SMART-on-FHIR app to pull PDMP

Deliverable 4
Link to Video: https://youtu.be/TH07_KiuXYw

Team Code Blue • 2019.04.21

Today I, Laura Pike, along with Alison Huang and Adam Sligar will present team Code Blue's Final Project for spring 2019 Health Informatic course at GA Tech. Our project was a SMART-on-FHIR app that clinicians in all settings and on all systems can view a patient's Prescription Drug Monitoring Program or PDMP report. Providing clinicians with patient PDMP status will help support pain management and opioid dispensing compliance, the first step in tracking the opioid crisis.

Introduction

- Project Goals and Objectives
- Languages and Tools
- Architectural Design
- Gantt Chart
- Project Successes
- Project Future Plans
- Demo

In this presentation we will look at the project goals and objectives, the languages and tools we used, the architectural design, the project timeline or Gantt Chart, followed by project successes, project future plans, and finally, a demo of our finished application.

Project Goals and Objective

- SMART-on-FHIR open source model app to be applied by public hospital districts and underserved clinics and providers
- High-value patient Rx safety solution
- Provide patient safety and extend national investment in Certified EHR systems

Our goals and objectives for the PDMP report application was to provide a solution that is affordable, accessable, and easy to use. Our solution is:

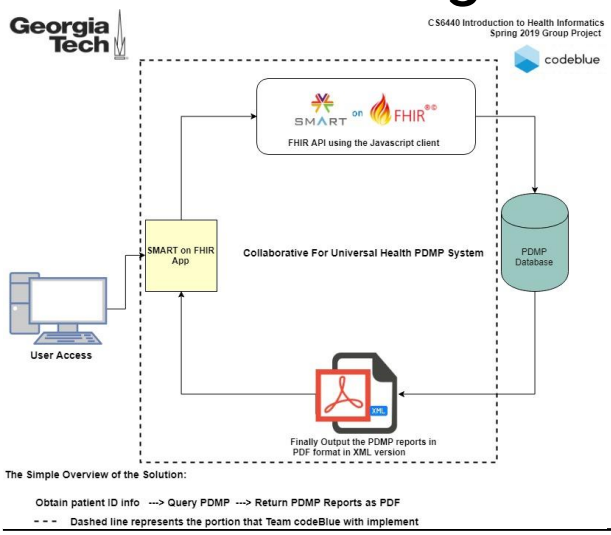
- a SMART-on-FHIR open source model app that can be applied by public hospital districts and underserved clinics and providers across the land.
- a compelling high-value patient Rx safety solution, which will help open doors to new generations of SMART-on-FHIR app solutions.
- And will provide patient safety and extend the national investment in Certified EHR systems.

Languages and Tools

- JavaScript
- Angular
- Material UI
- Docker
- Jenkins
- Health Data Analytics Platform (HDAP)

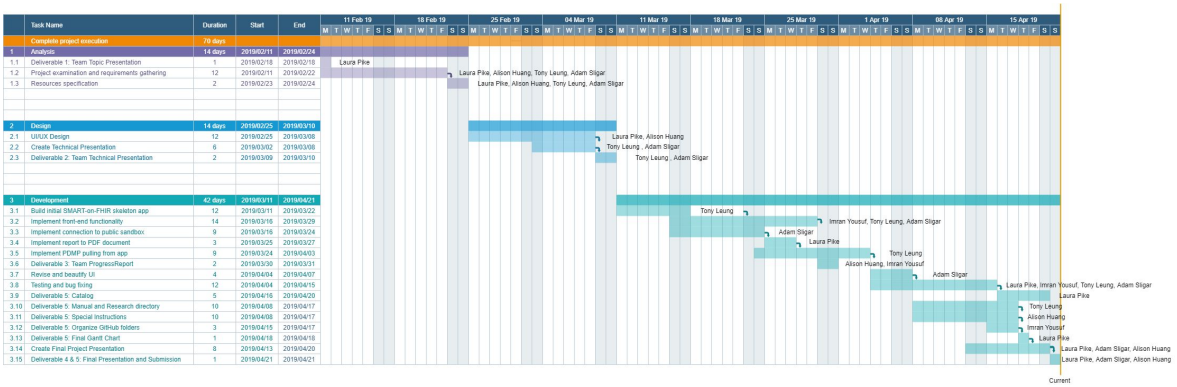
We have built a SMART-on-FHIR app using JavaScript, Angular, and Material UI. Angular and Material UI are frontend frameworks for building web-based applications. We have also created a working pipeline with jenkins and used docker to containerize our app. Finally, we used HDAP or the Health Data Analytics Platform, to obtain synthetic patient data.

Architectural Diagram



This is the architectural design of our final application. The components enclosed by the dotted lines represents the SMART-on-FHIR app that team Code Blue implemented. The SMART-on-FHIR app is intended to launch from the context of an EHR integration. The app then communicates and makes a request to the FHIR test server MedicationDispense Search APIs, which is represented by the PDMP Database. The FHIR server pulls data from their systems and allows the data to be displayed or exported as PDF. Our application does not directly integrated with an EHR, so does not including the OpenID connect integration.

Gantt Chart



	Task Name	Duration	Start	End
	Complete project execution	78 days		
1	Analysis	14 days	2019/02/11	2019/02/24
1.1	Deliverable 1: Team Topic Presentation	1	2019/02/18	2019/02/18
1.2	Project examination and requirements gathering	12	2019/02/11	2019/02/22
1.3	Resources specification	2	2019/02/23	2019/02/24
2	Design	14 days	2019/02/25	2019/03/10
2.1	UI/UX Design	12	2019/02/25	2019/03/08
2.2	Create Technical Presentation	6	2019/03/02	2019/03/08
2.3	Deliverable 2: Team Technical Presentation	2	2019/03/09	2019/03/10
3	Development	42 days	2019/03/11	2019/04/21
3.1	Build initial SMART-on-FHIR skeleton app	12	2019/03/11	2019/03/22
3.2	Implement front-end functionality	14	2019/03/16	2019/03/29
3.3	Implement connection to public sandbox	9	2019/03/16	2019/03/24
3.4	Implement report to PDF document	3	2019/03/25	2019/03/27
3.5	Implement PDMP pulling from app	9	2019/03/24	2019/04/03
3.6	Deliverable 3: Team ProgressReport	2	2019/03/30	2019/03/31
3.7	Revise and beautify UI	4	2019/04/04	2019/04/07
3.8	Testing and bug fixing	12	2019/04/04	2019/04/15
3.9	Deliverable 5: Catalog	5	2019/04/16	2019/04/20
3.10	Deliverable 5: Manual and Research directory	10	2019/04/08	2019/04/17
3.11	Deliverable 5: Special instructions	10	2019/04/08	2019/04/17
3.12	Deliverable 5: Organize GitHub folders	3	2019/04/15	2019/04/17
3.13	Deliverable 5: Final Gantt Chart	1	2019/04/18	2019/04/18
3.14	Create Final Project Presentation	8	2019/04/13	2019/04/20
3.15	Deliverable 4 & 5: Final Presentation and Submission	1	2019/04/21	2019/04/21

Link to Gantt Chart: https://b.gatech.edu/2UzAK48

This is our completed Gantt chart illustrating the tasks performed and who worked on them. We spent the first two weeks exploring what PDMP report applications were currently available and meeting with our 3rd party mentor to understand what they wanted. In honing down on the scope, we found that it would not be possible for us to integrate with an EHR, so did not including the OpenID connect integration which our mentor would have liked. However, requesting a PDMP report based on user input of a patient ID was acceptable. From here we were then able to create the architectural design, and decide on the language and tools to use. By the fifth week we were able to create a skeleton app of the application. In weeks 6 and 7, we focus on implementing the connection to the public sandbox and create our docker container for our application. In weeks 7 and 8, we implemented the heart of our application, the PDMP pull from HDAP and implemented the PDF report download. This allowed us to focus the next two weeks on testing, debugging, style, and making sure it met the needs of our mentor. We then spent the last two weeks on documentation and the final presentation. In the next slides, Alison will take us through our successes, the future plans, and then Adam will give a demonstration.

Project Successes

- Made all deadlines for deliverables
- Successfully established our test environment
- implemented the SMART-on-FHIR PDMP app based on the specific requirements
- Turn the app over to C4UH through a public GitHub account

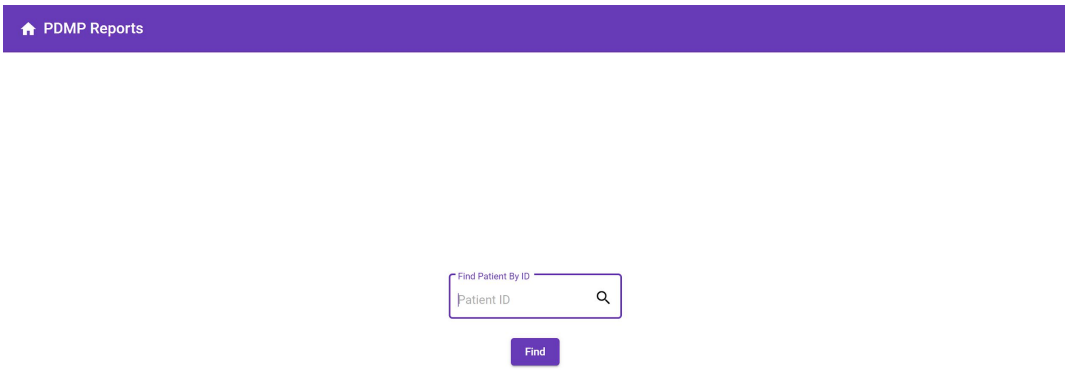
In the past 10 weeks, team Code Blue has been able to stay true to our timeline. We have successfully met all our milestones. By week 7, we had created a working pipeline with jenkins and used docker to containerize our app and connected with the HDAP server to obtain synthetic patient data. Within the next week, we had completed the implementation of the SMART-on-FHIR PDMP application to the satisfaction of our mentor with Collaborative for Universal Health, or C4UH. The finished application will be turned over to C4UH through a public GitHub account.

Project Future Plans

- Seamless access to state PDMPs is critical to support the fight against the opioid crisis
- SMART on FHIR holds promise as a technology approach to integrate data into clinical workflow in a simple way
- Pilots of the app are envisioned on a state and national level with the goal of making this SMART on FHIR app for PDMP a major piece of the technology armamentarium to fulfill this critical need
- Other information domains, including behavioral health, public health and social determinants of health will be able to integrate this type of SMART on FHIR approach

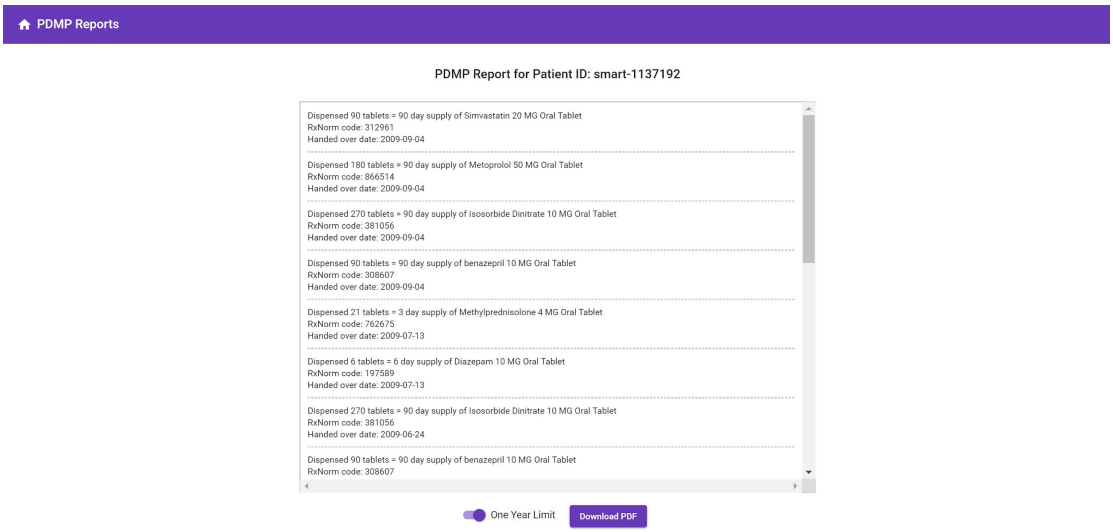
- Intro script: Upon finalizing our Smart-on-FHIR PDMP report app, we will place it on a public GitHub account allowing our mentor with Collaborative for Universal Health, or C4UH, to utilize it. The following are the benefits and plans they see for this app:
- seamless access to state prescription drug monitoring programs is one of the critical pillars to support our national fight against the opioid crisis.To date, getting this information into the workflow of clinicians (doctors, nurses and others) has been an inconsistent effort
- SMART on FHIR holds promise as a technology approach that can leapfrog continuing roadblocks to integrate this data into clinical workflow in a simple way
- pilots of the app are envisioned on a state and national level with the goal of making this SMART on FHIR app for PDMP a major piece of the technology armamentarium to fulfill this critical need
- other information domains, including behavioral health, public health and social determinants of health that are not present in current clinical workflow can also be integrated, using this type of SMART on FHIR approach as a model for effective action

SCREEN ONE



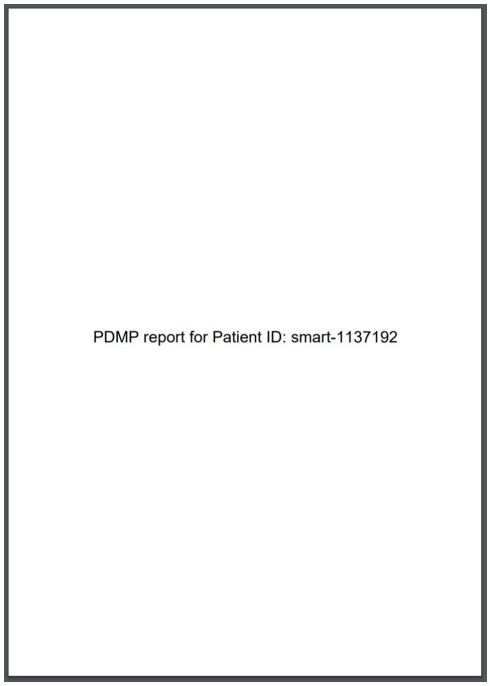
Alison: As Laura mentioned before, The current layout of PDMP Reports does not require the OpenID connect integration and no user authentication is needed, thus making our SMART-on-FHIR app more user friendly. When in need of searching for a specific patient ID, simply move the mouse cursor to the search box, and enter the ID number followed by clicking “Find”, the app will then connect with the FHIR server and pulls corresponding information from the PDMP database and display on the webpage that is ready to be downloaded in PDF format.

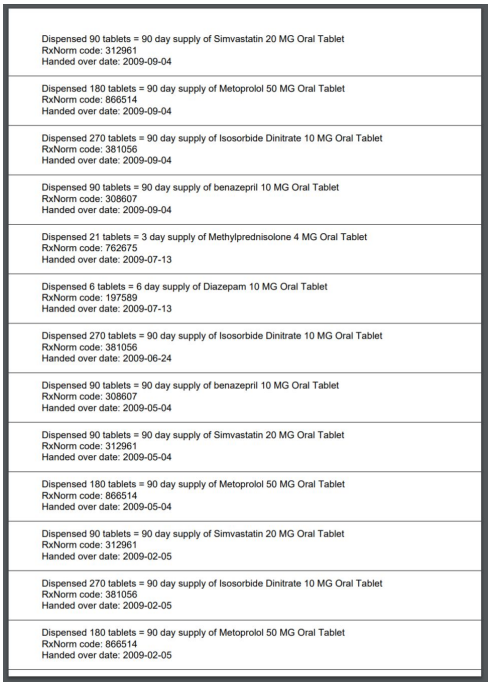
SCREEN TWO



Alison: Here a list of patient's information has been retrieved and displayed on the screen. It shows a patient's information pulled from the PDMP database in conjunction with FHIR server communications.The report would contain important prescription information such as the Date Displayed, Quantity, Strength, Days, Drug Name, Dispenser, City, Prescriber, the Patient Name , etc. Currently we are using synthetic dataset to test the app which contains information of Quantity, Strength, Days, RxNorm code, and Receiving Date. There is also an option of truncating the medical history to 1 year history by toggling the "One Year Limit" button to the right

To export the report, simply click "Download PDF" button, the report will be saved in a local computer.





Alison: The downloaded pdf report is illustrated here. Adam will give you a live demo next to go thru the entire process.

LIVE

https://cs6440-s19-prj015.apps.hdap.gatech.edu/

We have containerized our app and anytime there is a pull request and a merge to master a new version of the app is built and is deployed to the server. Here is a live demo of our app running on the server!

Conclusion

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Jing Huang
Tony Leung

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This concludes team Code Blue's presentation on the SMART-on-FHIR Prescription Drug Monitoring Program.