Curriculum Development Centers Program

Awardee of The Office of the National Coordinator for Health Information Technology

HEALTH IT WORKFORCE CURRICULUM
COMPONENT BLUEPRINT
Version 3.0/Spring 2012

Component Number: 9
Component Name: Networking and Health Information Exchange

Component Description: In-depth analysis of data mobility including the hardware infrastructure (wires, wireless, and devices supporting them) , the ISO stack, standards, Internet protocols, federations and grids, the NHIN and other nationwide approaches.

Assigned Institution: Duke University

Team Lead(s):
W. Ed Hammond, Ph.D., Duke Center for Health Informatics
Michele Parrish, Durham Technical Community College
Team Members:
Harry Bulbrook, (Consultant)
Charlene West, (Consultant)

Workforce Roles:

- Practice workflow and information management redesign specialist
- Clinician/practitioner consultants
- Implementation support specialists

Component Objectives:
At the completion of this component, the student will be able to:

1. Explain the functions of all layers of the ISO OSI models, including how they are interconnected and supported.
2. Recommend components of networking hardware that meet standards and support information exchange.
3. Analyze standards associated with the EHR functional model, the PHR functional model, and the family of profiles associated with specific domain functional requirements

This material was developed by Duke University funded by the Department of Health and Human Services, Office of the National Coordinator for Health Information Technology under Award Number IU24OC000024.

4. Explain the process and value of EHR certification.
5. Describe data standards required for the interoperable exchange of health care data, including terminology, data elements, document standards, imaging standards, and medical device standards.
6. Describe components of health IT standards (including HL7 and TC215) for health information exchange used by various stakeholders.
7. Examine additional standards related to shared and effective use of data, including clinical decision support.
8. Describe enterprise architecture models, including centralization vs federation and grids, service oriented architectures, and local implementations with respect to systems from single units to organizations, regions (RHIOS and HIEs), states, and nationwide healthcare information systems (NHIN).
9. Incorporate professional and regulatory standards related to privacy, confidentiality, and security when implementing and maintaining networks and health information exchange systems, including NHIN.

Component Units with Objectives

Unit 1 (ISO Open Systems Interconnection (OSI)):

Description: This unit will address the OSI, including the purpose and content of each of its seven layers: physical, data link, network, transport, session, presentation, and application. Products, processes, protocols and tools at each level will be explained. This unit will also focus on the flow of data through the models as data is transmitted and receive by end devices.

Objectives:

1. Explain the OSI representation of the various layers involved in networking, including the general functions of each layer and their interconnections
2. Explain the concept of the Application layer
3. Explain the concept of the Presentation layer
4. Explain the concept of the Session Layer
5. Explain the concept of the Transport layer
6. Explain the concept of the Network layer
7. Explain the concept of the Data Link layer
8. Explain the concept of the Physical layer
9. Explain connection-oriented versus connectionless communication

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10. Explain the use of network addressing including security considerations and vulnerabilities

Topics:

1. OSI Model and Layers
2. TCP/IP Model and Layers
3. Protocols
4. IP Addresses

Unit 2 (Network Media and Hardware Communication Devices):

Description: This unit is designed to help the student understand network media, hardware devices, and how to select appropriate items to meet the guidelines for usage.

Objectives:

1. Select appropriate network media types (such as Ethernet and Wireless) to facilitate networking and data exchange, taking into account access and regulatory requirements
2. Select appropriate hardware devices (such as routers, switches, and access points) to facilitate networking and data exchange, taking into account access and regulatory requirements

Topics:

1. Transmission Terminology
2. Network Media
3. Connectivity Devices

Unit 3 (National and International Standards Developing Organizations):

Description: This unit introduces students to the national and international organizations that create standards used in networking and health information exchange

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Objectives:

1. Explain why standards related to networking and health information exchange are important in the current environment.
2. Standards development
   - How standards are developed
   - Who develops them
   - How standards are accredited
   - How standards are selected
3. Understand different kinds of standards being developed and for what purpose
4. Learn about Standards Developing Organizations and the standards they create
5. Demonstrate how to find, obtain, and use standards that are needed to facilitate networking and health information exchange

Topics:

1. Standards and their importance to the health care community
2. Organizations that develop standards for Health Information Technology (HIT)
   a. Global
   b. U.S.

Unit 4 (Basic Health Data Standards):

Description: This unit provides an orientation to the important data-related standards that enable interoperable health data interchange

Objectives:

1. Understand why it is necessary to use a common set of data elements with common names to be able to exchange and understand data from other places.
2. Understand what is meant by semantic interoperability.
3. Understand many of the sets of controlled vocabularies in use today – how they are used and who requires their use.
4. Understand the use, purpose and interrelation among sets of controlled vocabularies in use today.
5. Identify the more common controlled vocabularies in use today: ICD, CPT, DRG, NDC, RxNorm, and LOINC.
6. Identify the more common controlled vocabularies in use today: SNOMED, MEDCIN, MedDRA, Nursing terminologies, MeSH and UMLS.
7. Understand data elements; attributes of data elements.
8. Understand contribution of master meta-dictionary of data elements to semantic interoperability.
9. Explain how data structures can be built from basic data components.

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10. Explain how templates and archetypes facilitate networking and information interchange.
11. Discuss Clinical Data Architecture (CDA), Continuity of Care Document (CCD), and Continuity of Care Record (CCR) Standards.

Topics:

1. Problems caused by the lack of a single terminology
2. Set of terminologies in use today
3. Common, controlled, vocabularies

Unit 5 (EHR Functional Model Standards):

Description: This unit explores the functional requirements and standards for electronic health records (EHRs).

Objectives:

1. Understand linking and aggregating data at all levels,
2. Understand how data may be interchanged among heterogeneous settings without loss of information,
3. Understand HL7 v2.x messaging communication standards,
4. Understand HL7 v3.0 messaging standards, and
5. Understand other data interchange standards including DICOM for imaging standards, NCPDP for prescriptions and medication reimbursement, IEEE for device interface standards, ASC X12N for claims and reimbursement standards, ASTM for document exchange, and IHE for profiles and registry standards.
6. Explain how model-based standards are created,
7. Define the methodology development framework,
8. Describe HL7 v3.0 messaging standards,
9. Imaging standards,
10. Standards for pharmacy services,
11. Interface standards for medical devices,
12. Claims and reimbursement standards,
13. Concept of profiling , and
14. Use and value of implementation guides.

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Topics:

1. Health Level 7's v2.n messaging standard
2. HL7 v3.0 messaging standards
3. SDOs that are used to exchange data other than clinical
    a. DICOM imaging standards
    b. NCPDP pharmacy services standards
    c. IEEE medical device standards
    d. X12N reimbursement standards

Unit 6 (Health Data Interchange Standards):

Description: This unit emphasizes the importance of adhering to health data interchange these standards in order to ensure compatibility between systems.

Objectives:

1. Understand the definition(s) of an Electronic Health Record
2. Understand architecture for an EHR
3. Identify and understand key standards for the EHR
4. Understand the HL7 EHR Functional Model Standards
5. Understand functional profiles
6. Understand the standards for Functional Models for the PHR
7. Understand the certification requirements for the EHR, PHR and functional profile

Topics:

1. Electronic Health Record
2. Functional requirements of an EHR system
3. Functional models for the Personal Health Record (PHR)

Unit 7 (Supporting Standards for EHR Applications):

Description: This unit presents a set of standards that support the application layer of the OSI and extend EHR functionality

Objectives:

1. Understand the clinical decision support standard Arden Syntax,
2. Understand standards for clinical guidelines,
3. Understand object-oriented expression language for clinical decision support – GELLO,
4. Understand the clinical decision support standard Infobutton,

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5. Understand disease management, and
6. Understand other clinical decision support applications.
7. Understand other standards that help to support networking and reporting requirements as well as functionality to optimize the connectivity among heterogeneous systems deployed within a single enterprise,
8. Understand single sign-on standards and the HL7 Clinical Context Object Workgroup (CCOW) standard,
9. Understand regulatory standards, and
10. Understand issues relating to person identifiers, master patient indices, and record locator services.

Topics:

1. Standards for clinical decision support
2. Standards for clinical guidelines
3. Clinical decision support
4. Standards for management of workflow

Unit 8 (Enterprise Architecture Models):

Description: This unit addresses different enterprise architecture models that provide an infrastructure for healthcare networks.

Objectives:

1. Explain regional healthcare networks – policy and implementation strategies
2. Explain the concept of a Nationwide Healthcare Information network
3. Explain the significance of Service Oriented Architecture in networking and health information exchange networks
4. Explain the value of an Enterprise Architecture in networking and health information exchange networks
5. Describe key elements of various service oriented architecture platforms and infrastructure options

Topics:

1. Regional health care networks and National health care networks

Unit 9 (Privacy, Confidentiality, and Security Issues and Standards):

Description: This unit explores issues related to creating an environment in which to transport data in a secure manner that ensures privacy and confidentiality.

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Objectives:

1. Explain the concepts of privacy and confidentiality requirements and policies and learn how to implement the requirements
2. Describe how to secure data storage and transmission using data encryption, signatures, validation, non-repudiation, and integrity (PKI, certificates, and security protocols)
3. Define access control methods
4. Analyze access restrictions to data storage and retrieval (physical and software)

Topics:

1. Security Concepts
2. Access Control
    a. Logical
    b. Physical

Unit 10 (Health Information Exchange):

Description: This unit explores the networking standards and the standards required for interoperability to enable the creation of Health Information Exchanges.

Objectives:

1. Understand the purpose and importance of a Health Information Exchange strategy,
2. Understand what an HIE is,
3. Understand the components of an

Topics:

1. EHR Settings
2. Issues for Sharing EHRs
3. Regional Centers

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