Academic Use EMR

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Introduction

An Electronic Medical Record (EMR) is a digital version of a patient's medical history, including past treatments and medications, and serves as a platform for nurses to document patient observations. Due to the high costs associated with commercial EMR systems, it's impractical for students to use these platforms for training in academic environments. The aim of this capstone project is to create a web-based EMR application that mimics real-world EMR systems. This will allow students to gain practical experience prior to working in the medical field and enable instructors to evaluate students' proficiency with the application.

Requirements

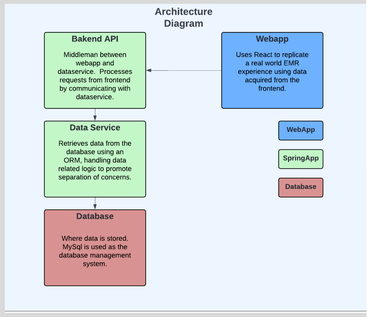
- Web applications looks and acts like other EMRs
- Menu bar at the top, tabs for patient charts, sidebar for note creation and addition to patient files
- Students can select a patient from a list of patients
- Students can traverse a patient's file from the tabs
- Students can insert notes into a patient's file
- Teachers can create and delete patients
- Summary page pulling patient data from backend

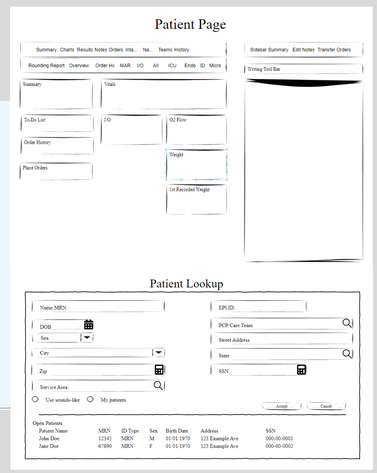
Technology

React: Front-end JavaScript library for building user interfaces based on components
Material-UI: React component library that implements Google's Material Design
Redux: A data store and dispatcher to update state
Docker: Packages software to allow for easy transfer between machines
Springboot: Simplifies development of Spring app
SQL: Database language/logic to store data
Hibernate: Object relational mapper

Design & Implementation

- Our frontend is serviced with an API implemented in a spring boot app that uses layers to separate
  - Controller layer: Entry point for requests
  - Service layer: Handles business logic
  - Repository layer: Fetches data
- We also utilized an Object-Relational Mapper and integrated Spring Security
- Implemented ICD-10 medical coding data scraping from an external website; integrated the data into our database; developed robust search functionality on our platform.





Testing

Front-end:
- Testing end-to-end of all the REST API calls

Back-end:
- J-Unit Testing for CRUD operations using MockMvc
- DataJPATest for testing JPA repositories
- Testing to verify authorization using spring security mock annotations
- Use-case testing

Results

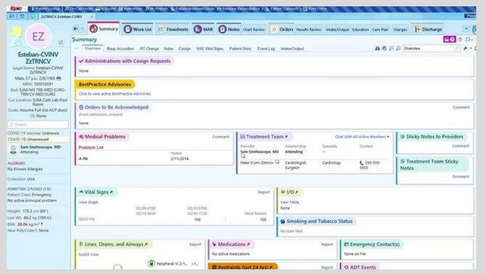
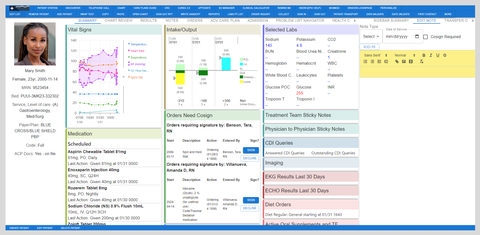


Figure 1:
EPIC EMR
This is the application we were attempting to emulate.

Figure 2:
UNH EMR
This is the current state of our web application



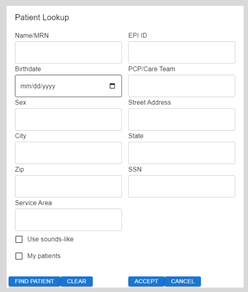


Figure 3:
This is what our Patient Lookup popup looks like in comparison to our early UI Mockup

Evaluation & Conclusion

Other groups will be adding more tabs to the EMR web app, as well as implementing various class features such as an assignment portal, quizzes, and counting clicks that users take. We provided a solid base for the product so going into the future new groups can contribute and develop the EMR. We also gave a Likert survey to various nursing students and educators to judge how useful our application is.

Sponsors

Kundai Midzi – Software Advisor
Clarrisa Michalak – Assistant Professor, Nursing