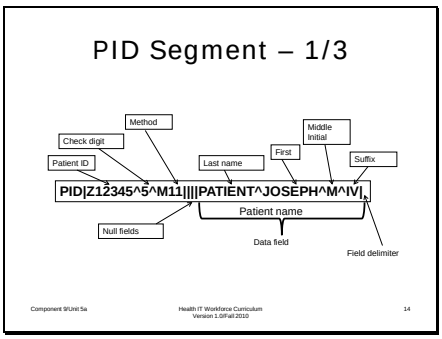


Slide 14



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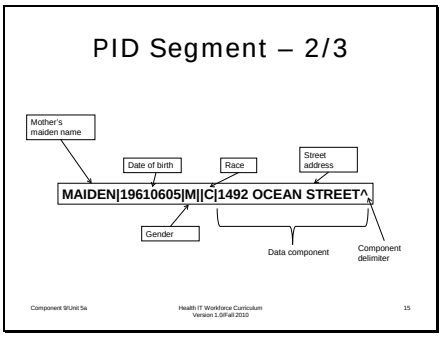
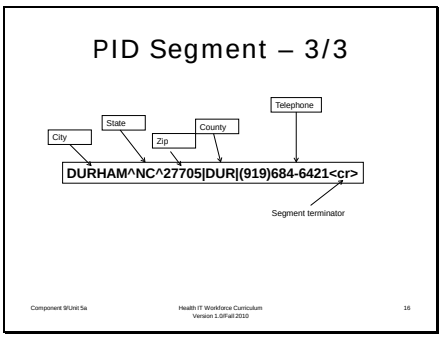


Slide 16



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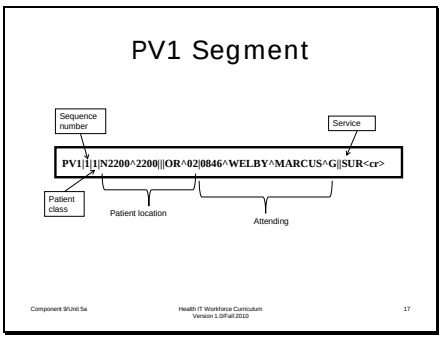
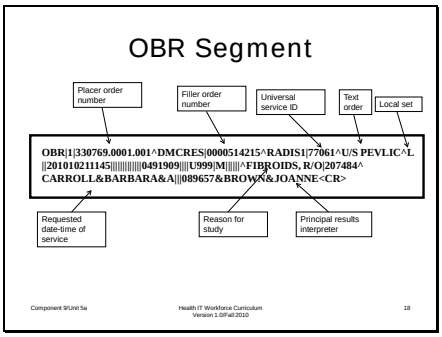


Slide 18



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Typical Result Message - ORU

```
MSH|^~\&||||19981105131523||ORU^R01<cr>
PID|||100928782^9^M11||Smith^John^J<cr>
OBR||||Z0063-0^^LN<cr>
OBX||XCN|Z0063-0^^LN||2093467^Smits^J^<cr>
OBX||Z0092-0^^LN||203BE0004Y^^X12PTX<cr>
```

Data field

Data component

segment

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OBX – the Flexible Segment

Data type

Identifying code for data element

Terminology source

Data value

Data units

```
OBX||NM|11289-6^^LN||38|C^^ISO+|||||F
```

numeric

LOINC

Note: code-value pair construction

Temperature reading coded as a LOINC term with a value of 38 degrees Centigrade; final report

Status: final

Other data fields include: date of observation, identity of provider giving observation, normal ranges, abnormal flags

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OBX with Coded Value

Data type = coded

LOINC code for ABO Blood Group

SNOMED code for Group O

```
OBX||CE|883-9^Blood Group^LN||F-D1250^Group O^SM|
```

Identifies test

Identifies result

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V2.4 Delimiter Based (1/2)

```
MSH|^~\&|REGADT|MCM|IFENG||199112311501||ADT^A04^ADT_A01|000001|P|2.4|||
EVN|A04|199901101500|199901101400|01||199901101410
PID|||191919^^GENHOS^MR~371-66-
9256^^^USSSA^SS|253763|MASSIE^JAMES^A||19560129|M|||171 ZOBERLEIN^^
ISHPEMING^MI^49849^""^||(900)485-5344|(900)485-5344||S^^HL70002| C^^
HL70006|10199925^^^GENHOS^AN|371-66-9256||
NK1|1|MASSIE^ELLEN|SPOUSE^^HL70063|171OBERLEIN^^ISHPEMING^MI^49849
^""^|(900)485-5344| (900)545-1234~(900)545-1200|EC1^FIRST EMERGENCY
CONTACT^HL70131
NK1|2|MASSIE^MARYLOU|MOTHER^^HL70063|300 OBERLEIN^^ISHPEMING
^MI^49849^""^|(900)485-5344|(900)545-1234~(900)545-1200|EC2^SECOND
EMERGENCY CONTACT^HL70131
NK1|3|||123 INDUSTRY WAY^^ISHPEMING^MI^49849^""^||(900)545-1200
|EM^EMPLOYER^HL70131|19940605||PROGRAMMER|||ACME SOFTWARE
COMPANY
```


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V2.4 delimiter-based (2-2)

```
PV1||O|O/R|||0148^ADDISON,JAMES|0148^ADDISON,JAMES||AMB|||||
||0148^ADDISON,JAMES|S|1400|A|||||||||||||||||GENHOS||||199501101410|
PV2||||||||199901101400||||||||||||||||||||||||199901101400
ROL||AD|CP^^HL70443|0148^ADDISON,JAMES
OBX||NM|3141-9^BODY WEIGHT^LN||62|kg|||||F
OBX||NM|3137-7^HEIGHT^LN||190|cm|||||F
DG1|1|19|0815^BIOPSY^ACODE||00|
GT1|1|MASSIE^JAMES^^^^^^^^^^^^^^^^|171
ZOBERLEIN^^ISHPEMING^MI^49849^""^|(900)485-5344|(900)485-5344
|||SE^SELF^HL70063|371-66-925||||MOOSES AUTO CLINIC|
171 ZOBERLEIN^^ISHPEMING^MI^49849^""|(900)485-5344|
IN1|0|0^HL70072|BC1|BLUE CROSS|171 OBERLEIN^^
ISHPEMING^M149849^""^||(900)485-5344|90|||||50 OK|<cr>
```


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V2.n XML-based

```
xmlns="urn:hl7-org:v2xml"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:hl7-org:v2xml ADT_A01.xsd">
<MSH>
    <MSH.1>|</MSH.1>
    <MSH.2>^~\&amp;</MSH.2>
    <MSH.3>
        <HD.1>REGADT</HD.1>
    </MSH.3>
    <MSH.4>
        <HD.1>MCM</HD.1>
    </MSH.4>
<MSH.7>
        <TS.1>201010191501</TS.1>
  </MSH.7>
  <MSH.9>
        <CM_MSG.1>ADT</CM_MSG.1>
        <CM_MSG.2>A04</CM_MSG.2>
        <CM_MSG.3>ADT_A01</CM_MSG.3>
  </MSH.9>

</MSH>
```

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v2 Functional Areas

- ADT, Registration, Orders, Results, patient financial, query language, immunization reporting, clinical trials, adverse drug reactions, scheduling, referrals, medical records, patient care, problem lists and goals, waveforms, personnel management, clinical lab automation transactions, master files

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Summary

- v2 messages easy to implement
- Needs sender-receiver agreements
- Most used in US
- Gets the job done