Informatics Concepts and Overview

1. Define health informatics and eHealth.
   - **Health informatics = e-Health** = the application of information technology to facilitate the creation and use of health related data, information & knowledge

2. Define the different stages of information hierarchy and provide clinical examples of each level.
   1. **Data:** observations or symbols (10)
   2. **Information:** data with meaningful facts that can lead to a conclusion (10 loose stools per day)
   3. **Knowledge:** information that is justifiably true (declining Hb = marrow dysfunction)
   4. **Wisdom:** use of knowledge to make intelligent decisions (declining Hb = acute bleed)

3. Define the different levels of data and be able to identify a given piece of data based on its level.
   1. Paper documents
   2. Unstructured, viewable electronic data (scanned docs)
   3. Structured, viewable electronic data (data not useable between different computers)
   4. Structured, computable electronic data (data accessible to share between computers)

4. Describe the flow of health data and provide examples of possible sources.
   - Flow of eHealth data: data → enterprise data warehouse → business analytics/intelligence
   - Sources of eHealth data: electronic health records, personal health records, claims data, home monitoring & data warehouses

5. Identify the possible advantages and disadvantages of using technology in practice.

Advantages	Disadvantages
- Increased efficiency in work - Improved & standardized patient care & therefore patient health outcomes) - Lower costs - Detects trends in sales/prescribing	- Mismatch of what we need vs. what is available - Technology advancing faster than practice/guidelines/workflow can't accommodate - Requires some computer literacy - Not funded or subsidized

6. Provide examples of barriers to the utilization of technology in practice.
   - Inadequate time, info, expertise/people, money/return on investment, interoperability between systems
   - Data rich but information poor
   - Changes workflow
   - Individual resistance to change
   - Privacy concerns

Health Informatics System

1. Describe the 4 main types of networks and be able to provide unique characteristics of each.
    a. Personal Area Networks (PANs)
        - Close proximity networks usually to connect accessories
        - Low power requirements
        - Fast connectivity
        - Wireless Personal Area Networks (WPANs) = Bluetooth or infrared devices
            - Security issues with wireless networks

    b. Local Area Networks (LANs)
        - Typically office/hospitals to share data, accessories, and other resources
        - Larger networks require hubs or routers to process and send data to the correct devices
        - Can be expensive to create large LANs but useful for small projects
        - Wireless (WiFi) Networks (WLANs)
            - Slower and more expensive than LAN
            - Doesn't require any hubs, but needs a router
            - Can be one part of a larger LAN, or can connect multiple LANs together

    c. Wide or Global Area Networks (WANs, GANs)
        i. Wide Area Networks
            - Networks that extend beyond cities or countries
            - Connects multiple LANs together
        ii. Global Area Networks
            - Connected networks with "unlimited" geographic area"
            - Coverage is not always consistent or available

    d. Virtual Private Networks (VPNs)
        - Shares a private LAN or WLAN with other users
        - Requires multiple levels of authentication
        - Data is encrypted by sender and decrypted at receiver

2. Identify one example of each of the 4 main types of networks and where they might be seen in practice.
    a. PANs: computer accessories, wireless headsets, printers, phones, wrist-band fitness devices
    b. LANs: pharmacy with 6 computers, 3 printers, 2 scanners and a fax machine on one LAN
        i. WLAN: hospital with 50 computers connected on one LAN, with 20 tablets/phones connected by WLAN
    c. Wide/Global Networks
        i. WANs: the Internet
        ii. GANs: 3G, 4G/LTE wireless phone networks
    d. VPNs: accessing patient charts on your work computer via your home computer

3. Define the Internet and World Wide Web.
   - **Internet:** largest and most important global network
   - **World Wide Web:** operates on top of the Internet via web browsers; browsers are able to connect & translate content on a screen for users to view

4. List the reasons why the Internet is the preferred network for accessing and transmitting data.
   - Large scale use & availability
   - Bandwidth capability
   - Ability to layer other technologies and standards

5. Explain the concept of service-oriented architecture and how it could be used in healthcare.
   - Aims to configure software systems to maximize efficiency, reduce redundancy, and minimize errors and costs
   - Requires splitting up activities in the system, then re-integrating them using a shared/ standardized way
   - **Example in healthcare:** Pharmacy-patient system to increase refill compliance
     1. Refill reminders sent to patient via mobile app
     2. Refills ordered via same mobile app
     3. Rx automatically queued for filling at the pharmacy
     4. Counting machine dispenses product

6. List the 3 benefits that a service-oriented architecture will enable.
   - Enables reduction in paperwork & data-entry activities
   - Consistent information across entire system
   - Faster responses to any future system changes and implementation of new capabilities

Privacy, Security and Ethics

1. Explain the 3 pillars of security: confidentiality, availability and integrity.
   a. **Confidentiality:** prevent data loss through usernames, passwords, encryption
   b. **Availability:** system and network availability during unexpected outages through backup generators or power supplies, backup files
   c. **Integrity:** maintain trustworthiness and permanence of data through data backup and archival tools

2. Provide at least 3 examples of security tools that can help deter and prevent security breaches.
   - Firewall
   - Access control lists
   - Authentication
   - Monitoring and auditing systems (can mimic a home alarm system)

3. List 3 reasons why a system may have varying degrees of authentication.
   - Sensitivity of data
   - System capabilities
   - Resources

4. Discuss at least 3 ways to ensure authentication, including biometrics, single-sign on, and smart card systems.
    - **Biometrics** and physical user identifiers: fingerprint, retinal scan, voice imprint
    - **Single sign on:** one set of credentials to access many of the logins one uses every day securely (Google, third-party password managers)
    - **Smart cards:** vital information with a self-contained processer and memory
        - Low cost, ease of use, portability and durability, and ability to support multiple applications
        - Encrypted patient information, biometric signatures and personal identification (PIN)
        - Lack standardization and positive identification = ☹

5. Define a digital signature and a wet signature.
    - **Digital signature:** an encrypted digital code appended to an electronic document to verify that it was created by a known source and has not been altered (different keys are used to create and verify digital signature)
    - **Wet signature:** pen to paper signature

6. Explain the legal and regulatory Acts in place for maintaining privacy and security specific to eHealth and technology.
    - PIPA and FIFA: reviewed by a committee every 6 years
        - **PIPA:** Personal Information Protection Act – rules around the collection and disclosure of personal information in "commercial activities" including health
        - **FIFA:** Freedom of Information and Protection of Privacy Act – applies to health authorities and hospitals
    - **BC eHealth Act** (Personal Information Access and Protection of Privacy Act): 2008
        - <u>Purpose:</u> legal framework for eHealth, support the development of a Provincial network
        - <u>3 key initiatives</u>
            1. The Minister can designate any public health database as a Health Information Bank
            2. Gives individuals the right to limit the information disclosed across different Health Information Banks
            3. Allows Health Information Banks to be exempt from following point #2 above

7. Describe the relationship between ethics, law, culture and society.
    - Ethics usually strongly informed by the law, society, and the prevailing culture
    - Ethics exists entirely outside of the law, but guided by our College of Pharmacists Code
    - Goal: for the good of a properly ordered and legal society

8. List at least 5 ways to protect data.
    - Encryption programs
    - Password protection on hardware and software
    - Anti-virus, anti-spyware and malware software
    - Clean computers before discarding
    - Be cautious of, or avoid social media
    - Removal of identifying materials from electronic files and databases