Citation Key
for more information see: http://open.umich.edu/wiki/CitationPolicy

Use + Share + Adapt

{ Content the copyright holder, author, or law permits you to use, share and adapt. }

- **Public Domain – Government**: Works that are produced by the U.S. Government. (17 USC § 105)
- **Public Domain – Expired**: Works that are no longer protected due to an expired copyright term.
- **Public Domain – Self Dedicated**: Works that a copyright holder has dedicated to the public domain.
- **Creative Commons – Zero Waiver**
- **Creative Commons – Attribution License**
- **Creative Commons – Attribution Share Alike License**
- **Creative Commons – Attribution Noncommercial License**
- **Creative Commons – Attribution Noncommercial Share Alike License**
- **GNU – Free Documentation License**

Make Your Own Assessment

{ Content Open.Michigan believes can be used, shared, and adapted because it is ineligible for copyright. }

- **Public Domain – Ineligible**: Works that are ineligible for copyright protection in the U.S. (17 USC § 102(b)) *laws in your jurisdiction may differ

{ Content Open.Michigan has used under a Fair Use determination. }

- **Fair Use**: Use of works that is determined to be Fair consistent with the U.S. Copyright Act. (17 USC § 107) *laws in your jurisdiction may differ

Our determination **DOES NOT** mean that all uses of this 3rd-party content are Fair Uses and we **DO NOT** guarantee that your use of the content is Fair.

To use this content you should **do your own independent analysis** to determine whether or not your use will be Fair.
Health Informatics Standards & Health IT Interoperability

“Providing a framework”

Fall 2013

A. Flynn

University of Michigan
Introduction to Health Informatics Course
Course Map-Week 9

- Lectures
  - i
  - ii

- Skill Modules
  - EHRs (VistA)
  - Elements & functions of Info. Systems

- 5 DOMAINS
- 10 METHODS
- 4 INFO. RESOURCES

- HIT STANDARDS
- KICK OFF
- END

- time
About Skill Module 3

START WITH THE STUDY GUIDE!

I. Readings – Three Types
   (a) Textbook Chapter 7
   (b) Detail Articles – *note the assigned pages*
   (c) Reference Materials

II. SELF STUDY Exercises *in separate folder*

III. SKILL MODULE 3 MASTERY TEST
Health Information Exchange is...

(a) *Verb* “The **electronic sharing of health-related information among organizations.**”

For a similar definition to (a) above of HIE see: p. 17
Health Information Exchange

- HIE is a **process that requires standards**
- HIE addresses health system **fragmentation**
- HIE helps **realize cost & quality gain** from HIT
- Several **pilot approaches** to HIE are being tried
- Many **barriers to HIE** remain including **work needing to be done to develop standards**
Key computing concepts...

- Free text vs. Coded data
- Syntax vs. Semantics
- Communication requires *shared* syntax and semantics
Communication Breakdown?

Why do we need data interchange standards in healthcare?

acetaminophen (Tylenol) 160mg/5mL, give 42mg every evening (5mL)

Standards can help to **diminish** ambiguity.
What you Need to Know

1. Definition/Characteristics of Standards
2. HIT Data Interchange Standard Types
3. Coded data vs. free text
4. Message vs. document standards
5. Semantic “content” vs. syntax
6. Position Dependent vs. Tagged Field syntaxes
7. Definition of Interoperability
8. What is a User Story in a Use Case?
Agenda

Giving a Framework
“a basic structure”

1. Standards, in general
2. Standards in HIT
3. Interoperability
STANDARDS, in general
What is a standard?
A standard is . . .

“a set of rules or definitions that specify how to carry out a process or produce a product”
– Hammond & Cimino, Ch. 7

“a specification approved by a recognized body and made available to the public”
– Intelligent Transport Systems, U.K.

“an acknowledged measure for comparison”
– The Free Dictionary

“a document, established by consensus that provides rules, guidelines or characteristics for activities or their results” – Am. Natl. Standards Inst. (ANSI)
A standard is . . .

A defined specification of rules, guidelines, or characteristics made available to the public.

- Definition for this course
**de facto** or **de jure**?

**de facto** – unofficial but predominant, “in fact”
*e.g.*, ½ inch spacing of rollers in a bicycle chain

**de jure** – obligatory, required by regulation, “concerning law”
*e.g.*, a building code requires newly installed residential, outdoor water spigots to have pressure relief valves to prevent pipe bursts

Why are PDFs difficult to edit?

The **intent** of the PDF file standard is to facilitate exchanging and viewing - *but not editing*

The PDF standard includes specified security provisions for “conforming writers”

*ISO 32000-1:2008 specifies a digital form for representing electronic documents to enable users to exchange and view electronic documents independent of the environment...*
Compliance

ASTM D4814-11b Specification for Auto Engine Fuel
Interdependency

- ASCII (character set)
- SMTP (transmission)
- XML (syntax)
- JPEG (image encoding)
- MIME (character encoding)
- CSS (style/layout)
- HTML (content)
- HTTP (transmission)
- Java Script (logic)

Welcome to Wikimedia Commons,
a database of 13,501,923 freely usable media files to which anyone can contribute.
Incremental adoption

Corporate Average Fuel Economy (CAFE) Standards

US DOT & US EPA

† fuel consumption
† greenhouse gas emissions

‘average fleet’ of cars will have

54.5 mpg by 2025
About Standards, generally

1. May be *de facto* or *de jure*
2. **INTENT** matters, and may constrain **SCOPE OF USE**
3. **COMPLIANCE** is not guaranteed, and so must be validated and/or **CERTIFIED**
4. Many **INTERDEPENDENT** standards are usually needed to achieve ultimate aims
5. **INCREMENTAL ADOPTION** of standards can facilitate their implementation and use
HEALTH CARE INFORMATICS STANDARDS

‘STANDARDS IN HEALTH IT’
Several Data-Interchange Standards used in Health Care

- Security of data
- Transport of data from A → B
- Syntaxes – ‘format’, sequence + structure
- Terminologies and Code Sets
Nomenclature - names
Terminology - terms
(Standard) Vocabulary
Code set

*From Chapter 7, Biomedical Informatics – Computer Applications in Healthcare and Biomedicine
What is a formalism?

“a rigorous definition of a fuzzy or non-evidently sharp concept”
– Arkoudas K, Principles of Computation and Relative Computation, 1994

**Known benefits of formalisms**

1. Organize knowledge systematically
2. ↓ ambiguity (resolve borderline cases)
3. Facilitate the formulation of laws (rules)
4. Facilitate the **genesis of standards**
XI Diseases of the Digestive System K00-K93
K35-K38 Diseases of appendix
Included:
K35 “Acute appendicitis”
K35.2 “Acute appendicitis with generalized peritonitis”

Excluded:
XI excludes cancers C00-D48
Systematized Nomenclature of Medicine

**BACTERICIAL PNEUMONIA**

*is an*

**INFECTIOUS DISEASE OF THE LUNG**

**Causative Agent**

**BACTERIUM**

**Associated Morphology**

**INFLAMMATION**

SNOMED uses *formalisms*
A standard is . . .

A **defined specification** of **rules, guidelines, or characteristics** made **available to the public**.

- Definition for this course
Several Data-Interchange Standards used in Health Care

- Security of data
- Transport of data from A → B
- Syntaxes – ‘format’, sequence + structure
- Terminologies and Code Sets

Types of Data-Interchange Standards

Sender → Receiver
1. Position Dependent
1500 | N | Elm | Ave | Jackson | MI | 49202

2. Tagged Field
<Address><St_num>1500</St_num><Direction>N</Direction><Street>Elm</Street><St_type>Ave</St_type><City>Jackson</City><State2L>MI</State2L><Zip5>49202</Zip5></Address>
INDICATIONS AND USAGE

FLOVENT DISKUS is an inhaled corticosteroid indicated for:

- Maintenance treatment of asthma as prophylactic therapy in patients 4 years and older. (1)

- Treatment of asthma for patients requiring oral corticosteroid therapy. (1)

FLOVENT DISKUS is NOT indicated for the relief of acute bronchospasm. (1)
Several Data-Interchange Standards used in Health Care

- Security of data
- Transport of data from A \( \rightarrow \) B
- Syntaxes – ‘format’, sequence + structure
- Terminologies and Code Sets

Data Interchange

TYPES of Data-Interchange Standards

Sender \( \leftrightarrow \) Receiver
Utilized standards. Still failed?

Source of Truth

Computerized Provider Order Entry (CPOE) System

EHR SYSTEM

Bar Code Medication Administration System

1

ORDER DATA SENT VIA HL7 STANDARD MESSAGES

50 mL dextrose 5%

Separate Pharmacy System

Edit Here

500 mL dextrose 5%

ORDER & PRODUCT DATA SENT VIA HL7 STANDARD MESSAGES
INTEROPERABILITY
Interoperability is* . . .

“Interoperability means the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of health care for individuals and communities.”

- Health Information Management Systems Society Integration and Interoperability Steering Committee, 2005

*Definitions of interoperability vary. This definition will be the ‘course’ definition.
“Work Together” (Interoperability): >1 organization & >1 type of system, multi-person workflow sequence

From Integrating the Healthcare Enterprise, Eye Care Technical Framework Volume 1, Based on Figure 3.6 Case E1 – Registered and Ordered workflow, 2/15/10
Use Case Snippet Example

“Close Loop Referral”

Primary Care Physician’s Office (assess)

EHR-1 *sends referral message to* EHR-2

Specialist’s Office (assess/treat)

EHR-2 *sends consult message back to* EHR-1

Primary Care Physician’s Office (evaluate)

EHR-1 *sends annotated message to* PHR-1

Patient’s Home (consider/undergo/do)

## User Story Example

### “Close Loop Referral”

<table>
<thead>
<tr>
<th>EVENT in the Story</th>
<th>System(s) Used</th>
<th>Trigger for Intended Outcome of Closed Loop Referral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AJ, a 30 year old female, goes to see her doctor for a mole on her toe</td>
<td>Registration system Registration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Office EHR-1</td>
<td></td>
</tr>
<tr>
<td>2. Mehdi, AJ’s doctor refers AJ to a dermatologist</td>
<td>Office EHR-1</td>
<td>EHR-1 triggered to send EHR-2 an e-referral</td>
</tr>
<tr>
<td></td>
<td>Office EHR-2</td>
<td></td>
</tr>
<tr>
<td>3. Diana, the dermatologist removes the mole and sends consult note and treatment</td>
<td>Office EHR-2</td>
<td>EHR-2 triggered to send “referral completed” message</td>
</tr>
<tr>
<td></td>
<td>Office EHR-1</td>
<td>to EHR-1</td>
</tr>
<tr>
<td>4. Mehdi reads the consult note and update, and notifies AJ he has read them by</td>
<td>Office HER-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AJ’s eMAIL client</td>
<td></td>
</tr>
</tbody>
</table>

What we did and did not cover today

1. Definition/Characteristics of Standards
2. HIT Data Interchange Standard Types
3. Coded data vs. free text
4. Message vs. document standards
5. Semantic “content” vs. syntax
6. Position Dependent vs. Tagged Field syntaxes
7. Definition of Interoperability
8. What is a User Story in a Use Case?
Conclusion – HIT Standards

“Most of the standards are not complete . . .”

“Standards do NOT exist to support FULLY the requirements of health professional workstations.”

– Hammond WE, Cimino JJ, Chapter 7, p. 308-9
Image Attributions

- “Book” by gingercoons is in the Public Domain.
- “Pumpkin moliugas” by Keistutis is in the Public Domain.
- “Neumonia” by Joseaperez is in the Public Domain.
- “Wikimedia Commons” by Wikimedia Commons is under a Creative Commons license CC BY-SA 3.0.
- “Weights and Measures Nevada Seal” by George5530 is in the Public Domain.
- “Cheater plug edited” by PleaseStand is under a Creative Commons license CC BY 3.0. https://commons.wikimedia.org/wiki/File:Cheater_plug_edited.jpg
- “Schlegel wireframe 600-cell” by 박신환 is under a Creative Commons license CC BY-SA 3.0. https://commons.wikimedia.org/wiki/File:Schlegel_wireframe_600-cell.png