1 a) Importance of healthcare data

→ Informed decision making

Quality improvement

Efficient healthcare management

Personalized care

Population health management

Support for clinical research and innovation

Improved Patient safety

Enhanced communication and coordination.

1 b. Different types of healthcare data

→ * Electronic Medical records

* Medical Images

* Histopathology

* Multi-omics data

* Epidemiological data

* Time series data

* Handwritten clinical notes

* Social network data.

2 a. Health informatics Programs.

→ 1) Degree Programs
- Associate's Degree in health informatics.
- Bachelor's – " ——————
- Master's – " ——————
- Doctorals Programs

2) certificate programs

3) online Programs.

Key organisations

1] American Medical Informatics Association [AMIA]

2) Healthcare Informatics and Management systems society [HIMSS]

3) American Health Informatics Management Association [AHIMA]

4) National e-Health Collaborative [NeHC]

5] Central Bureau of Health intelligence [CBHI]

6) Indian Association for Medical Informatics [IAMI]

Career opportunities

1) Clinical Informatics specialist

2) Health Information Manager

3) Healthcare data analyst

4) Electronic Health Record specialist

5) Chief Medical Information Officer (CMIO)

6) Health Information security officer

2b] ## Fundamental principles of security and privacy

1) Confidentiality

2) Integrity

3) Availability

4) Authentication

5) Authorization

6) Privacy by design

7) Non-repudiation

8) Compliance with regulations

9] Patient Rights and consent

10) Incident Response and Reporting

Challenges associated with the adoption of EHR.

3 a)
1) Financial Barriers
2) Physician Resistance
3) Usability Issues
4) Integration Challenges
5) Workflow disruption
6) Data Quality and Accuracy
7) Privacy and security concerns
8) Training and support
9) Change Management
10) Customisation Needs
11) Scalability Issues
12) Patient Access and Engagement
13) Legal and Ethical Issues.

3b.   E MR   to EHR

* Single org
* Limited interoperability
* Used in small clinics
* May not fully comply with national standards for health info exchange & interoperability
* Limited patient access

Access multiple org.
Emphasizes interoperability
widely adopted across hospitals
Developed to comply.
Designed to enhance patient engagement

[write about data types
  functionality etc]

4 a) Different types of Medical Coding system

1) ICD [International Classification of diseases]
2) CPT [Current Procedural terminology]
3) HCPCS [Healthcare common procedure coding system]
4) DRGs [Diagnosis Related group]
5) NDC [National Drug Code]

Critical for insurance claims and reimbursement claims

4 b) Importance of terminological standards

1) Enhanced Data Accuracy
2) Facilitating interoperability
3) Improving Research and data analysis
4) Support for patient safety and Quality of care
5) Facilitating Education and Training.

5 a) Key Barriers in implementing health health information system.

→ Highcost and financial constraints
Resistance to change
Insufficient training and education
Interoperability issues
Privacy and security concerns
Workflow disruption
Stakeholder engagement
Technical challenges
Regulatory and policy barriers

5 b) Security Principles involved in maintaining privacy and protecting sensitive data in Health informatics.

→ 1. Confidentiality
 - Access controls → RBAC, Audit Trails
 - Data encryption → At Rest, At transit

 2. Integrity
 - Checksum and Hash functions
 - Audit Logs

3. Availability
 - Redundancy
 - Regular Maintainence

4. Accountability
 - User identification
 - Incident Response Plans

5. Least Priviledge
 - Access Management policies
 - Regular Audits

6. Data Minimization
 - Collect only necessary data
 - Regular Data Audits

6 a) Health informatics modules

→ 1] Claims processing automation
 2] Data Management and Integration
 3) Fraud detection and prevention
 4) Improved customer service
 5) Regulatory compliance and reporting
 6) Care management and coordination
 7) Cost management and utilization review

8) Telemedicine Integration

6b) Career Opportunities

- Health informatics specialist
- Clinical Informaticist
- Health Data Analyst
- Health information Manager
- Bioinformatics specialist
- Telehealth coordinator
- Health IT Consultant
- Chief information Officer (CIO) in Healthcare

Essential skills for success in health informatics
- Technical Skills
  - Proficiency in health information technologies, EHR systems and analytical tools
  - Understanding
- Analytical skills
  - Analyze complex datasets, identify trends and generate insights
  - strong problem skills

- Communication skills

- Project Management

- Interpersonal skills

- Adaptibility and continuous learning.

- Knowledge of healthcare systems.

7 a). Key Organisations
- American medical informatics association [AMIA]
- Health level seven International [HL7]
- National Institutes of Health [NIH]
- World Health Organisation [WHO]
- American Health information Management association [AHIMA]
- International Medical Informatics [IMIA]

7 b) Limitations of health informatics
- Technological limitations
  - Interoperability issues
  - Data security and privacy concerns
  - User friendly design
  - High costs of implementation
- Organisational limitations
  - Resistance to change
  - Lack of standardization
  - Inadequate training and support
  - Integration with existing workflow.
- Socio-cultural limitations
  - Public awareness and Understanding
  - Digital Divide
  - Trust issues
  - Cultural sensitivity
- Regulatory and legal limitations
  - Regulatory compliance
  - Liability concerns.

8 a) How Client/Server management systems help ensure the privacy and security of health information in healthcare enterprise.

→ 1) Centralised Data Management
- Controlled access
- Data integrity

2) Authorization and Authentication
- User authentication
- Role based Access control

3) Data Encryption
- Data Transmission security
- Data storage security

4) Audit trails and monitoring
- Activity Logging
- Anomaly Detection

5) Compliance with Regulations
- Regulatory standards
- Data minimisation and retention policies

6) Backup and disaster recovery
- Data Redundancy
- Disaster recovery plans

7) Secure Client Devices
- Endpoint security
- Device management Policies

8) User training and awareness
- Security awareness training
- Phising and social Engineering Prevention

8 b) Key Health information resources

- Electronic health records (EHR) systems
- Health information systems exchange (HIE)
- Clinical Decision support systems (CDSS)
- Telehealth platforms
- Patient Portals
- Data Analytics tools
- Health informatics workforce training and development
- Mobile Health Applications
- Interoperability solutions
- Artificial intelligence and machine learning

9a) Role of authentication and identity management in protecting healthcare data and ensuring secure access

→ 1) Understanding authentication and identity management

- Authentication

  - Methods : Password based authentication

    Multi factor —,, ——

    Biometric —,, ——

- Identity Management

  Components : Access control policies

  Users provisioning and de

  de-provisioning

  Audit trails and monitoring

c] Importance of Authentication

- Protecting sensitive data
    - Patient privacy
    - Regulatory compliance

- Mitigating cybersecurity threats
    - Preventing unauthorized access
    - Reducing insider threats

- Facilitating secure collaboration
    - Inter organisational Data sharing
    - Telehealth services

Best Practices

- Multi Factor Authentication
- Role based Access control
- Regular audits and monitoring
- User training and education.

Challenges

- Complexity of systems
    - Multiple systems
- User compliance
    - Resistance to change
- Balancing security and usability
    - User experience

9b) Database systems

Overview of hospital Database requirement
- Capacity: 50 beds
- specialization: 4 specific diseases

Key data requirements
- Patient information
- staff information
- Room management
- Disease specific data
- Medications
- Appointments and admissions
- Billing and insurance.

Key entities and attributes
1. Patients → (Patient ID
                    FirstName
                    LastName
                    DOB, gender, Contact Number
                    Email, Address, Medical history
                    current disease ID)

2. staff → (staff ID
                FN, LN, Position
                specialization, contact
                No., Email, scheduleID)

3. Room → (Room ID
              RoomType
              BedCount
              currentoccupancy
              status)

4) Disease
   - Disease ID
   - DiseaseName
   - Treatment Protocol
   - SpecialistID

5) Medication
   - MedicationID
   - MedicationName
   - Dosage
   - AdministrationSchedule
   - PatientID

6) Appointment
   - AppointmentID
   - Patient ID
   - Staff ID
   - AppointmentDate
   - AppointmentTime
   - Reason.

7) Billing
   - Billing ID
   - PatientID
   - Total Amount
   - Insurance Coverage
   - Payment status

8) Schedule
   - ScheduleID
   - StaffID
   - WorkDate
   - shift

Check out conceptual design, Relationship b/w entities