Patient-First Interoperable Patient-Provider Portal: Group 002 - Final Submission Paper

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1 IMPLEMENTATION AND LINKS

1.1 Team Details

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1.2 External Links

Github Repository: https://github.gatech.edu/ykhan46/CS-6440-Team-Platypus

Jira:https://teamplatypus.atlassian.net/jira/software/projects/SCRUM/boards/1/backlog

Application: https://platypus-htck.onrender.com

Final demo: https://www.youtube.com/watch?v=_fnpo4AVGDY

1.3 Final Task List

More details on our tasks can be found in our Jira projects, linked above in our external links section (1.2).

Summary	Sprint	Assignee	Status
Project Setup: Investigate User Permissions and Github Actions for Pull Requests	Sprint 3	Joey Bishop	Done
Project Setup: Generate Data for the JSON Database using Synthea	Sprint 3	Josephine Bierbaum	Done
Project Setup: Setting up Initial Codebase using React	Sprint 3	Josephine Bierbaum	Done
Project Setup: Setup FHIR JSON Database	Sprint 3	Josephine Bierbaum	Done
Backend API to check login credentials	Sprint 3	Josephine Bierbaum	Done
Documentation: Create initial latex user guide and add endpoint documentation	Sprint 3	Daniel Haseler	Done
Patient/Provider Endpoints: Expand API endpoints for both Patient and Provider	Sprint 3	Daniel Haseler	Done
Frontend for login	Sprint 3	Josephine Bierbaum	Done
Patient/Provider: Login to Website	Sprint 3	Josephine Bierbaum	Done
Patient View: Expand the Endpoints for Patient Information	Sprint 3	Joey Bishop	Done
Patient/Provider: Logout of Website	Sprint 3	Josephine Bierbaum	Done
Provider Endpoint: Setup JSON Database containing credentials for Patient Details	Sprint 3	Tung Duong	Done
Project Research: FHIR API Endpoints Design	Sprint 3	Yaseen Khan	Done
Provider View: Add a new Patient to Patient List	Sprint 4	Josephine Bierbaum	Done
Provider View: Search for a Specific Patient	Sprint 4	Josephine Bierbaum	Done
Render Deployment	Sprint 4	Tung Duong	Done

Patient View: View Medical Information	Sprint 4	Tung Duong	Done
Patient View: Edit Medical Information	Sprint 4	Tung Duong	Done
Add communication/chat between Patient and Provider	Sprint 4	Josephine Bierbaum	Done
Project Deployment	Sprint 4	Joey Bishop	Done
Provider View: View Patient's Medical Information	Sprint 4	Joey Bishop	Done
Record Sprint #4 demo	Sprint 4	Daniel Haseler	Done
Create endpoints to retrieve observation data	Sprint 4	Josephine Bierbaum	Done
Provider View: Edit Patient's Medical Information	Sprint 5	Joey Bishop	Done
Provider View: Implement Appointment Scheduling (with information and confirmation in Patient page)	Sprint 5	Tung Duong	Done
Frontend styling updates	Sprint 5	Joey Bishop	Done
Patient View: Share Medical Information to Provider	Sprint 5	Yaseen Khan	Done
Patient View: Accepting/Denying Information Requests	Sprint 5	Yaseen Khan	Done
Provider View: Add Comments to Patient Data	Sprint 5	Josephine Bierbaum	Done
Project Demo: Record a Demo of the Patient-Provider Full-Stack application	Sprint 6	All	Done
Project Demo: Write Deployment Instructions on the README.md file	Sprint 6	All	Done

2 PROJECT SUMMARY AND DISCUSSION

2.1 Background and Need

In modern healthcare, the exchange of patient information remains fragmented across multiple providers and systems, even as the amount of data collected increases. Patients often see a range of specialists, such as a primary care physician, cardiologist, or therapist, each of whom use distinct portals or electronic health record (EHR) systems. While interoperability standards exist (such as HL7 and FHIR (Fast HealthCare Interoperability Resources)) to address these issues, consistent access for patients is still unreliable. Practically, this means many patients have issues accessing their records, managing who can see their data, or sharing information between providers.

Evidence shows that improved patient access to records results in several positive outcomes. One study in the *Journal of the American Medical Informatics Association* found that patient access to records was associated with better engagement, improved error detection, and resulted in overall better health outcomes (Goldzweig et al., 2012). Another review supported the positive relationship between access to EHRs and patient satisfaction and engagement, though it did not observe statistically significant improvements in health outcomes (Tapuria et al., 2021). A third review also found a much higher patient engagement in their health when provided improved EHR access, and further recommended research in the relationship between access and health outcomes (Alomar et al., 2024).

Many existing patient portals are provider-centered and limited in scope, focusing on the needs most relevant to providers (like scheduling or billing) rather than individual patient needs. This may be partly due to organization factors including profit incentives, as one study shows that economic factors often lead to resistance to the adoption of patient-forward, transparent systems. This is likely because such information may be monetized or become a liability for providers when access is patient-driven (Holmgren et al., 2023). Therefore, development of such a system may be unlikely to be led by a profit-motivated provider, and must be developed by a patient-focused third party.

2.2 Solution and Implementation

This project aims to resolve a need in the healthcare system: providing patients meaningful control over their records, across providers and systems. Our patient-provider sharing platform places patients at the center of their data management, addressing their primary goals first, and uses the FHIR standard.

The system includes a patient-facing portal where users can view and manage their health information (such as charts, medications, allergies, appointments, and billing records). From this portal, patients have the ability to view and select what subsets of information to share with providers. They can select from conditions, medications, encounters (ex: appointments), observations, and vaccinations. A code is generated for the patient to share with their provider to authenticate. Patients can also chat with their providers and view provider comments.

On the provider side, a secure portal allows clinicians to view patient charts once granted access. They can search for a patient and enter the patient's code to authenticate. After authenticating, the provider can view patient information, chat with patients, and share comments about the patient's health data that are visible to the patient. If more data is needed, providers can request additional data access from the patient, which the patient can choose to approve or deny.

Overall, the solution will integrate patient-centered access and control with interoperable standards to bridge the gap between patient agency and provider needs. By aligning patient-centered design with FHIR, this project not only supports scalability across existing EHR platforms but extends the underlying objective of FHIR.

2.2.1 Solution Specific: Patient-First Features

Patient portals enable patients to access their healthcare data and may improve patient-provider communication and patient engagement and interest in their healthcare data. Studies have shown that some patient portals improve patient engagement, but some patients have concerns about providers having unrestricted access to their data (Dendere et al., 2019). Our application solves this issue by putting the data access policy into the hands of the patient, who chooses what types of data a provider can access. If needed, providers can request for additional data if the patient did not grant them access to view it.

Additionally, a preliminary study on giving patients access to provider appointment notes found that patients anticipated having greater trust and understanding of their medical conditions and their visits (Delbanco et al., 2010). Our patient-provider portal enables communication between patients and providers via a chat system and provider comments on patient data. By giving patients and providers a direct method of communication in addition to notes, we hope that patients will have more understanding about their data and more trust in their providers.

2.3 Discussion and Future Work

Overall, we accomplished our goal of creating a patient portal that is patient focused and gives patients control over the access to their healthcare data. If we continued the project, we could build out more features for the provider, such as billing and sending prescriptions to a pharmacy. Additionally, a quick summary at the top of the patient data categories could be added to see the highlights of the data without reading through the list of items.

If we wanted to make our patient portal publically available, we would need to conduct beta tests with some real patients and providers to make sure that we are meeting their needs and expectations. User feedback could be used to add additional features or fine tune the existing features to meet the user's needs better. Additionally, if we had actual users, it's likely that a database would be a better solution to store the data instead of json files. It would also be helpful to conduct a study of our application with users to confirm that the application solves the need for patients getting meaningful control over their records.

2.4 References

1. Alomar, Dalia, Almashmoum, Maryam, Eleftheriou, Iliada, Whelan, Pauline, and Ainsworth, John (Nov. 2024). "The Impact of Patient Access to Electronic Health Records on Health Care Engagement: Systematic Review." eng. In: *Journal of medical Internet research* 26. Place: Canada, e56473. ISSN: 1438-8871 1439-4456. DOI: 10.2196/56473.
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Place: United States, pp. 121–125. ISSN: 1539-3704 0003-4819. DOI: 10 . 7326 / 0003 - 4819 - 153 - 2 - 201007200 - 00008.

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4. Goldzweig, Caroline Lubick, Towfigh, Ali Alexander, Paige, Neil M., Orshansky, Greg, Haggstrom, David A., Beroes, Jessica M., Miake-Lye, Isomi, and Shekelle, Paul G. (July 2012). *Systematic Review: Secure Messaging Between Providers and Patients, and Patients' Access to Their Own Medical Record: Evidence on Health Outcomes, Satisfaction, Efficiency and Attitudes.* eng. Book Title: Systematic Review: Secure Messaging Between Providers and Patients, and Patients' Access to Their Own Medical Record: Evidence on Health Outcomes, Satisfaction, Efficiency and Attitudes. Washington (DC).
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3 TECHNICAL DOCUMENTATION

3.1 User Manual

The PLATYPUS Patient-Provider Portal is deployed and accessible at: https://platypus-htck.onrender.com. No installation or setup is required to use the live application. Simply navigate to the URL above in your web browser.

Full instructions and technical documentation is available on our GitHub repo here:https://github.gatech.edu/ykhan46/CS-6440-Team-Platypus/blob/main/User Guide.pdf

3.1.1 Login Process

1. Navigate to https://platypus-htck.onrender.com
2. Click the login button on the main page
3. Enter your username and password in the popup dialog
4. Click Login to authenticate
5. You will be automatically redirected based on your user type:
    a. Patients are redirected to their personal chart view
    b. Providers are redirected to their dashboard

If login credentials are incorrect, an error message will be displayed. Users attempting to access protected pages without authentication will be automatically redirected to the login page.

3.1.2 Patient Features

Personal Health Chart

After logging in, patients can view their comprehensive health information organized into collapsible sections:

- Demographic Information: Name, date of birth, gender, address, and phone number
- Health Conditions: Current and past medical conditions with onset dates
- Vaccinations: Complete vaccination history with dates and locations
- Past Encounters: Medical visits, appointments, and procedures with provider and location details
- Recent Observations: Latest lab results, vital signs, and other clinical measurements

Chart Navigation

- Use the Expand All / Collapse All button to show or hide all sections at once
- Click on individual section headers to expand or collapse specific sections
- The Demographics section is expanded by default for quick access to basic information
- If an item in a section was commented on by a provider, it will have a green lightbulb icon next to the item name.

- Clicking the lightbulb icon for an item will show the provider(s)' comments. Click outside of the popup to close

Accept/Deny Appointments

1. Navigate to the My Appointments section
2. The patient can view confirmed appointments with their provider, and have the option to confirm and cancel upcoming appointments
3. After clicking Confirm or Cancel, there is a confirmation screen that pops up to confirm the choice
4. If the patient confirms, the appointment will show as confirmed in both the patient and provider view
5. If the patient cancels, the appointment will show as cancelled in the patient and provider views

Accept/Deny Provider Requests

A provider can send a request to a patient to receive access to a restricted section set by the patient. Near the bottom of the patient chart, the patient can accept/deny medical requests from the provider

1. Navigate to the Access Requests section
2. A provider request contains: Provider Name, Requested Sections, Reason, Date Requested
3. For each request, the patient can either click on the Allow Access or Deny button
4. If the patient selects Allow Access, the provider will be able to see the new sections they requested in the provider view.
5. If the patient selects Deny, the section the provider requested will continue to be locked.

Share Medical Information

At the bottom of the patient health chart, the patient can view their current sharing settings of all the providers that have access to the patient's information

- Expand the Sharing Settings Section
- Click on each of the checkboxes to enable/disable access to specific medical sections for the provider

- The patient can enable/disable: Demographics, Conditions, Medications, Encounters, Lab Results, Vaccinations
- Click on the Save Button to save the changes. The changes apply automatically in the provider view
- To remove a provider, click on the Remove Provider Button
- A confirmation dialog will popup to confirm the changes
- If removed, the provider will no longer have access to the patient's medical information and cannot add the patient without an access code
- To add a provider, enter the provider ID in the input field and click on Find Provider
- If the provider was found, select the medical sections for the provider to have access to
- Click on Save and Generate Code to finish adding the provider
- A new access code is automatically generated for the provider to use to add the patient to their list

Logout Process

1. Click the person button in the bottom toolbar (farthest right)
2. Click the Logout button that shows below where the person button was clicked
3. You will be logged out and directed to the login page
4. If the silhouette button is accidentally clicked, click away from the Logout button to hide it

3.1.3 Provider Features

Navigation

The provider interface includes a left navigation panel with the following sections:

- Patients: Main patient management dashboard
- Schedule: Appointment and scheduling management

Patient Management Dashboard

Providers have access to a comprehensive dashboard with the following features:

- Patient List: View all patients currently under their care
- Patient Search: Search for and add new patients to their practice

- Patient Data Access: View detailed patient information for authorized patients

Adding Patients to Practice

1. Click Search for Patients button on the dashboard
2. Enter the patient's ID in the search field
3. Click the search icon to verify the patient exists
4. The patient's name will be displayed for confirmation
5. Enter the required access code in the provided field
6. Click Add Patient to complete the process

If the access code is correct, the patient will be added to the provider's patient list and the page will refresh. Incorrect access codes will display an error message.

Viewing Patient Data

1. From the Patient tab on the provider dashboard
2. Locate the desired patient in the patient list table
3. Click the View Data button (open icon) in the corresponding row
4. Access the patient's complete medical information

Requesting Patient Information Access

A provider can request access to a restricted section of a patient's medical record.

1. Follow the Viewing Patient Data steps to navigate to the patient page
2. Select on Request Access on a locked section
3. Confirm the selection and write a reason why the provider needs access
4. Click on the Send Request button for the patient to receive the request
5. Click on the Access Requested button to view the status of the request
6. Once the patient accepts the request, the provider will be able to view the requested section.
7. If the patient denies the request, the provider will continue to not see the restricted sections.

Adding/Editing Comments on Patient Data

1. While viewing patient data, the provider can double click on an item name within a section to add a comment
2. Type the comment in the text box

3. Click Save Comment to save the comment
4. Existing comments will be indicated by a lightbulb icon next to the item name.
5. To edit an existing comment, click the lightbulb icon
6. Click outside of the popup to close without saving the comment

Chatting with a Patient

1. From the Patient tab on the provider dashboard
2. Locate the desired patient in the patient list table
3. Click the Chat button (chat bubble icon) in the corresponding row
4. The chat page will open with a history of the conversation
5. To view prior chat history, scroll up to view older messages
6. To write a new message, type in the text box and click the Send button (paper airplane icon).
7. The page will reload to show the latest chat message in the conversation

Scheduling Appointment with a Patient

1. Navigate to the Scheduling tab on the left for the provider dashboard
2. Click on the New Appointment Button
3. A New Appointment Form will display
4. Enter the Patient ID and click the Find Patient Button to verify the patient name
5. Select the date using the calendar view (click on the calendar icon to show the calendar)
6. For Start time, click on the clock icon and select the start time for the appointment
7. Enter a name for the appointment
8. Click on the Schedule Button to confirm the appointment creation
9. The appointment will show as pending until the patient confirms or denies the appointment

Logout Process

1. Click the person button in the top toolbar (farthest right)
2. Click the Logout button that shows below where the person button was clicked
3. You will be logged out and directed to the login page

4. If the silhouette button is accidentally clicked, click away from the Logout button to hide it

3.2 Architecture Diagram

Our application's architecture includes a single JSON database, a Python backend with separate controllers for patients and practitioners, and a TypeScript/React frontend with an accompanying web server (Figure 1).

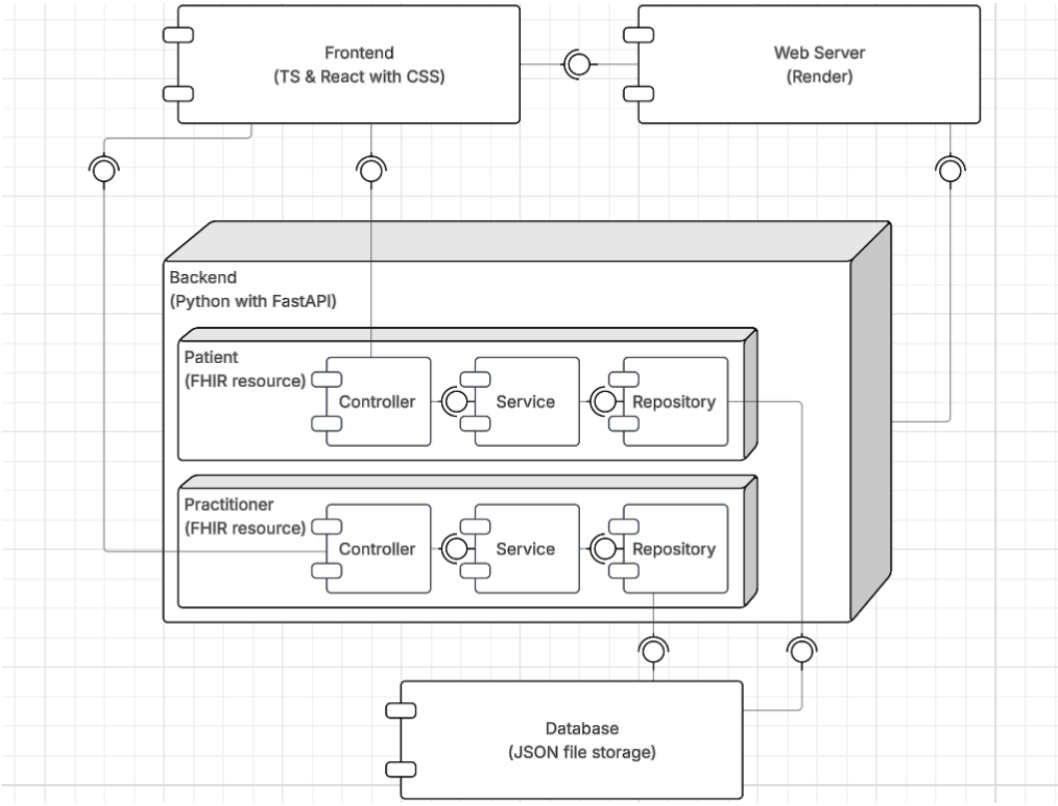

Figure 1—*The architecture diagram.*

3.3 Mockups

Three screen mockups were provided to illustrate the primary user flows that the application supports. The patient flow is represented with a mobile layout. Mockups for the patient login screen and chart view are provided in Figure 2.

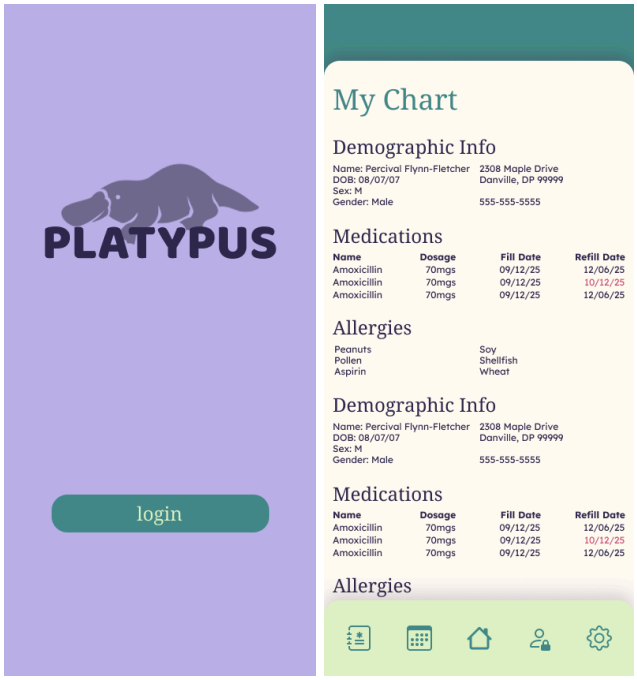

***Figure 2**—The patient login screen (left) is very minimal, with the app logo and a login button. The chart view (right) includes a scrolling page that covers the patient's full chart. A bottom navbar includes options for appointments, provider sharing settings, and app settings.*

The provider flow (Figure 3) is represented with a desktop layout, and a mockup for the provider dashboard is provided.



***Figure 3**—The provider dashboard includes a horizontal taskbar and a vertical navbar. The navbar supports a patients view and scheduling view. The main content displays the selected patient's chart.*