Curriculum Development
Centers Program

Component 8
Installation and Maintenance
of Health IT Systems

Unit 1b

Elements of a Typical
Electronic Health Record System

Typical Server Elements

- Types of servers:
  - Application server: computer on which the EHR/PM (Practice Management) application resides
  - Database server: computer on which the database software resides
  - Citrix or terminal server: computer that supports thin client network
- Application, database, and terminal services may reside on the same computer for small installations (<10 users)

Server Software Elements
of the EHR

- IOM: 8 Core Components
  1. Health information in database
  2. Results management
  3. Order entry and management
  4. Decision support
  5. Electronic communication/connectivity
  6. Patient support
  7. Administrative processes
  8. Reporting and population health management

EHR Clients

- EHR systems make medical records available to multiple simultaneous users.
- Tablets, laptops, and PCs allow instantaneous access by healthcare staff as they move around health centers.
- Clients use application software to securely connect to and pull data from the EHR server to fulfill user requests.

EHR Hardware – Defined

- Hardware is:
  - the physical components that make up a computer system.
  - necessary to make the computer work and run properly.

EHR Hardware – Most Common

- Servers
- Workstations
- Laptops
- Tablets
- PDAs/smartphones
- Flat-panel monitors
- Scanners
- Printers
- Storage and backup
- Shredders
- Medical diagnostic and treatment items

EHR Hardware – Servers

- The server(s) are the "home base" of the core EHR system, with components including:
  - Storage of patient database (index)
  - Real-time, dynamic compilation of patient information from varied sources
  - Modules for parsing user requests
  - User management tools
  - Customization tools

EHR Hardware – Servers

- Picking the right server
  - Consult your IT staff, hardware & EHR vendor(s), and/or consultant to determine the hardware specs required for your organization.
  - Important items to consider include:
    - Reliability
    - Performance
    - Scalability

EHR Hardware – Servers

- Storage requirements depend on EHR/PM application, volume of scanned documents
  - Check with your EHR vendor.
  - Rule of thumb: 5 GB/year/provider

EHR Hardware – Servers

- Purchase considerations
  - Brand
    - e.g. Dell vs. "white box"
  - Operating system (OS)
    - e.g. Windows XP
  - Processors
    - e.g. 2.4 GHz Xeon

EHR Hardware – Servers

- Purchase considerations (cont'd)
  - RAM
    - e.g. 1 GB
  - Hard drive configuration
    - e.g. RAID 5
  - Network card
    - e.g. 1 GB/second
  - Accessories: monitor, keyboard, CD/DVD drive, UPS (Uninterruptible Power Supply)

EHR Hardware – Servers

	Internal	External/Hosted
Cost	Higher initial costs	Monthly fees
Management	Need staff to implement & manage server(s), perform software/hardware maintenance & backup	Dependent on vendor for scheduled maintenance
Power	Capable of utilizing full power of server	Often share resources with other institutions
Connectivity	Control speed & connectivity to server(s)	Remote locations, so connectivity may be shared with other customers, reducing speed

EHR Hardware – Clients

- Fixed workstations
  - Connected to server via wired network
  - Strategically positioned throughout work environment to facilitate convenient access
  - Most commonly used and often already in place
  - Economical

EHR Hardware – Clients

- Mobile computers
  - Laptops: physical keyboards; input generally via keyboard or mouse/touchpad, no touch option
  - Tablets: data entry & navigation including touch input, via stylus / electronic pen or finger
    - Slates
    - Convertibles
    - Booklets
  - Connect wirelessly to the network
  - Use rechargeable batteries

EHR Hardware – Clients

- Mobile computers (cont'd)
  - Advantages
    - Additional mobility compared to workstations
    - Save time
    - Can be cheaper if additional infrastructure such as ports are needed
  - Disadvantages
    - Typically more expensive than fixed workstations
    - Subject to theft
    - Easily broken
    - Require additional support, cleaning, maintenance

EHR Hardware – PDAs and Smart Phones

- Personal Digital Assistants (PDAs) and Smart Phones combine computing and networking / cellular features into a personalized unit.
  - Like tablets, mostly pen-based, using stylus for input rather than keyboard
  - Allow users to access patient data remotely, from any location with network connectivity
  - Similar advantages & disadvantages as laptops & tablets
  - May require additional hardware/infrastructure resources

Network

- Collection of computers and devices connected by communication channels
- Allows users to communicate and share resources with other users
- Important terms
  - Ethernet
  - LAN (Local Area Network)
  - WLAN (Wireless Local Area Network), WiFi
  - WAN (Wide Area Network)
  - Point-to-point or fractional T1
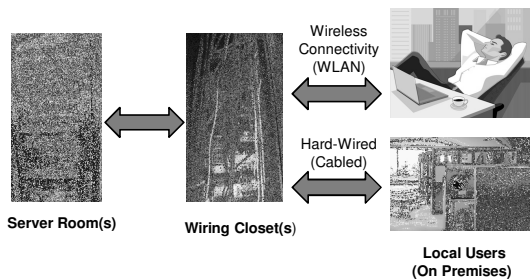 - Bandwidth
  - VPN (Virtual Private Network)
  - Firewall

Local Area Network
(Corporate Offices, NYC)

Wireless Connectivity (WLAN)

Hard-Wired (Cabled)

Server Room(s)   **Wiring Closet(s)**

Local Users (On Premises)

Wide Area Network

Internet / ISP Connectivity

**Corporate Offices
New York City**

Satellite Connectivity

**Branch Offices
Tokyo, Japan**

**Regional Offices
Raleigh, NC**
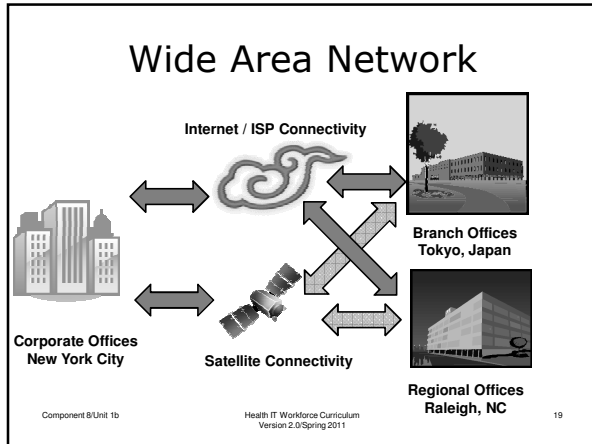
Network – Assessing Usage

- Must be able to support data requirements of EHR application

- Insufficient capabilities will degrade application performance and increase risk of user rejection

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Network – Assessing Usage

- Considerations
  - How many users will need simultaneous access to the network?
  - Bandwidth requirements of the EHR system (per vendor)
    - Special bandwidth needs of scanning equipment or other medical equipment
  - Sufficient connectivity between internal and remote resources such as satellite facilities

Network – Assessing Usage

- Conduct a wireless connectivity survey

- Explore remote connectivity options, including VPN (Virtual Private Networks)