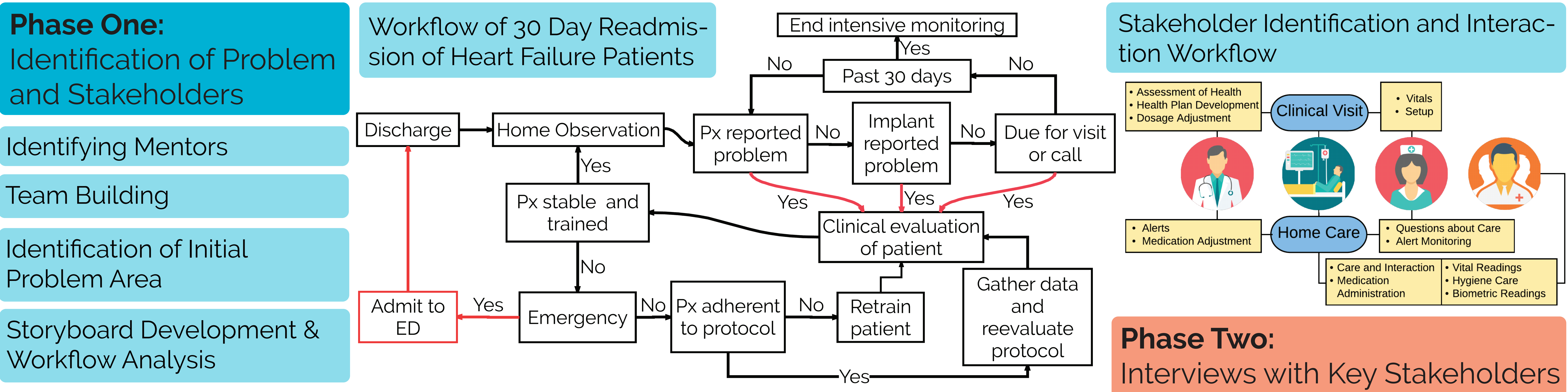# Heart on FHIR: Integrating Patient Generated Data into Clinical Care To Reduce 30 Day Heart Failure Readmissions

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BIOMEDICAL INFORMATICS AND MEDICAL EDUCATION

Problem & Approach

30-day readmissions are extremely costly for hospitals. Heart failure patients are particularly vulnerable following an exacerbation event, and so need to be tracked closely following discharge. However, data tend to be siloed, the patient may fail to retain or accurately interpret home care instructions, and the self-management plan may not be fully communicated to the patient. Additionally, data collected by the patient may not be accurately reported, and are often collected on paper, which makes interpretation during the clinical encounter difficult. We propose a user-centred design approach to developing an application that facilitates the collection of patient generated data (PGD), integrates these data into the EHR using SMART on FHIR, and provides application interfaces tailored to each stakeholder.

Design Process

Phase One:
Identification of Problem and Stakeholders

- Identifying Mentors
- Team Building
- Identification of Initial Problem Area
- Storyboard Development & Workflow Analysis

Workflow of 30 Day Readmission of Heart Failure Patients

Stakeholder Identification and Interaction Workflow

Phase Two:
Interviews with Key Stakeholders

Doctors
"I only have **30 minutes** with a patient"
"It's hard to tell when a patient is being **dishonest or forgetful**"
"Which Patient Generated Data I would collect **depends on the patient**"

Nurses
"Patients **don't always understand** the health information provided"
"I get many **questions** from patient caregivers and families"
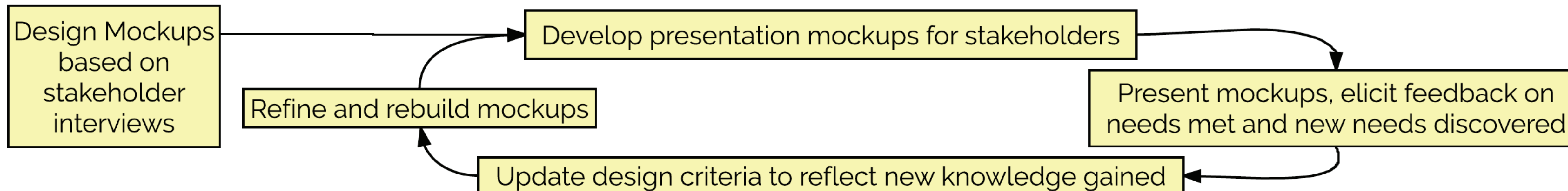"Patient **coordination is challenging** with high case loads"

Patients
"[My smartphone] is **easy to access**, even outside my home"
"I tried using a notebook [to track my condition] but it's **cumbersome**"
"I also feel **"unprepared"** when I visit the

Caregivers
"My goal was to keep my father **out of the hospital"**
"I filled **notebooks** tracking my father's health"
"Having a **tracking app** would be a huge help"

Phase Three:
Iterative Prototyping

- Design Mockups based on stakeholder interviews
- Develop presentation mockups for stakeholders
- Refine and rebuild mockups
- Present mockups, elicit feedback on needs met and new needs discovered
- Update design criteria to reflect new knowledge gained

Phase Four:
Final Prototyping

Physician Tailoring

Exclude | Include
Weight
Heart Rate
Medication

1. Enrollment
Nurse enrolls patient into the Heart on FHIR program. The doctor tailors the data collection mechanism to limit burden and maximize benefit.
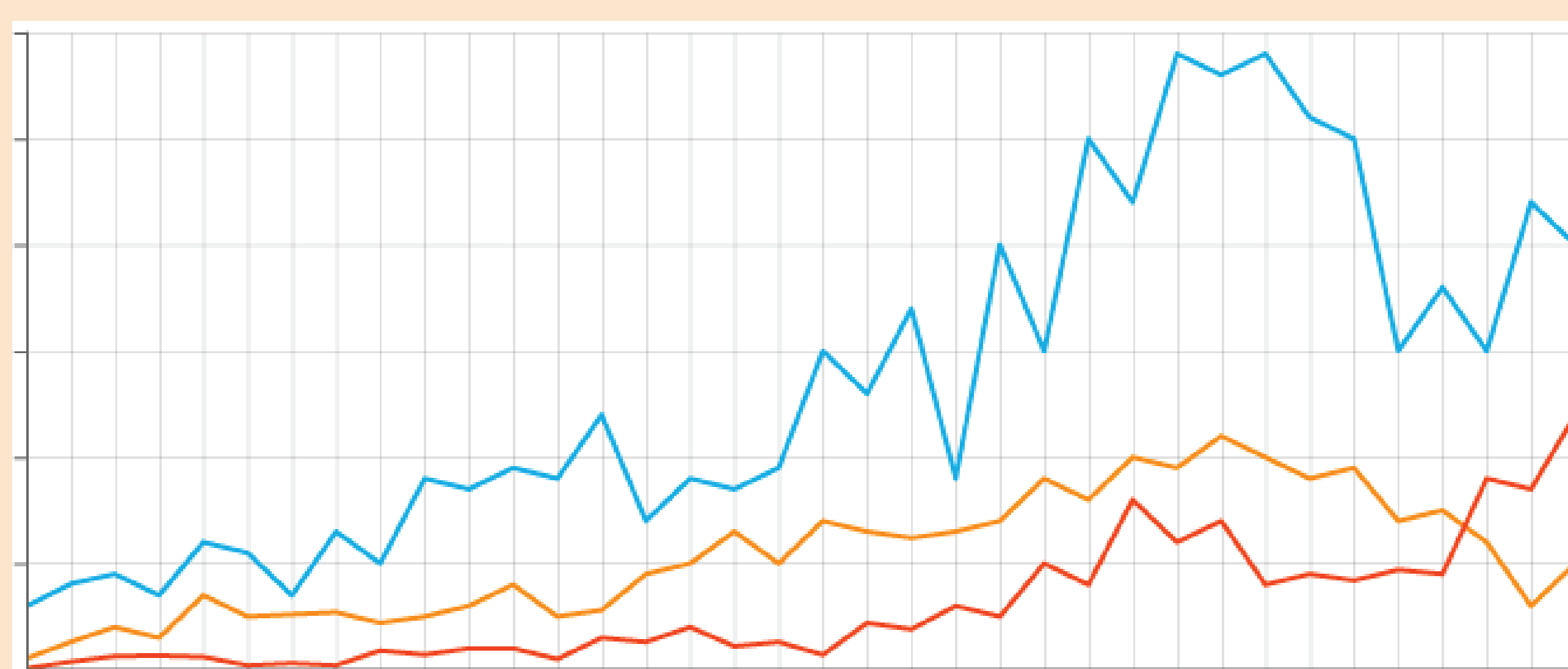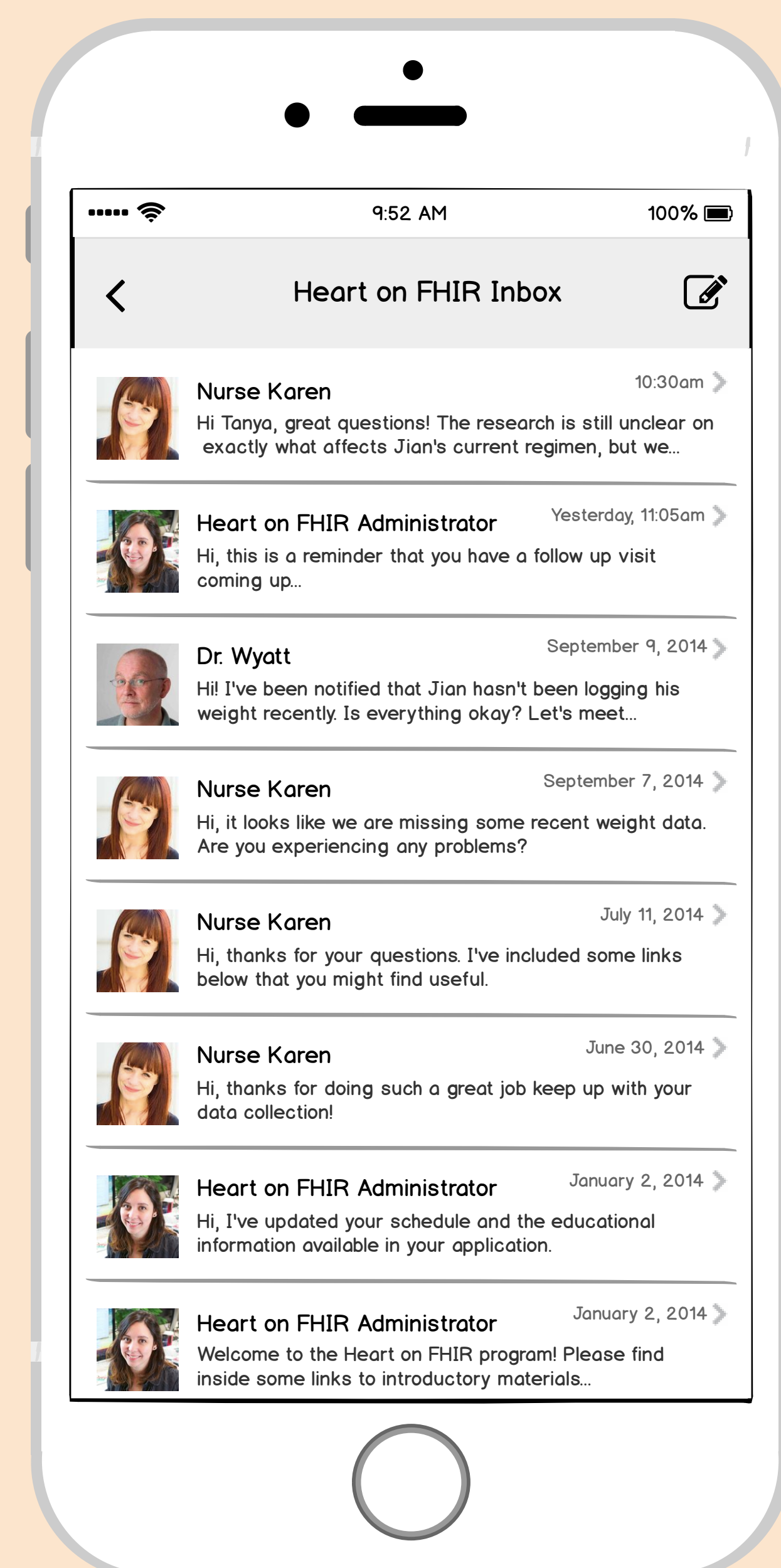
4. Messaging
Questions and concerns can be sent back and forth between all stakeholders.

2. Data Entry
Patient and caregiver collect assigned data through active and passive collection methods.

3. Monitoring
Nurses, patients, and caregivers are able to visualize and monitor health trends from the collected data. Nurses have a population view of the patient's to help monitor and manage the population.

FHIR

01 02 03 04

All stakeholders will have visualization capacity to better understand trends in the patient's health.

Patient	Progress	Status	Notifications	Actions
Adam	12 days	Stable		
Betty	3 days	Stable	Missing data	Prompt I Call
Charles	23 days	Improving	Missing data	Prompt I Call
Diane	12 days	Worsening	Care partner question	Review
Eric	1 day	Stable	Schedule appointment	Calendar
Francis	16 days	Stable		
Greg	18 days	Stable	Weight gain threshold trigger	Call
Hannah	21 days	Stable		