

Workshop Section: Developing a Healthcare Interoperability Solution with FHIR

Objective: For this assignment, your group will select one of the provided themes related to healthcare data interoperability and develop a comprehensive plan for its implementation. This plan should address the essential data elements, FHIR resources, medical terminologies, architectural components, and team requirements.

Group Size: 3-5 students per group

Submission: A written report and a 15-minute presentation per group.

Possible Themes for Assignments

(Choose One or create your own!)

1. **Cancer Data Harmonization and Interoperability**
2. **Multisite Clinical Trial Data Management**
3. **Genomic and Clinical Data Integration for Research:**
4. **Real-Time Clinical Decision Support and Patient Safety**
5. **Standardized Data Modeling and ETL for**

Research

Assignment Instructions (for your chosen theme):

For your selected theme, address the following five key areas in your report and presentation:

Part 1: Define Which Data Elements Are Needed

- **Objective:** Identify the core clinical, demographic, and administrative data elements essential for your chosen project.
- **Tasks:**
 - Brainstorm and list all relevant data elements (e.g., patient ID, diagnosis codes, lab results, medication names, visit dates, genomic markers, consent status, etc.).
 - Justify why each data element is critical for the success of your project based on your chosen theme.
 - Consider the granularity and potential sources of this data.

Part 2: Define Which FHIR Resources Should You Use

- **Objective:** Map the identified data elements to appropriate FHIR resources and profiles.
- **Tasks:**

- For each major data element or set of related elements identified in Part 1, determine the most suitable FHIR resource(s) (e.g., Patient, Observation, Condition, MedicationRequest, Specimen, Consent, QuestionnaireResponse, ResearchStudy, etc.).
- Identify if specific FHIR profiles (e.g., US Core profiles, International Patient Summary (IPS) profiles, or disease-specific profiles) are applicable and explain why.
- If a direct FHIR resource mapping isn't obvious, propose how the data might be represented (e.g., using Extension elements, Bundle resources for aggregation).
- Provide examples of how instances of these FHIR resources would represent your data.

Part 3: Define Which Medical Terminologies Should Be Applied for the Coded Elements

- **Objective:** Specify the standardized medical terminologies and code systems to be used for coded data elements.
- **Tasks:**
 - For all coded data elements identified (e.g., diagnoses, procedures, lab tests, medications, body sites, observation values), identify the

appropriate medical terminologies (e.g., SNOMED CT, LOINC, RxNorm, ICD-10-CM, CPT, Orphanet, Gene Ontology, etc.).

- Explain *why* these specific terminologies are suitable for your project, considering their scope, granularity, and interoperability benefits.
- Discuss how the use of standardized terminologies will enhance data quality and semantic interoperability.
- Provide examples of how specific codes would be used within your chosen FHIR resources.

Part 4: Define Which Architectural Components Your Project Will Require

- **Objective:** Design a high-level architectural overview of your proposed solution, outlining the necessary components.
- **Tasks:**
 - **Data Sources:** Identify the types of systems where the raw data would originate (e.g., EHRs, lab information systems, genomic sequencers, patient-reported outcome platforms).
 - **Integration Layer:** Describe how data will be ingested and transformed (e.g., ETL processes, FHIR servers, message queues, APIs).
 - **Data Storage:** Specify the type of data storage

(e.g., FHIR-native server, relational database, data lake, OMOP CDM database) and justify your choice.

- **Processing/Analytics:** Outline any components for data processing, analysis, or machine learning (e.g., analytical databases, machine learning platforms, business intelligence tools).
- **User Interface/Applications:** If applicable, describe the applications or interfaces that would interact with the system (e.g., clinical dashboards, research portals, mobile apps).
- **Security and Privacy:** Briefly discuss how security (authentication, authorization) and privacy (de-identification, consent management) would be addressed within your architecture.
- **Diagram:** Include a high-level architectural diagram illustrating the flow of data and interaction between components.

Part 5: Define Which Kind of Team Will You Need to Implement

- **Objective:** Propose the roles and expertise required to successfully implement and maintain your solution.
- **Tasks:**
 - **Key Roles:** Identify essential team roles (e.g.,

Project Manager, FHIR Architect, Data Engineer, Clinical Informaticist, Software Developer (backend/frontend), UI/UX Designer, QA Engineer, Security Specialist, Medical Terminologist, Domain Expert (e.g., Oncologist, Epidemiologist)).

- **Skills and Responsibilities:** For each role, outline the primary skills, knowledge, and responsibilities required.
- **Team Structure:** Suggest a possible team structure and how these roles would collaborate.
- **Interdisciplinary Nature:** Emphasize the importance of interdisciplinary collaboration for successful healthcare IT projects.