# Introduction

The recent final ruling coming from ONC’s Cures Act has raised new healthcare related challenges. While there are several key requirements, or mandates, in this ruling, the one around the mandatory use of FHIR® has lit a fire under the industry.  We have come together to leverage our resourcefulness and innovative thinking to define a creative solution to address the disconnect between high-risk COVID-19 patients and routine monitoring by way of Remote Patient Monitoring.

# Scope

Our hack proposes a companion bot for remote health monitoring of high-risk patients diagnosed with COVID-19.

**The companion bot will:**

* increase the recovery of high risk COVID patients
* reduce the number of occupied beds in hospitals
* increase the availability of clinical staff
* reduce the strain on EMS staff
* reduce medical costs for providers and patients

The companion bot will attend to the basic needs of its patients: companionship while in quarantine, consistent support and feedback, real-time monitoring and alerting. This real-time monitoring would enable the patients to receive the timely support they need, in the comfort of their own home, with quality care at a more economical rate. Patients will be able to interact with the companion bot via SMS, Email and a WebApp. Clinicians will be able focus on the data and feedback that matters with the use of the clinical facing dashboard that brings proper attention to critical needs. Furthermore, de-identified versions of this data could be used by researchers to further improve care, clinician and patient alerting and the companion bot overall.

# User Stories in the Healthcare Crisis

Approximately 133 million Americans, representing more than 40% of the total population of this country are affected by incurable and ongoing chronic diseases. This number is projected to grow to an estimated 157 million, with 81 million having multiple conditions (4). Patients with chronic diseases are at significantly greater risk for acquiring COVID-19 and subsequent mortality from the virus according to the CDC (5).

Over a third of adults report that COVID-19 has negatively impacted their ability to receive medical care. And for patients living with chronic diseases, the combination of disruptions or delays in care and shifting daily routines can make it even more challenging to manage their health. During Covid-19, it’s critical that care teams continue to prioritize the ongoing needs of patients living with chronic diseases—and identify any new barriers to self-management. (2)

One way to provide this support and coordination is to provide a easily assessible companion to ask and answer questions of these patients real-time.

**Patient Example 1:** 67 year old, female in rural SC, with COPD, Diabetes, and Kidney Failure. No family nearby, 10 specialists, immobile, with COVID with mild symptoms.

**Patient Example 2:** To build the companion bot, the use case focuses on an 75-year old male, in an independent living unit in a long term care facility. He has pre-existing diagnoses of Diabetes II, hypertension, and is at risk for a heart attack.

**Patient Example 3:**

# Team Members & Roles:

|  |  |  |  |
| --- | --- | --- | --- |
| Member(s) | Experience | Team Role | Tasks |
| Tia Pope | Health Informatics Researcher, Developer, Product Manager | Lead | * Project Scope * Define & Delegate Tasks * Assist with all areas * Possibly Present Outcome |
| Anju Philip | Medical Informatics, Healthcare Solution Architect, and IT Operations | Design Solution Architect | * Work with Rajeev, Tia & Cori to design a feasible solution * User Stories * Mockups |
| Rajeev Pillai | Solution Architect (Medical Imaging) [EDT] | Technical Solution Architect | * Work with Anju, Tia & Cori to design a feasible solution * Architectural Diagrams * Mockups |
| Cori Thompson | Health Informatics Professional, Business Analyst (PST) | Project Manager & Designer | * Work with Rajeev, Tia & Anju to design a feasible solution * UML Diagraming * Mockups |
| Furqan Rauf | Software developer | Developer | * Work with Jusitn to build a POC (which may not work with tools we pick but illustrates how the app will function) |
| Jusitn N | Software developer | Developer | * Work with Jusitn to build a POC (which may not work with tools we pick but illustrates how the app will function) |
| Natonya Taylor | TBD | Designer & Tester | * Mockups * Presentation Testing |
| Daniel Ratschiller, Khoa Ngyuen, Dpatha, James Stone | TBD | Testing, Research, Development | Will assign task once they engage. |

# Technical Design

**Overall Structure:** Doesn’t have to be mobile specific, we can create a progressive web app (mobile compatible) that takes in patient data via mobile or web ---> to FHIR ---> which could be either 1) compiled in to a CDM or EHR for research or tied to alerts for physician monitoring, etc. So many ways we can go.

* **What Data will be Collected?**
* **What will the Dashboards look like?**
* **Security Components?**
* **Alerting & Reminders?**
* **Example Conversation & Communication with Bot.**

1. **Architecture**
   1. UI & Basic Function – Bot Layer on SMS, Email, WebApp
   2. Physical Device\* (optional) – we can utilize MS IOMT
   3. AI Bot – Create one or utilize established tools like: <https://github.com/microsoft/botframework-solutions>
   4. Databases
   5. FHIR & OMOP: Propose OMOP on FHIR: <https://github.com/omoponfhir/omoponfhir-main> or Azure FHIR API with OMOP connector: <https://github.com/Microsoft/fhir-server-samples>
2. **Diagrams**
3. **Wireframes/UI Mockups**

# User Manual

# Future Work

# References:

1. MS Reference:
2. Chronic Management: <https://www.advisory.com/daily-briefing/resources/primers/5-ways-to-adapt-chronic-disease-management-during-covid-19>
3. Support Doc: <https://www.advisory.com/-/media/Advisory-com/COVID-19/Covid19-Chronic-Disease-resource.pdf>
4. <https://nationalhealthcouncil.org/wp-content/uploads/2019/12/AboutChronicDisease.pdf>
5. <https://www.healio.com/news/rheumatology/20200430/cdc-offers-guidance-to-patients-with-chronic-disease-living-with-uncertainty-during-covid19>

# Appendix:

Centers for Disease Control and Prevention. [cited 2020 Jun 15]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html>

Institute for Healthcare Improvement. [title, date]. [cited 2020 Jun 15]. Available from: [http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx](https://slack-redir.net/link?url=http%3A%2F%2Fwww.ihi.org%2FEngage%2FInitiatives%2FTripleAim%2FPages%2Fdefault.aspx))

<https://www.beckershospitalreview.com/healthcare-information-technology/5-top-reasons-why-remote-patient-monitoring-is-destined-to-take-off.html> ~~As the nation moves from uncoordinated fee-for-service delivery of health services to a coordinated, accountable and patient-centric fee-for-value model, the ability of hospitals and physician practices to survive and thrive will depend on whether they can achieve the triple aim of higher-quality )~~

<https://www.healthcareitnews.com/news/guide-connected-health-device-and-remote-patient-monitoring-vendors> ~~Now more than ever, in the midst of a pandemic, healthcare IT leaders can use a comprehensive listing of companies that make technologies that help keep tabs on patients from afar.~~

Observational Health Data Sciences and Informatics [OHDSI]. OMOP Common Data Model. 2020[cited 2020 Jun 15]. Available from: <https://www.ohdsi.org/data-standardization/the-common-data-model/>

BlueCross Health Index : <https://www.bcbs.com/the-health-of-america/health-index#:~:text=The%20Blue%20Cross%20Blue%20Shield,BCBS%20members%2C%20commercially%20insured%20Americans.> ( RKP)

Additional Reference on Alternate Framework: <https://smarthealthit.org/smart-markers-a-framework-for-patient-generated-data/> (RKP)