OnPoint: A Social and Mobile Platform to Optimize Health Services for Complex, Chronic Care Management

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ONPOINT

A SOCIAL AND MOBILE PLATFORM TO OPTIMIZE HEALTH SERVICES
FOR COMPLEX, CHRONIC CARE MANAGEMENT

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CHAPTER 1 : TECHNICAL CONTRIBUTIONS
1.1 INTRODUCTION

Effective treatment for chronic illnesses revolves around an active, engaged, and informed patient who is able to make health decisions and self-manage his or her care. Our project is a social and mobile platform called OnPoint that is geared towards helping chronic care patients understand their care plan and make effective decisions that are critical to managing their own health. In order to adhere to their care plans, patients must understand why and how they should change their lifestyles to manage their disease. Chronic care management is highly complex, and our partners the UC Davis School of Nursing have identified several core needs and required functionality. These functions include: a shared care plan, medication management, symptom management, appointment tracking, nutrition tracking, physical activity tracking, and personal device integration (Haynes and Kim 2015:3-4). We faced the challenge of narrowing down the scope of the project to a feasible amount of work. Through our discussions with our advisors, background research on available healthcare management tools, and interviews with target users and stakeholders, we whittled down the list of features to a set of the most critically important functions, shown in Table 1-1. The scope of our project will encompass several core elements: a shared care plan, a medication management module, and a symptom management module. A central focus of our project is facilitating communication and collaboration between patients and their care team to help manage aspects of their health.
### TABLE 1-1: Supported functionality

**List of functionality for OnPoint**

<table>
<thead>
<tr>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shared care plan</td>
</tr>
<tr>
<td>• Medication management</td>
</tr>
<tr>
<td>• Symptom management</td>
</tr>
<tr>
<td>• Appointment tracking</td>
</tr>
<tr>
<td>• Nutrition tracking*</td>
</tr>
<tr>
<td>• Physical activity tracking*</td>
</tr>
<tr>
<td>• Personal device integration*</td>
</tr>
</tbody>
</table>

(* functionality is supported by existing applications and will not be implemented in our project.*)
1.2 PHASE 1: DESIGNING THE USER INTERFACE

We are designing a user interface to help patients navigate the complexities of their health management. Our project consists of two phases: the design phase and the implementation phase. Since design work is best done collaboratively, we have worked together on most of the design phase of the project as we iterate through the three stages of design process: design, prototype, and evaluate. The work breakdown for the first phase is shown in Figure 1-1.

![Figure 1-1: Work breakdown for the design phase](https://balsamiq.com/)

First, in the design stage, we brainstormed together to create a design and merge our ideas as we created low-fidelity sketches using paper and post-it notes. Next, in the prototype stage, we split up the work to create medium-fidelity prototypes in Balsamiq\(^1\)

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\(^1\) Balsamiq Mockups subscription for rapid wireframing was purchased from November 2015 – March 2016. https://balsamiq.com/
and Keynote, using Keynotopia\(^2\). Finally, in the evaluate stage, we collaborated to present our prototypes for feedback, and decided what to amend during our next cycle of design iteration. In his paper, Bill Kim discusses the design process for the shared care plan, which encompasses features ranging from goal-setting to symptom management. Zhuosi Wang and I will both write about the medication management functionality. In her paper, Zhuosi Wang discusses the tracking aspect of medication management, which reminds users to take their medications and track their daily medication adherence. I will briefly describe the main view of our application, and describe in detail the challenges and progress of the scheduling aspect of medication management, which aids patients in understanding and scheduling their prescriptions.

1.2.1 MAIN HOMEPAGE VIEW

The primary goal of our main homepage view of our application is to give the user an overview of their current health status, and prompt the user with reminders and actions that will help the user adhere to a care plan. In order to effectively follow a care plan and make the necessary lifestyle changes to improve their health, patients need to become more engaged in their own care. To do this, patients should be trained with the self-management skills that are necessary to effect behavioral change. Patient self-management support can be broken down into several aspects: decision-making, problem-solving, goal-setting, and assessment (Funnell 2009:2). As patients encounter

\(^2\) Keynotopia iPhone prototyping templates licenses were purchased in February 2016. http://keynotopia.com/
issues in their daily lives, they need to know how to assess the issues and decide on a course of action to resolve the issues. To achieve the goals outlined in care plans, patients should figure out how to break down long-term goals into near-term achievable steps, which helps increase their confidence in their ability to follow the plan and consequently increases self-efficacy (Funnell 2009:2). In addition, an informed and engaged patient can participate in more effective interactions with his or her physician, resulting in better quality of care.

The design for our main view supports the patient by prompting the user to take necessary actions using cards. Cards will appear on the main view when the user needs to take action or requires a reminder; in effect the main homepage view acts as a sort of health timeline detailing relevant events and actions. For example, when the user needs to take certain medications, a card will appear, reminding the user about which medications should be taken at what time. By tapping on the card, the user can navigate to the specific view that manages the health aspect detailed by the card. If the card requires an action, then the card will be updated with the status of the action. When the card has been completed, then the user can choose to archive the card and move the card to “History”. Cards cannot be destroyed, so a log of the user’s actions is preserved in the card history. An example of how the card is updated after the user takes action is shown in Figure 1-2.
FIGURE 1-2: A series of wireframes designed in Keynote detailing how the main homepage view cards link to health modules and update according to user action. After the user has taken Lasix and proceeds to take and skip the other medications, the main homepage cards are updated with the latest status. If necessary, cards for urgent actions may also be generated.
Our application features five main health aspect modules: medications, measurements, appointments, symptoms, and goals. These health aspect modules can be reached through navigation tabs on the bottom of the main homepage view, or through cards that appear on the main timeline view. By providing modules such as medication tracking and goal setting to help the user manage different aspects of his or her health, our application aims to help the user become a more informed and engaged patient.

Social community support is also an integral part of keeping patients engaged in their self-care. Having support from not only healthcare professionals, but family, friends, and peers who experience similar problems is shown to help patients manage the challenges of chronic disease (Funnell 2009:2). To address this, our application will support a commenting feature on the cards in the main timeline view. A patient who is using OnPoint will be able to designate friends and family as authorized users who can view the main homepage and comment on the cards.

1.2.2 MEDICATION SCHEDULING

The medication scheduling portion of our app is designed to help patients plan when they must take their medications and create a routine in their daily lives to adhere to their prescribed medication treatment. Unfortunately, medication nonadherence is a serious public health issue; the World Health Organization estimates that only half of all patients with chronic illnesses in developed countries adhere to their medication
plan (Adherence to Long-Term Therapies: Evidence for Action 2003). Nonadherence has been shown to result in poorer quality of life, increased healthcare costs, and even preventable deaths (Yeaw, Benner and Walt 2009:1). Indeed, medication adherence is critical to helping patients improve their health and outcome (Ellwood 2007:3). However, taking medications can be complex and confusing for patients, especially those with chronic illnesses who must juggle a large number of prescriptions which each have differing instructions and warnings. Thus, the process of translating a list of medications into a daily schedule is crucial in helping patients understand how and when to take their medications.

We designed an interactive scheduler for patients to view their prescribed medications along with associated instructions, and drag-and-drop each medication into a time slot. Our team created a medium-fidelity prototype for a tablet format in Balsamiq and later created a higher fidelity prototype in Keynote for the mobile phone format. The medication scheduling process encompasses several technical challenges. First, patients must have an easy, intuitive method of inputting their prescription medications. Second, patients need to be able to plan when to take their medications. Finally, the digital representation in our app should complement the tools that patients use in real life, such as pillboxes, in order to make the app easier to understand.

**1.2.2.1 Challenge 1: Medication input**
The first challenge for medication scheduling is creating an easy method for patients to input their prescriptions, which often include complex drug names, various warnings and limitations, and instructions. Older patients may not have the dexterity and eyesight to manually enter information. In addition, form factors such as tablets or mobile phones are not conducive for intensive data entry tasks. Thus, our solution seeks to leverage the camera functionality of a tablet or mobile phone, so the user can take several photographs of the prescription bottle, and with optical character recognition (OCR), translate the characters in the image into text. Using OCR, the important information printed on the label such as instructions can be parsed, so that our app can understand what is printed. This information will be used by our app to guide the user in scheduling the medication. We will also provide a backup, alternative method to allow patients to manually input their data, in case the OCR technology is unable to perform sufficiently well. Figure 1-3 shows a sequence of wireframes designed using Keynotopia in Keynote. This mock-up of screen sequences illustrates how a user can choose to take images of a prescription label to capture drug and barcode information. The envisioned design uses OCR to extract the text in order to populate the fields pertinent to the medication such as the drug name, dosage, timing, instructions, and purpose.
FIGURE 1-3: An example of Keynote wireframes designed using Keynotopia. This sequence shows how a user can input medication by using the camera on the device to capture images. Using OCR technology, text can be extracted from the images.
1.2.2.2 Challenge 2: Planning medication times

The second challenge of planning when to take the medications is one of the most algorithmically complex problems to solve. Medications have different requirements, such as having time constraints that dictate a specific time window to take the prescription, or having requirements to take the medications with a meal in order to prevent upset stomachs. To reduce the effort that the patient must make to generate a schedule, our partners at UC Davis worked with a team at Purdue University to create an algorithm that takes as input a list of medications and restrictions, and outputs a suggested schedule. However, as it is still under development, this algorithm cannot handle the most complex medication schedules such as those with meal requirements. Our plan is to leverage this algorithm to generate a basic schedule, and offer a drag-and-drop interface for the patient to make adjustments as needed in order to take other constraints into account and to better fit their schedules. The drag-and-drop functionality allows the user to easily make adjustments to their medication schedules when the care plan evolves.

1.2.2.3 Challenge 3: Designing the visual interface

The third challenge for medication scheduling involves designing a visual interface to graphically represent time slots in an intuitive way. Since patients often use pillboxes (Figure 1-4) to organize their medications, we decided to create an interface that uses the pillbox metaphor to evoke a familiar concept and connect the digital
representation on the tablet to the physical pillbox in reality. We first solved this by researching pillbox designs, and chose to discretize the duration of an entire day into four time slots: morning, noon, evening, and night. However, when we presented our four-slot pillbox design for review by our UC Davis advisor, we received negative responses. We learned from this design review that we should focus on helping patients take their medications at the correct time, instead of fitting the prescriptions into the limits of the four-slot pillbox. For the next design iteration, we removed the four-slot constraint. Instead, we discretized the 24-hour day into several time slots, which could be adjusted by the user. Thus, depending on a patient’s daily routine, mealtimes, and medication requirements, we can suggest the optimal pillbox to buy and use for their schedule. By enabling patients to schedule their medications at the correct time and providing them the proper matching pillbox in real life, we aim to improve adherence. An example screen from of our medication scheduling wireframes designed using Balsamiq is shown in Figure 1-5, followed by an example of our medication pillbox filling wireframe to aid the user in matching the pills and pillboxes in real life to the generated schedule shown in Figure 1-6.
FIGURE 1-4: An example of a 4-slot pillbox used by patients to organize medications.

FIGURE 1-5: Medication scheduling wireframe designed using Balsamiq. The left side of the screen shows the user’s daily schedule, with adjustable time slots for the meals. In this example, there are three time slots corresponding to mealtimes. On the right side of the screen, the user views the medications that need to be scheduled. The user selects each medication and uses the touchscreen interface to drag the medication into the desired time slot. In this example, the application recommends a 4-slot pillbox.
1.2.3 USER TESTING SCENARIOS

After redesigning our prototypes with the feedback from the design review, we prepared our medium-fidelity designs to perform user testing with research participants. To do so, we contextualized the design within a storyboard so that users can understand the situations and motivations surrounding the use case. Having a storyboard kept the design grounded in real-world contexts, so that we, as designers, always kept the end-user in mind as we designed the user interface and interactions. However, creating a storyboard presented new challenges. First, we had to decide on a persona to design our application and scenarios around. Second, we needed to have realistic scenarios that accurately reflected what patients would face in their daily lives.

Selecting a persona for design was challenging because we had several variables
that we wanted to make sure we supported. These variables included how long the patient had been dealing with his chronic disease, whether or not a patient had a clinician who served as a care coordinator in his care network, and whether or not a patient had a family member who was around to help facilitate his care. Each of these different variables would affect what we would include in our scenario and the information we would present in our prototype walkthrough. We requested a full persona from our UC Davis advisory team, since they have a deep understanding of patients and doctors that they work with directly and have the clearest idea of the target user. The UC Davis advisors gave us a full, complex persona of a diabetes patient suffering from heart disease who grappled with eight medications, saw several physicians, and needed to take several daily health measurements (See Appendix A). This information was crucial in setting up the information in our storyboard.

Creating realistic scenarios for our storyboard was also a challenge because of our limited experience in the medical industry. We constructed several scenarios of use based on the information provided by UC Davis and also our background research. However, we still needed more guidance to create realistic interactions. For example, in our health timeline design, we had created a “comment” feature, which allowed any member of the care team to comment on items that appeared on the timeline. One scenario that we had envisioned was a patient commenting on his health status and receiving a reply from a nurse care coordinator. When we showed this scenario to our
UC Davis advisors, we were informed that this scenario was not realistic, since nurse care coordinators often have hundreds of patients, even upwards of a thousand patients. These nurses would have their hands full and would not be able to monitor the potential thousands of health status updates from their many patients. Thus, we realized that we needed to adjust our scenarios to account for the fact that the typical interaction between a nurse care coordinator and the patient was conducted by phone. Instead of allowing patients to directly send messages to their clinicians, our application would prompt the user to contact the clinician’s office by phone via the mobile device’s phone functionality.

1.2.4 USER TESTING SETUP

We created a set of tasks and scenarios for the users to step through in our Keynote prototypes for our main health timeline view, medications module, measurements module, symptoms module, goals module, and appointments module, which are detailed in Table 1-2. For example, we constructed a measurements task where the user would use the application to log some daily measurements such as blood pressure and weight, and we provided props such as a blood pressure cuff and a scale so that the user could go through all the motions of the interaction. We also tested the medication scheduling and tracking parts of the application using props such as medication bottles filled with candy and pillboxes to simulate a daily pill-taking scenario. Figure 1-7 shows a scenario where the user uses the application to fill the
pillbox with the medications. With this setup, we could observe how a user would interact with the application on a mobile phone in a real-world scenario and discover which parts of the design were intuitive or confusing.

### TABLE 1-2: List of user-testing scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Details</th>
</tr>
</thead>
</table>
| Medication Scheduling      | The user is given a new medications list with 8 different prescription drugs, as well as a pillbox and medication bottles filled with candy “medication”.  
The user’s task is to step through the set-up procedure to input medications, generate a schedule, view the schedule, and explore the schedule page.  
Next, the user is told to add a time slot to the schedule and use the drag-and-drop functionality to move a medication from the morning time slot to the new time slot, as well as modify the name and reminder time for the time slot.  
Finally, the last task is to use the interactive diagram feature in the application to fill the pillbox prop with the candy “medication”. |
| Medication Tracking        | The user is presented with the main homepage view, where a medications card is reminding the user to take the medications stored in the morning time slot of the pillbox.  
Next, the user needs to figure out what the card is telling the user to do, and complete the step of taking and skipping certain scheduled medications.  
Finally, the user should navigate to the medication module to take an as-needed medication from the Medication Cabinet. |
| Measurements               | The user is presented with the main homepage view, where a measurements card is reminding the user to take the daily weight, blood pressure, and heart rate measurements.  
The user is given a scale prop, and a blood pressure cuff and told to go through the motions of taking readings and entering them into the application. |
| Symptom Management         | The user is presented with a reminder card on the main homepage view to take a screening questionnaire.  
The task is to click on the card to navigate to the questionnaire and step through the questions. |
| Appointments and Commenting | The user is presented with the main homepage view, where an appointments reminder card has appeared.  
The user is tasked with viewing the appointment details.  
Also, the user can view a comment that someone has made on the card, and reply to the comment on the card. |
FIGURE 1-7: The image on the left shows a pillbox and a variety of prescription bottle props filled with candy to simulate the process of organizing and taking pills. The Keynote wireframe on the right shows the corresponding view in the application, which aids the user in matching the physical pillbox with the desired schedule.

We met with our users at UC Davis and ran through the scenarios to collect feedback on all aspects of our design. Our user-testing group consisted of clinicians, nurse care coordinators, health coaches, patients, and family members, who are participants in the research study that encompasses our project, detailed in Table 1-3.

<table>
<thead>
<tr>
<th>Participant set-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 patient and 1 family member caregiver</td>
</tr>
<tr>
<td>2 1 patient and 1 health coach</td>
</tr>
<tr>
<td>3 1 patient and 1 nurse care coordinator</td>
</tr>
<tr>
<td>4 2 clinicians</td>
</tr>
</tbody>
</table>
1.2.5 USER TESTING FEEDBACK

User testing allowed us to observe actual people using our application and helped us to identify usability problems in our design. As users stepped through the scenarios and interacted with the application, we noted their thought processes and asked for their assessment on ease of use. We gathered the feedback that the “comments” functionality in our application was very useful and great for addressing the need for better communication and collaboration. However, the font size should be increased to improve readability. In addition, some of our user interface design elements required re-design to afford action, and users also requested additional functionality for the medication feature.

1.2.5.1 Main Homepage Cards Improvements

A core issue was that our cards in the health timeline view should be more explicit about what action the user needs to take. For example, when presented with a card to take medications, the limited graphical element of the card and the wording on the card did not make it clear to the user that the user should tap directly on the card in order to proceed to the next screen. In order to solve this, we redesigned our card element to color code according to card urgency, rather than color code by health module category, and changed the wording to be clearer. The updated design is shown in Figure 1-8.
1.2.5.2 Medications Improvements

Users also requested more flexibility in the medications module. For example, patients may need to adjust the dosage and timing of their medication as they experience side effects. Thus, it is important for our application to handle use cases where patients can take a varying amount of a medication depending on their health status. Updates to the medication design are shown in Figure 1-9.
FIGURE 1-9: Improvements to Medications. The left screen shows the initial design. The right screen shows the updated design with the flexibility to edit time slots, medications, and dosage.

With the valuable feedback from the user testing sessions, we refined our prototypes in preparation for the final phase of our project: implementation.
After we finalized our design, we began to implement our application to bring our project to life. Since we are a team with limited experience developing mobile applications, our UC Berkeley advisors brought in an application development consultant, Dmitri Skjorshammer, to help manage the project and provide implementation help for difficult application elements. In addition, we are collaborating with a medical student who will be helping us integrate the application with Apple’s HealthKit.

During the implementation phase, we split the work to individual tasks. For simpler modules, we each developed a module individually; Bill implemented the measurements module, Zhuosi created the appointments module, and I developed the goals module. For more complicated portions of the application such as the timeline view and medications modules, we divided the work into different sub-features that we are developing individually and integrating together when completed. Bill worked on the backend integration to store and fetch data from Firebase\(^3\), which is a NoSQL cloud database. Zhuosi and I worked on the user interface for the onboarding setup steps. I worked on the main timeline view featuring daily cards, and also worked on the medication-scheduling portion of the application with the drag-and-drop interface. The work breakdown is outlined in Figure 1-10.

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\(^3\) Firebase is a cloud services provider that provides backend services such as data storage and user authentication. [https://www.firebase.com/](https://www.firebase.com/)
Design, Prototype, Evaluate
Angela, Bill, and Zhuosi

Implement Modules

Goals, Medication Scheduling, Main View
Angela

Measurements, Medication Tracking, Firebase Integration
Bill

Appointments, Medication Input, Commenting
Zhuosi

Test and Debug
Angela, Bill, and Zhuosi

FIGURE 1-10: WORK BREAKDOWN FOR IMPLEMENTATION PHASE
1.3.1 IMPLEMENTATION: CHOOSING A DEVELOPMENT PLATFORM

One of the first tasks we faced was deciding upon a development platform. At first, we originally planned on developing on the native iOS platform, since the Apple xcode platform simplifies the process of styling the application with iOS elements. However, we decided to develop on a hybrid HTML/CSS/AngularJS platform using the Ionic Framework\(^4\) to run on PhoneGap. Using this approach, we can leverage the strong HTML/CSS/AngularJS developer community. Also, we will not be restricted to using a specific native platform such as iOS or Android; using PhoneGap, we can create cross-platform applications more easily in the future.

1.3.2 IMPLEMENTATION: SOFTWARE ARCHITECTURE

At a high level, our software architecture can be described as having three main components: model, view, and controller, as shown in Figure 1-11. The model handles data and queries from the database. The view includes the HTML and CSS code, which renders the user interface and determines how the screens look. AngularJS features two-way data binding, so that if data changes in the model, the change is immediately reflected in the view, and vice versa. For example, if the medication data is bound to the view for medication scheduling editing, then when the user drags a medication from one time slot to another time slot, this change is immediately reflected in the data.

\(^4\) Ionic Framework http://ionicframework.com/
array. The final portion is the controller, which handles user interactions and processes events from the view and updates the model.

![Software Architecture Diagram](image)

**FIGURE 1-11**: High-level diagram of software architecture

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### 1.3.3 IMPLEMENTATION: FINAL FEATURES

We have created an alpha version of our application (See Appendix B) with basic functionality for a user to create an account and set up their health data. The user can step through an onboarding process to input, schedule, and track their medications and measurements. In addition, the user can create appointments and input goals. Finally, most importantly, the user can view all of their current and upcoming actions and reminders as cards on the main home view. The main homepage view serves as a snapshot of what the user needs to accomplish daily in order to be healthy and follow
their care plan. Users can comment on the card and directly navigate to the health module to perform an action or check the latest status. I will elaborate in more detail about the onboarding process, main homepage view, and medications functionality.

1.3.3.1 Onboarding Process

The user begins by registering an account with an email and password. Next, the onboarding process guides the user through setting up the different aspects of their care plan. Currently, we support Medications setup and Measurements setup. Other planned onboarding setup processes for modules such as Appointment, Symptoms, and Goals have not been implemented.

For Medications setup, we implemented a simple interface for users to manually input the medication details. For the purposes of user testing, we have prepopulated eight auto-filled medication choices based on the given persona for medications that are taken on a scheduled basis. For additional as-needed medications, users can add medications by inputting the drug name, dosage, instructions, and purpose. Currently, the application does not support OCR technology to automatically extract medication information from images of prescription labels. Thus, users have to manually input each medication by data entry. For the schedule generation step, we have not integrated any scheduling algorithms, and currently have hard-coded a pre-determined schedule based off of the given persona. To work around the lack of a scheduling algorithm, we provide an interface for users to modify the generated schedule, shown
in Figure 1-12. Within the schedule, users can create new time slots, edit the time slots, and drag-and-drop medications from one time slot to another. Finally, the user can view an interactive diagram to help fill their medication pillbox.

FIGURE 1-12: Screenshots depicting the drag-and-drop functionality for editing the medication schedule. This example shows moving Coumadin from the Morning to the Afternoon time slot.

For Measurements setup, a user is able to create a schedule and select three pre-defined types of measurements to add to the schedule: weight, blood pressure, and heart rate. The user can also set the reminder days and times.

1.3.3.2 Main Homepage View

The main homepage view features cards for the current day and upcoming cards for the next day. By tapping on “view”, the user will navigate to the module requiring attention, as shown in Figure 1-13. The user can view and comment on the current cards, but cannot perform any actions on the upcoming future cards. When a user has
completed a card, the card can be archived. Archival removes the card from the main view and displays it under the History tab in the main view. Currently, cards are only generated for scheduled medications and scheduled measurements. Future improvements would include card generation for all scenarios such as medication refill reminders and upcoming appointments.

FIGURE 1-13: Screenshots depicting a user viewing a Medications card, which leads the user to the Medications tab showing the medications that should be taken at that reminder time. After the user takes or skips the medications, the Medications card is updated to “Completed” status in the main homepage view.

1.3.3.3 Medications

The medication functionality is a core part of the application. Through the medications tab, the user can view the daily schedule and take or skip medications in each time slot, manage the list of medications, and consult an interactive diagram to
help fill their physical pillbox. However, we have not implemented algorithms to verify if a medication can be skipped or if the user should take a medication at a certain time.

1.3.4 FUTURE WORK

Future work for OnPoint would be to add graphical elements and implement animations to create a more aesthetically pleasant user experience that were designed in the Keynote wireframes (See Appendix C). In addition, the permissions settings and commenting feature would need to be enhanced to allow other authorized users access to another user’s timeline view. Also, the measurements feature and symptom management feature would need to be integrated with Apple’s HealthKit and ResearchKit frameworks in order to leverage the data visualization and aggregation platforms. We would integrate more advanced functionality such as OCR technology for medication input, and also implement a robust medication-scheduling algorithm to enhance the user experience of setting up medications. Finally, we would add functionality to allow a user to generate a report of past health activity over a specified period of time, which the user can bring to an appointment with a clinician to improve patient-doctor interactions.

1.4 CONCLUSION

OnPoint is the next step in improving patient outcomes by helping chronic care patients understand and adhere to their care plans. Throughout the past school year,
we have been focused on designing and creating the new platform for chronic care patients to effectively manage their self-care. We strove to thoroughly understand user needs in order to create a mobile application that best serves chronic care patients. As we iterated through the design process, we refined the user interface with each prototype and used valuable user feedback and insights to inform our design. During the limited span of our school year, we have focused on designing modules that address the most important aspects of a patient’s health status, specifically on the shared care plan, medications and symptoms. However, OnPoint has the potential to grow into a more comprehensive health platform with additional modules such as activity tracking, device integration, and nutrition management. With OnPoint, we hope to make a meaningful impact in the lives of chronic care patients.
CHAPTER 2 : ENGINEERING LEADERSHIP

Co-authored by Angela Hsueh, Bill Kim, and Zhuosi Wang
2.1 INTRODUCTION

Chronic disease is the greatest challenge facing the healthcare system in the United States. It is the leading cause of death, accounting for 7 out of 10 deaths each year, and over half of all Americans have at least one chronic condition (Chronic Disease Prevention and Health Promotion 2015, Gerteis, Izrael and Deitz 2014:4). In order to address the challenges and long-term nature of chronic illness, the healthcare system is evolving from a reactive system to a more proactive system aimed at preventative care and patient self-empowerment. Chronic diseases require a diverse range of medications, appointments, caregivers, and specialists to effectively manage the disease and the patient. This poses significant challenges for patients as they are left to self-manage their care between office visits. Furthermore, a patient who suffers from one chronic disease also often suffers from multiple comorbidities such as depression, hypertension, and obesity. The varying number and magnitude of diseases a patient suffers from further complicates the delivery of efficient and effective care (Kim 2015:1). Managing chronic conditions requires complex interactions between multiple healthcare specialists, multiple transitions between physical locations and different degrees of maintenance and surveillance (Kim 2015:1). Our project is a collaborative mobile platform for patients to engage in their care and more effectively manage their complex health conditions. We will analyze how our project fits into the industry landscape, our approach to marketing, and the challenges we face regarding health data regulations.
2.2 INDUSTRY ANALYSIS

The healthcare landscape is constantly evolving as it adapts and transforms to best serve the needs of an ever-increasing population. Our capstone project is at the center of an emerging industry within healthcare: the disease management industry. The number of people with chronic diseases is projected to grow over the next few decades as the baby boomer generation ages and becomes more susceptible to chronic illness. (Anderson 2010:7) Moreover, the Patient Protection and Affordable Care Act has brought wellness and long-term patient care to the forefront (Curran 2015:5-6). The potential market for a comprehensive chronic care management system is huge with such a high demand from the increasing population of potential buyers.

The current state of solutions for chronic care management pales in comparison to the alarming rate at which the need for such a system is rising. Current care management revolves around infrequent checkups from a care manager and relies heavily on family members as well as self-care. The disease management industry, however, has rapidly grown due to the digital revolution and technological advancements. E-patients, healthcare consumers that have taken a more active role in their own care by researching various topics online, have been a direct result of the internet and information age (Ball and Lillis 2001:2-3). The rise of the electronic health records and the e-patient has contributed to improving information flow between doctors, patients, and caregivers. Furthermore, the propagation of medical devices and
smartphone applications that pair with these devices in the realm of preventative medical care have empowered patients to monitor their own health, and have also improved communications between patients and their care network as well as strengthened patient self-care.

With the rapid pace of technological developments, there is no shortage of developers or engineers who can invent a solution for chronic care management. The disease management industry has experienced a flurry of new entrants such as CareZone⁵, Flow Health⁶, Caremerge⁷, and CareSync⁸, which increases the rivalry within the industry. All of these companies provide smartphone solutions to lighten the load of managing the patient’s chronic disease. The disease management industry, however, is still looking for a comprehensive solution that can increase coordination and collaboration without significantly impeding the natural flow of a patient’s life.

2.3 MARKET ANALYSIS

Our project is designed to help chronic care patients understand their care plan and make the behavioral lifestyle changes necessary to improve their health outcomes; this is a central tenet to the evolving healthcare paradigm that healthcare professionals are struggling to effectively address through patient and provider training. Thus, our

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⁵ CareZone https://carezone.com
⁶ Flow Health https://www.flowhealth.com
⁷ Caremerge http://www.caremerge.com/web
⁸ CareSync http://www.caresync.com
strategy to introduce our product to the market will be to first target healthcare professionals, who in turn, can recommend our app to their patients who have chronic diseases. Since we are partnering with the UC Davis School of Nursing, we can leverage the credibility of our partnership and proven deployment in the UC Davis Health System to market our app to healthcare professionals, and also take advantage of any network effects and connections of our partners at UC Davis. With the goal of increasing adoption rate, our product is developed on the iOS platform and will be offered in the Apple AppStore for free.

2.4 REGULATION AND ETHICS

The proliferation of health-related smartphone applications, of the standalone variety and also those which pair with medical devices, has brought to the spotlight regulatory concerns over such technologies. The US Food and Drug Administration (FDA) has regulatory authority over the safety of mobile health applications and stipulates that “apps acting as medical devices or as accessories to medical devices will require FDA approval, whereas apps that provide users with the ability to log life events, retrieve medical content, or communicate with clinicians or health centers will not be regulated under its jurisdiction [...] the FDA has focused on safety, it has
largely left the review and certification of apps to the marketplace” (Powell et al. 2014:1851).

The explosion of smartphone applications that are aimed at the healthcare industry provides convenience and ease of use for patients but also comes with various risks and security concerns. Since we are not creating a medical device, which comes with risk of liability and also requires a lengthy and complicated process of FDA approval, we must be careful to distinguish ourselves as a non-medical health management application which aggregates health data and facilitates communication and collaboration. Our challenge lies in providing enough guidance to help patients organize their health care, without crossing the line to becoming a medical device by providing diagnoses or medical recommendations. Instead, all medical advice and suggested adjustments of a patient’s care plan will come from the health care professionals within the patient’s healthcare team. In a nutshell, our application is an information channel, not an information generator.

Since our project centers on patient medical data, we must be mindful of regulations and laws concerning privacy. In the United States, the Health Insurance Portability and Accountability Act (HIPAA) Privacy and Security Rules establish standards governing patient health data. According to the HIPAA Privacy Rule, any “individually identifiable health information” must be protected. This includes the individual’s past, present, or future physical or mental health or condition; the
provision of health care to the individual; the past, present or future payment for the provision of health care to the individual and other common identifiers that could be used to identify the individual (Office for Civil Rights 2003:3-4). Because our application will aggregate various factors that describe the patient’s health status and present it in a timeline view with searchable past history, we must be vigilant in the transmission and security of the information collected by the application. We will provide data privacy by creating user accounts and only giving read and write permissions to specific users designated by the care plan and the patient. Furthermore, all information transfer, such as screening questionnaire and symptom protocol results, will be encrypted. Through these precautionary steps we will safeguard the patient’s health-related data and ensure their privacy is secure.

2.5 CONCLUSION

The healthcare industry is on the cusp of a digital revolution as technology empowers patients to take charge of their own health. With the ever-increasing human population combined with the aging of the baby boomer generation, a more efficient and effective healthcare system is a challenge that is evident now more than ever before. Our capstone group will leverage expert advice from the UC Davis School of Nursing and CITRIS to maneuver around patient data privacy concerns and create an application to meet the rising demand for a comprehensive chronic care management system. Our focus on fostering and facilitating collaboration and communication will
distinguish us from current solutions and will serve as the key to improving chronic care management.
REFERENCES


<www.rwfj.org/pr/product.jsp?id=50968>.


Kim, K and Hartmann, B. “A Social/Mobile Platform for Optimizing Health Services for Complex Chronic Care Management.” Project Proposal, 2015.


APPENDIX A: PERSONA
Mrs. A’s Care Plan:

**Summary of problem:**

Mrs. A is a 72 year-old woman who has been living with type II diabetes for 12 years. She developed cardiovascular disease and was recently informed that she has heart failure. She has noticed greater difficulty in walking with hip and leg pain. Mrs. A takes eight prescription medications: Metoprolol (beta-blocker), Lisinopril (ace inhibitor), Coumadin (anti-coagulant), Lasix (diuretic), Lipitor (statin), and Losartan (angiotensin receptor blocker), as well as Metformin for diabetes and Ativan for anxiety. All are taken daily but on different schedules, e.g. before going to bed, 1 hour before taking food, or with food. Mrs. A sometimes doesn’t take Lasix if she plans to go out for the afternoon because it causes frequent urination. Several medications cause Mrs. A to be dizzy and fatigued. She describes them as making her feel “loopy” and prevents her from driving. She’s not sure they are working so she sometimes decides to take a break from them. Mrs. A needs to limit intake of vitamin K-rich foods, e.g. kale/collards/grapefruit, pomegranate, as vitamin K can make Coumadin less effective as a blood thinner. She is also on a low-sodium and diabetic diet and restricted fluid intake. Mrs. A’s healthcare team includes a primary care doctor, cardiologist, diabetes educator, dietician, and pharmacist who are located in four different facilities. She has visits with her doctors around every six months. She’s met with the diabetes educator and dietician once. She sees the pharmacist to get her refills. She lives alone in a two-story home. Her son lives in the same town and although he works full-time and has a family, he frequently helps with her healthcare and daily living needs. Her daughter lives in another state and checks in regularly with both of them. Mrs. A’s greatest concerns are remaining independent and having the energy to visit with friends and family.

Mrs. A’s Care Plan:

I. The care team
II. Goals
III. Medications
IV. Measurements
V. Symptoms
VI. Nutrition
VII. Access and changes to the care plan

<table>
<thead>
<tr>
<th>Name</th>
<th>Role/relationship</th>
<th>Responsibilities</th>
<th>Nature/frequency of</th>
</tr>
</thead>
</table>

I. The care team
| **Geeta Patel** | **Cardiologist** | 1. Prescribe list of medications for heart failure and adjust as needed  
2. Answer questions about symptoms, problems, and issues with medication related to heart failure during visits  
3. Set clinical goals based on existing guidelines  
4. Monitor Mrs. A’s heart failure, including assessing symptoms and physiologic parameters  
5. Set clinical goals based on existing heart failure guidelines | After diagnosis, will see Mrs. A every 1-2 weeks until it is certain that all parameters are stable (BP, kidney function, heart rate, potassium levels). Then she will move to once a month and if after 3-4 months she is doing well, she will move to every 4-6 months. |
| **Bob Smith** | **Primary care physician** | 1. Monitor Mrs. A’s diabetes, including assessing symptoms and physiologic parameters  
2. Monitor Mrs. A’s general health and well-being  
3. Communicate with Geeta about any information relevant to Mrs. A’s heart condition  
4. Adjust diabetes medications as needed  
5. Set clinical goals based on existing guidelines | Sees Mrs. A during primary care visits every 6 months and when she has an issue or problem |
| **Denise Myers** | **Nurse care coordinator** | 1. Help Mrs. A understand the causes and management of heart failure  
2. Check in on Mrs. A’s progress regularly, including viewing summaries of measurements and symptoms  
3. Make sure Mrs. A understands her clinical goals  
4. Help Mrs. A set personal goals related to her treatment  
5. Answer questions about symptoms, problems, and issues with medication related to heart failure as needed by phone, MyChart, or in person through a clinic or home visit  
6. Send Mrs. A symptom management decision aids according to results of screening tool  
7. Checks Mrs. A’s medications against her medical chart  
7. Reconcile medication list at every visit | Sees Mrs. A during cardiology visits every six months; communicates with Mrs. A weekly regarding measurements and labs (more often when a problem arises). Available by phone when a question or concern arises. Views Mrs. A’s data weekly; if something looks wrong, Denise verifies with Mrs. A that the data of concern is accurate. Then, she contacts Geeta for guidance, especially if it will require medication adjustment |
| Ken Rodriguez | Pharmacist | 1. Fill and dispense Mrs. A’s medications  
2. Ensure that Mrs. A understands her medications, their instructions, and their restrictions  
3. Medication reconciliation  
4. Coumadin monitoring: The Coumadin clinic is run by pharmacy at UC Davis. They do their own follow ups for blood testing and dosing.  
A critical component and definitely a goal of therapy and monitoring is to have the Coumadin clinic alerted every time a medication is changed. There are a lot of medications that affect the levels of Coumadin and sometimes the dosing needs to be adjusted. The physicians do not do this. | Does not make contact with Mrs. A directly; explains medications and instructions to her son when he comes to pick up the medications |
|---|---|---|
| Nicole Graham | Dietician | 1. Help Mrs. A understand her dietary restrictions and needs  
2. Create a diet plan for Mrs. A  
3. Teach Mrs. A about tracking certain nutrients, such as sugar, potassium, vit K and salt  
4. Check in with Mrs. A around nutrition | Met with Mrs. A when she was diagnosed with diabetes diagnosis and again after her heart failure diagnosis. Since the heart failure diagnosis, follows up with Mrs. A monthly by phone |
| Alan Moore | Diabetes educator | 1. Help Mrs. A understand causes and management of diabetes  
2. Educates on lifestyle modifications  
3. Educates on sign and symptoms of complications i.e. hypoglycemia, wound healing, eye exams, etc. | One-time visit with Mrs. A; no subsequent communication |
| Roger Anderson | Son | 1. Pick up meds from pharmacy  
2. Drive Mrs. A to appointments  
3. Help Mrs. A understand her condition and care plan  
4. Help Mrs. A understand her symptoms and determine if she needs to see a clinician  
5. Learns about the data needed for | Regularly looks at Mrs. A’s measurements and symptoms. Speaks daily with Mrs. A by phone and in person about how she is doing. Knows and communicates with all |
monitoring (BP, sugar, weight, etc.) of the members of the care team.

| Allison Thomas | Daughter | 1. Check in on Mrs. A and ensure she is getting the care she needs  
2. Provide emotional support | Regularly looks at Mrs. A’s measurements and symptoms. Speaks daily with Mrs. A by phone about how she is doing but is not actively involved in delivering her care or speaking with her care team. |

II. Goals

**Personal goals:**

1. Remain independent  
2. Keep visiting with friends and doing my daily activities  
3. Be able to visit out-of-town family by plane  
4. Feel healthy

**Clinical goals:**

1. Control systolic blood pressure to lower than 130/80 mm Hg but not less than 90 mmHg  
2. Home glucose monitor to avoid hypoglycemia- this is what kills diabetics in the short term!  
3. Keep HbA1C levels at 7% or less  
4. Keep heart rate between 60-80 bpm  
5. Tolerate all heart failure medications  
6. Lower LDL cholesterol levels to below 100 mg/dL  
7. Weight- we usually define a dry weight and then monitor 3-5 Lb. changes from it to modify medications (i.e. diuretics) and diet (i.e. salt).  
8. INR measurement for Coumadin goal is 2-3  
9. Oxygen levels with ambulation or while sleeping – keep O2 saturation at >91-92%  
10. Decrease anxiety levels  
11. Due to a risk of hyperkalemia with the Losartan, move Mrs. A off of losartan; if blood pressure increases, switch to carvedilol instead of metoprolol

III. Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Description</th>
<th>Dose</th>
<th>Timing</th>
<th>Instructions</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furosemide (brand name Lasix)</td>
<td>Diuretic</td>
<td>40 mg</td>
<td>Twice daily: first in morning and then 6-8 hours later</td>
<td>Orally</td>
<td>Treats salt and fluid retention and swelling caused by heart failure</td>
</tr>
<tr>
<td>Metoprolol succinate (brand)</td>
<td>Beta-blocker</td>
<td>25 mg; double dose</td>
<td>Twice a day,</td>
<td>Orally</td>
<td>Used to treat heart failure, and high blood pressure</td>
</tr>
</tbody>
</table>
### IV. Measurements taken at home

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unit</th>
<th>Frequency</th>
<th>Purpose</th>
<th>Instructions</th>
</tr>
</thead>
</table>

names: Toprol, Lopressor) extended release tablets

every 2 weeks to highest tolerated dose up to 200 mg per day

morning and night

pressure

Lisinopril (brand name: Prinivil, Zestril) ACE inhibitor 40 mg Twice a day, morning and night Orally Used to treat congestive heart failure

Warfarin sodium (Coumadin) Anticoagulant 2 mg Once a day, morning Orally Used to treat and prevent blood clots by acting as a blood thinner

Atorvastatin (Brand name: Lipitor) Statin 20 mg Once a day, best given at bedtime because liver deals with cholesterol during sleep Orally; do not take with grapefruit Used to treat cholesterol and triglyceride levels

Losartan Angiotensin II receptor antagonist 25 mg Twice a day, morning and night Orally Used to treat high blood pressure

Metformin (Brand names: Glumetza, Riomet, Glucophage) immediate release Oral hypoglycemic agent Antidiabetic 500 mg Twice daily Orally; with meals Used to treat type 2 diabetes

Lorazepam (Ativan) Benzodiazepine 0.5 mg One tablet, as needed Orally Used for the short-term relief of the symptoms of anxiety
<table>
<thead>
<tr>
<th>Weight</th>
<th>Kg (if possible); can use lbs if more comfortable</th>
<th>Daily; in the morning before eating or drinking (after urination)</th>
<th>Sudden weight gain can be a sign that heart failure is worsening</th>
<th>Weigh on the same scale at the same time each day. If you gain more than 1.4 kg or three pounds in one day, call Denise.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure</td>
<td>mm Hg</td>
<td>Twice daily, in the morning before taking medications, and 4-6 hours after morning meds</td>
<td>Controlling blood pressure is important because heart failure can get worse if the heart is pumping too hard or not hard enough.</td>
<td>For both measurements, use the digital blood pressure/heart rate monitor. Take measurements at the same time every day, while sitting down and resting. If you see a reading that seems too high or low, try again twice more. If you get the same reading two more times, call Denise.</td>
</tr>
</tbody>
</table>
| Heart rate (pulse)             | Beats per minute (bpm)                           | Daily, in the morning, before getting out of bed                  | Monitoring heart rate is important because a fast or slow rate can indicate that something is wrong with the heart. | Target blood pressure: 90-130/60-80 mm Hg  
Call if blood pressure is above 160 (systolic) or below 90 systolic  
Target heart rate: 60-80 bpm  
Call if heart rate is above 100 bpm or below 45 bpm |

V. Symptoms

*Currently, we are only going to focus on anxiety and constipation. We will add more symptoms later.*

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety, Constipation</td>
<td>Mrs. A will use the screening tool every two weeks. If she selects that yes, she is experiencing the symptom, she will automatically receive the symptom decision aid tool for that symptom. Depending on the resulting score, Denise will either send self-care materials or reach out to Mrs. A to make another plan for care</td>
</tr>
</tbody>
</table>
VI. Nutrition

<table>
<thead>
<tr>
<th>Foods to avoid or limit</th>
<th>Reason to avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grapefruit</td>
<td>Interacts with Lipitor</td>
</tr>
<tr>
<td>Alcohol, cranberry juice</td>
<td>Can increase the effect of Coumadin</td>
</tr>
<tr>
<td>Large amounts of kale, spinach, brussel sprouts, parsley, collard greens, mustard greens, chard, green tea</td>
<td>These are rich in Vitamin K and can lessen the effect of Coumadin; you can still eat small amounts of these foods; the most important thing is that the amount of Vitamin K stays consistent from week to week</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Have no more than 1 drink per day; drinking large amounts of alcohol can cause cardiomyopathy or bleeding (interaction with Coumadin)</td>
</tr>
<tr>
<td>Caffeine (coffee, tea, chocolate)</td>
<td>It can increase heart rate or give you palpitations.</td>
</tr>
<tr>
<td>Salty foods (canned and processed foods, condiments, olives, pickles, soups, gravy, instant cereal, cured meats, cheese, sports drinks, fast foods, and frozen foods)</td>
<td>Aim to eat 1500 grams or less of salt each day; watch out for hidden salt</td>
</tr>
<tr>
<td>Fluids (don’t forget about foods that contain a lot of fluid, like ice cream, juicy fruits, and soups)</td>
<td>Limiting fluids can help you feel better and lower risk of going back to the hospital; limit fluids to 8 cups (2,000 mL or 2 L) per day</td>
</tr>
<tr>
<td>Added sugar (ingredients listed as granulated sugar, cane sugar, corn syrup, glucose, dextrose, maltose, galactose, fructose)</td>
<td>Carbohydrate intake should be limited to 250 grams of complex carbs per day (for 2,000 calorie diet). Try to have around 50 grams of carbs per meal and 20 grams for snacks.</td>
</tr>
</tbody>
</table>

VII. Access and changes to the care plan

Mrs. A can grant different types of access to her care plan to members of the care team. For those with the ability to make changes, the change has to be approved by Mrs. A. When a change is made, members of the care team with viewing privileges should receive a notification. The following shows privileges:
<table>
<thead>
<tr>
<th>Person</th>
<th>Can make changes</th>
<th>Goals</th>
<th>Meds</th>
<th>Measures</th>
<th>Symptoms</th>
<th>Nutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geeta Patel</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bob Smith</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Denise Myers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ken Rodriguez</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Nicole Graham</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Alan Moore</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Roger Anderson</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Allison Thomas</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Reference:

APPENDIX B: SCREENSHOTS
Appendix of Screenshots

This appendix contains screenshots of OnPoint, developed using Ionic Framework. The OnPoint application can be viewed using Ionic View on an Apple iPhone 6, or and Apple iPad Mini. The following screenshots are for the Apple iPhone 6.

Each screen is displayed on a page, with instructions on how to proceed to the next screen.
To “Create an account” and register, refer to Appendix Figure B-2: Registration screen.

To “Login”, refer to Appendix Figure B-3: Onboarding start screen.
After filling in all fields, click on “Register” and proceed to Appendix Figure B-3: Onboarding start screen.
To set up “Medications”, proceed to Appendix Figure B-4: Add medication screen.

To set up “Measurements”, proceed to Appendix Figure B-7: Measurements Schedule List.

To go to the home page, proceed to Appendix Figure B-9: Main Home View displaying cards.
To add a medication, tap the “+“ and proceed to Appendix Figure B-5: New Medication screen.

Otherwise, return to the onboarding screen Appendix Figure B-3: Onboarding Start Screen.
When all of the medication fields are input, tap the save button and continue to Appendix Figure B-6: Medication Input List.
APPENDIX FIGURE B-6: MEDICATION INPUT LIST

To continue, tap “Generate Schedule” and proceed to Appendix Figure B-18: Medications Tab - Editing the medication schedule.
Tap “+” to add a new schedule, proceed to Appendix Figure B-8: New Measurement Schedule.

If done with both Medications and Measurements onboarding, proceed to the main home page, Appendix Figure B-9. Otherwise, return to the onboarding screen Appendix Figure B-3: Onboarding Start Screen.
When done filling in all fields, tap the “Save” button at the bottom of the screen to return to Appendix Figure B-8: New Measurement Schedule.
To view the Medications card, proceed to Appendix Figure B-12: View Medication Time Slot. To view the Measurements card, proceed to Appendix Figure B-21: Measurements tab - View today’s measurement schedule. To comment on a card, go to Appendix Figure B-26.
APPENDIX FIGURE B-10: MAIN HOME VIEW DISPLAYING CARD THAT HAS BEEN COMPLETED

To comment on a card, go to Appendix Figure B-26.

To view tabs, Medications: Appendix Figure B-13, Measurements: Appendix Figure B-21, Appointments: Appendix Figure B-24, Goals: Appendix Figure B-25.
APPENDIX FIGURE B-11: MAIN HOME VIEW SCROLLED DOWN TO VIEW UPCOMING CARDS FOR TOMORROW

To return to the top of the page, go to Appendix Figure B-9: Main Home View displaying cards or Appendix Figure B-10: Main Home view displaying card that has been completed.
APPENDIX FIGURE B-12: VIEW MEDICATION TIME SLOT

To take all of the medications, tap the “Take All” and return to Appendix Figure B-10: Main Home view displaying card that has been completed.

To view a medication, tap on the medication and proceed to Appendix Figure B-17.
APPENDIX FIGURE B-13: MEDICATIONS TAB - VIEW MEDICATION LIST. USER HAS THE OPTION OF ADDING AS-NEEDED MEDICATION TO THE MEDICINE CABINET.

To view a medication, proceed to Appendix Figure B-17.

To add a medication, select the “+”. Note: for user testing purposes we have disabled the “+” for “Scheduled Mediations” since the medication schedules are pre-determined.

To add an as-needed pill, proceed to Appendix Figure B-14.
APPENDIX FIGURE B-14: NEW CABINET MEDICATION

Fill in all fields, and return to Appendix Figure B-13.
To view a list of all medications, proceed to Appendix Figure B-13. To view a diagram for filling the pillbox, tap the “Fill Pillbox” tab. Proceed to Appendix Figure B-20.

Scroll down to view the Medicine Cabinet and access as-needed pills. Proceed to Appendix Figure B-16.
APPENDIX FIGURE B-16: MEDICATIONS TAB - MEDICATION SCHEDULE VIEW SCROLLED DOWN TO VIEW REST OF THE TIME SLOTS AND ALSO MEDICINE CABINET.

To scroll up, view Appendix Figure B-15.

To view medication details, proceed to Appendix Figure B-17: View Medication Information.
APPENDIX FIGURE B-17: VIEWING MEDICATION INFORMATION. THIS IS ACCESSED WHEN THE USER TAPS ON A MEDICATION. THE USER CAN CHOOSE TO TAKE OR SKIP A MEDICATION.

Choose to either “skip” or “take” the medication. Return to Appendix Figure B-12: View Medication time slot.
APPENDIX FIGURE B-18: MEDICATIONS TAB - EDITING THE MEDICATION SCHEDULE

To edit a time slot, proceed to Appendix Figure B-19: Medications Tab - Editing a time slot in the medication schedule. To complete the medications onboarding process, proceed to Appendix Figure B-20: Medications Tab - Viewing the Fill Pillbox diagram. Otherwise, return back to the Medications Tab: Appendix Figure B-15: Medications Tab - Medication Schedule displaying all time slots in the day.
APPENDIX FIGURE B-19: MEDICATIONS TAB - EDITING A TIME SLOT IN THE MEDICATION SCHEDULE.

Save and return to Appendix Figure B-18: Medications Tab - Editing the medication schedule.
To view the medication schedule, tap on “Schedule” and proceed to Appendix Figure B-15.

To view the list of all medications, tap on “Medications” and proceed to Appendix Figure B-13: View Medication list.
The user can input the scheduled measurements and save the measurements. These will appear under the “History” tab.

To add an unscheduled measurement in order to log an extra reading, tap “Add” and proceed to Appendix Figure B-22: Measurements Tab – Logging an additional measurement.
APPENDIX FIGURE B-22: MEASUREMENTS TAB - LOGGING AN ADDITIONAL MEASUREMENT THAT IS NOT SCHEDULED.

To view the daily scheduled measurements, proceed to Appendix Figure B-21.
APPENDIX FIGURE B-23: VIEW APPOINTMENTS

Return to home by tapping the “Home” tab and proceeding to Appendix Figure B-9: Main Home View.
APPENDIX FIGURE B-24: VIEW GOALS. USER CAN COLLAPSE OR EXPAND GOALS AND ALSO ADD NEW GOALS.

To add a new goal, tap the “+” and proceed to Appendix Figure B-25: Add Goal.

Return to home by tapping the “Home” tab and proceeding to Appendix Figure B-9: Main Home View.
Fill in all fields and return to Appendix Figure B-24: Goals Tab.
APPENDIX FIGURE B-26: COMMENTS PAGE. WHEN A USER CLICKS ON A CARD TO COMMENT, THIS SCREEN WILL ALLOW THE USER TO VIEW ALL COMMENTS AND REPLY.

Return to the main page view when done commenting. Proceed to Appendix Figure B-9: Main Home View.
APPENDIX C: KEYNOTE WIREFRAMES
Medium-fidelity Prototypes

This appendix contains the medium-fidelity prototypes developed in Keynote using Keynotopia. Each screen contains clickable elements, which link to other screens. Thus, these prototypes can simulate basic application functionality and allow users to interact with the prototype. These prototypes were used during user testing sessions with UC Davis.
Set up your onPoint plan

Medications

Measurements

Appointments

Symptoms

Goals
Take a picture of your medication and we will automatically create a medication schedule for you!

- Take Picture of Medication
- Manually Input Medication
Instructions
Use Good Lighting
Don’t Block Label
Frame and Focus
Take Multiple Pictures
Capture all Details

OK
ZESTRIL (lisinopril)

Twice a day, morning and evening.

Use: This medicine is an ACE inhibitor used to treat heart failure and high blood pressure.

Warning:
- Do not take other medicines without consulting your doctor.
- Do not use this medicine if you are allergic to it.

Side Effects: An empty tablet shell may remain in your body. Your body has already absorbed the medicine.
Enalaprilat (injectable)

Morning and night, oral

This is an ACE inhibitor that treats high blood pressure.

Do not discontinue without consulting your doctor or pharmacist.

If you are pregnant or plan to become pregnant, this medication may cause problems for your baby.

A bitter taste may appear in your stool. This effect is not harmful and will diminish as you continue the medication.
(40 mg)

Orally

High blood pressure
Step 1 of 5
Input Meds

Medications to schedule

Zestril

Add Another Medication

Generate Schedule
<table>
<thead>
<tr>
<th>Name</th>
<th>Toprol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage</td>
<td>25 mg</td>
</tr>
<tr>
<td>Timing</td>
<td>Twice a day, morning and night</td>
</tr>
<tr>
<td>Instructions</td>
<td>Orally</td>
</tr>
<tr>
<td>Purpose</td>
<td>Used to treat heart failure, and high blood pressure</td>
</tr>
<tr>
<td>Notes</td>
<td>Lorem ipsum</td>
</tr>
</tbody>
</table>
Medication Setup

Step 1 of 5
Input Meds

Medications to schedule

Lasix

Toprol

Add Another Medication

Generate Schedule
Medication Setup

Step 1 of 5
Input Meds

Medications to schedule

- Lasix
- Toprol
- Zestril
- Coumadin
- Losarten
- Lipitor

Add Another Medication

Generate Schedule
Medication Setup

Step 1 of 5
Input Meds

Medications taken as needed

Ativan

Medications to schedule

Lasix
Toprol
Zestril
Coumadin
Losarten

Add Another Medication

Generate Schedule
Step 2 of 5
Generate Schedule

Generating Schedule...
Done!

We’ve created a schedule for you based on your list of medications:

Lasix
Toprol
Zestril
Coumadin
Losarten
Lipitor

Your “As Needed” Medications are in the Medicine Cabinet.

View Schedule
## Step 3 of 5
### Review Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning</th>
<th>Afternoon</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td></td>
<td>Lasix</td>
<td>Lipitor</td>
</tr>
<tr>
<td>M</td>
<td>Toprol</td>
<td>Toprol</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>Zestril</td>
<td>Zestril</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Coumadin</td>
<td>Losartan</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Lasix
- Lipitor
- Toprol
- Zestril
- Coumadin
- Losartan

---

**February 1, 2016**

**Medications Setup**

- **Morning**
  - Toprol
  - Zestril
  - Coumadin
  - Losartan
  - Riomet

- **Afternoon**
  - Lasix
  - Toprol
  - Zestril
  - Losartan
  - Riomet

- **Evening**
  - Lipitor
Step 3 of 5
Review Schedule

February 1, 2016
Medications Setup

Lipitor (Atorvastatin)
Take once a day
Best taken at bedtime because liver deals with cholesterol during sleep.

This is an example of how to move a pill from one slot to another.
Medications Setup

Step 3 of 5
Review Schedule

Daily Schedule

Morning
- Lasix
- Toprol
- Zestril
- Coumadin
- Losartan

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening
- Lipitor
Step 3 of 5
Review Schedule

Morning
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Afternoon
- Lipitor

Evening
- Enter a name for the new time slot
- Done
**Step 3 of 5**  
Review Schedule

### Daily Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Lasix</td>
</tr>
<tr>
<td>M</td>
<td>Toprol</td>
</tr>
<tr>
<td>T</td>
<td>Zestril</td>
</tr>
<tr>
<td>W</td>
<td>Coumadin</td>
</tr>
<tr>
<td>T</td>
<td>Losartan</td>
</tr>
</tbody>
</table>

- **Morning**
  - Lasix
  - Toprol
  - Zestril
  - Coumadin
  - Losartan

- **Noon**
  - Remove

- **Afternoon**
  - Lasix
  - Toprol
  - Zestril
  - Losartan
  - Riomet

- **Evening**
  - See All
Step 3 of 5

Review Schedule

9:41 AM
100%
February 1, 2016
Medications Setup

Noon
Lasix
Toprol
Zestril
Coumadin
Losartan

Afternoon
See All
Lasix
Toprol
Zestril
Losartan
Riomet

Evening
See All
Lipitor

Finalize Schedule
Step 3 of 5
Review Schedule

Monday Wednesday Friday

Morning

- Lasix
- Toprol
- Zestril
- Coumadin

See All

Afternoon

- Lasix
- Toprol
- Zestril
- Losartan

Evening

- Lipitor

See All
### Medication Setup

**Step 4 of 5**  
**Finalize Schedule**

Set your reminder times for each medication time shown below:

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Reminder Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td>7:00 AM</td>
</tr>
<tr>
<td>Noon</td>
<td>12:00 PM</td>
</tr>
<tr>
<td>Afternoon</td>
<td>3:00 PM</td>
</tr>
<tr>
<td>Evening</td>
<td>6:00 PM</td>
</tr>
</tbody>
</table>

Done
<table>
<thead>
<tr>
<th>Time</th>
<th>AM/PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>AM</td>
</tr>
<tr>
<td>10:05</td>
<td>PM</td>
</tr>
<tr>
<td>11:10</td>
<td></td>
</tr>
<tr>
<td>12:15</td>
<td></td>
</tr>
<tr>
<td>6:45</td>
<td></td>
</tr>
<tr>
<td>7:50</td>
<td></td>
</tr>
<tr>
<td>8:55</td>
<td></td>
</tr>
</tbody>
</table>
Set your reminder times for each medication time as shown below:

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Reminder Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td>9:00 AM</td>
</tr>
<tr>
<td>Noon</td>
<td>12:00 PM</td>
</tr>
<tr>
<td>Afternoon</td>
<td>3:00 PM</td>
</tr>
<tr>
<td>Evening</td>
<td>6:00 PM</td>
</tr>
</tbody>
</table>

Done
Let’s fill in your pillbox.

Please have your medications and your pillbox handy for the next step.
## Step 5 of 5

### Fill Pillbox

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select medication to begin:

- Lasix
- Toprol
- Zestril
- Coumadin
- Losartan
- Riomet
- Lipitor
### Step 5 of 5
**Fill Pillbox**

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Morning</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Noon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Afternoon</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Evening</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fill your pillbox with Lasix

- Lasix
- Toprol
- Zestril
- Coumadin

Done
<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select medication to begin:

- Lasix
- Toprol
- Zestril
- Coumadin
- Losartan
- Riomet
- Lipitor
### Step 5 of 5
#### Fill Pillbox

<table>
<thead>
<tr>
<th></th>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Morning</strong></td>
<td></td>
<td></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>Noon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Afternoon</strong></td>
<td></td>
<td></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>Evening</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fill your pillbox with Toprol

Done

- Lasix
- Toprol
- Zestril
- Coumadin
- Losartan
- Riomet
- Lipitor
Step 5 of 5
Fill Pillbox

Select medication to begin:

Lasix
Toprol
Zestril
Coumadin
Losartan
Riomet
Lipitor
## Step 5 of 5
### Fill Pillbox

<table>
<thead>
<tr>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Morning**
- Losartan
- Torisel
- Lipitor
- Coumadin
- Lasix

**Noon**
- Losartan
- Toprol
- Zestril
- Coumadin

**Afternoon**
- Losartan
- Toprol
- Zestril
- Coumadin

**Evening**
- Losartan
- Toprol
- Zestril
- Coumadin

Select medication to begin:

1. Lasix
2. Toprol
3. Zestril
4. Coumadin
5. Losartan
6. Riomet
7. Lipitor
Set up your onPoint plan

Measurements

Appointments

Symptoms

Goals
Medications
February 1, 2016

Morning
- Lasix
- Toprol
- Zestril
- Coumadin
- Losartan

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening
- Lipitor

Medicine Cabinet
Settings

View Medication List

View Medication Schedule

Reminder Times

Fill Pillbox
February 1, 2016

How are you feeling?

Take medications!  7:00 am
Lasix, Toprol, Zestril, Coumadin, Losartan, Riomet

Comment  Take Medications
Select a medication above to Start
Morning

Lasix (Furosemide)

Dose: 40 mg

Instructions: Take twice daily; First in morning and then 6-8 hours later

Purpose: Treats salt and fluid retention and swelling caused by heart failure

Skip Take
(LASIX) Furosemide

Instructions:
Take twice daily; First in morning and then 6-8 hours later

Dose:
40 mg

Purpose:
Treats salt and fluid retention and swelling caused by heart failure

Are you sure you want to skip Lasix?
February 1, 2016

Morning

**Lasix (Furosemide)**

**Dose:** 40 mg

**Purpose:** Treats salt and fluid retention and swelling caused by heart failure

**Instructions:** Take twice daily; First in morning and then 6-8 hours later

**Options:**
- Take
- Skip
- Alternate
Medications
February 1, 2016

Morning

- **Lasix (Furosemide)**
  - **Instructions:** Take twice daily; First in morning and then 6-8 hours later
  - **Dose:** 40 mg
  - **Purpose:** Treats salt and fluid retention and swelling caused by heart failure

Are you sure you want to skip Lasix?

- **No**
- **Yes**

Alternate
February 1, 2016

Medications

Morning

- **Skipped**
  - Lasix

- **Take**
  - Toprol
  - Zestril
  - Coumadin
  - Losartan
  - Riomet

**Action Completed!**

**You have skipped:**

- Lasix

[Undo]

[Skip]  [Take]
February 1, 2016

Morning

Lasix
- Skipped

Toprol
- Take

Zestril
- Take

Coumadin
- Take

Losartan
- Skip

Riomet (Metformin)
- Take

Dose: 500 mg

Instructions:
Take orally, twice daily, with meals

Purpose:
Used to treat Type 2 Diabetes
Medications
February 1, 2016

Morning

Skipped
Lasix

Action Completed!
You have taken:

Toprol  Zestril  Losartan  Riomet

Undo

Skip  Take
Medications
February 1, 2016

Morning

- **Skipped**
  - Lasix

- **Take**
  - Coumadin (Warfarin sodium)

**Instructions:**
Take orally once a day in the morning

**Dose:**
2 mg

**Purpose:**
Treats and prevents blood clots by acting as a blood thinner.
Medications
February 1, 2016

Morning

Lasix
Skipped

Coumadin (Warfarin sodium)

Instructions:
Take orally once a day in the morning

Dose:
2 mg

Purpose:
Treats and prevents blood clots by acting as a blood thinner.

Warning:
You should not skip Coumadin. Please take the dose as soon as possible, unless it is time for your next dose.

Are you sure you want to skip Coumadin?

Dose: 2 mg

No

Purpose: Treats and prevents blood clots by acting as a blood thinner.

Yes
February 1, 2016

Morning

- Skipped: Lasix
- Skipped: Coumadin

Action Completed!
You have skipped:
- Coumadin

Undo

Skip

Take
Medications
February 1, 2016

Morning

- Skipped Lasix
- Skipped Coumadin

Action Completed!
You have skipped:
- Coumadin

Undo

Back to Medications Home

Skip
Take
February 1, 2016

Morning
- Skipped Lasix
- Skipped Coumadin

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening
- Lipitor

Medicine Cabinet
URGENT: Skipped Medication!  8:20 am

Coumadin

Comment  Medications

Completed Medications  8:20 am

Taken:  Toprol, Zestril, Losartan, Riomet
Skipped:  Lasix

Comment  Medications
Medications
February 1, 2016

Morning
- Skipped Lasix
- Skipped Coumadin

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening
- Lipitor

Medicine Cabinet
February 1, 2016
Medications

Morning

Lasix
Skipped

Coumadin
Skipped

Select a medication above to Start

Skip
Take
February 1, 2016

Medications

Morning

Skipped
Lasix

Skipped
Coumadin

Coumadin (Warfarin sodium)

You skipped your 8:00 am dose at 8:20 am. Please take this dose as soon as possible.

Instructions:
Take orally once a day in the morning

Purpose:
Treats and prevents blood clots by acting as a blood thinner.

Skip
Take
February 1, 2016

Morning

Skipped Lasix

Action Completed!
You have taken:

Coumadin

Undo

Back to Medications Home
February 1, 2016

Morning

**Lasix**
- Skipped

**Coumadin**
- Skipped

---

**Coumadin (Warfarin sodium)**

You **skipped** your 8:00 am dose at 8:20 am. More than 4 hours have passed. Please **DO NOT TAKE** this dose.

**Instructions:**
Take orally once a day in the morning.

**Purpose:**
Treats and prevents blood clots by acting as a blood thinner.
February 1, 2016

How are you feeling?

**Completed Medications**

**9:14 am**

Taken: Coumadin

Comment

Medications

**Completed Medications**

**8:20 am**

Taken: Toprol, Zestril, Losartan, Riomet

Skipped: Lasix

Comment

Medications

URGENT: Skipped Medication!

8:20 am

Coumadin

Comment

Medications

Completed Medications

8:20 am

Taken:     Toprol, Zestril, Losartan, Riomet

Skipped:  Lasix

Comment

Medications
February 1, 2016

**Morning**
- Skipped Lasix
- Skipped Coumadin

**Afternoon**
- Lasix
- Toprol
- Zestril
- Losartan
- Skipped Riomet

**Evening**
- Lipitor

**Medicine Cabinet**
Medications
February 1, 2016

Morning
- Skipped Lasix
- Skipped Coumadin

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening

Medicine Cabinet
- Ativan
- Lasix
- Toprol
- Zestril
- Losartan

Skip
Take
Medications
February 1, 2016

Morning
- Skipped Lasix
- Skipped Coumadin

Medicine Cabinet
- Ativan (Lorazepam)
  Provides short-term relief of the symptoms of anxiety

Select reason for taking Ativan:
- Felt Anxious
- Heart Racing
- Other…

Skip  Take
February 1, 2016

How are you feeling?

---

Completed Medications 9:42 am
Taken: Ativan
Reason: Felt anxious

---

Completed Medications 9:14 am
Taken: Coumadin

---

Completed Medications 8:20 am
Taken: Toprol, Zestril, Losartan, Riomet
Skipped: Lasix

---

URGENT: Skipped Medication!
8:20 am
Coumadin

---

Comment
Medications
Medications
February 1, 2016

Morning
- Skipped (Lasix)

Afternoon
- Lasix
- Toprol
- Zestril
- Losartan
- Riomet

Evening
- Lipitor

Medicine Cabinet
February 1, 2016

How are you feeling?

Take Measurement  7:00 am
Weight, Blood Pressure, and Heart Rate

Comment  Measurements

View Past History
<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>incomplete lbs</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>incomplete mmHg</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>incomplete bpm</td>
</tr>
</tbody>
</table>

Measurement Reminder!

7:00 am

Weight, Blood Pressure, and Heart Rate Measurements incomplete
February 1, 2016

How are you feeling?

**Medications**

**Measurements**

**Appointments**

**Home**

**Goals**

**Comment**

**Measurements**

Weight: 

Blood Pressure: incomplete

Heart Rate: incomplete

**Measurement Reminder!**

7:00 am

Weight, Blood Pressure, and Heart Rate

Measurements incomplete

- Weight
- Blood Pressure
- Heart Rate

Done

lbs

mmHg

bpm
February 1, 2016

### Measurements

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td><strong>120</strong> lbs</td>
<td></td>
</tr>
<tr>
<td><strong>Blood Pressure</strong></td>
<td>/</td>
<td>mmHg</td>
</tr>
<tr>
<td><strong>Heart Rate</strong></td>
<td><strong>incomplete</strong></td>
<td>bpm</td>
</tr>
</tbody>
</table>
February 1, 2016

Weight: 120 lbs

Blood Pressure: 170/100 mmHg

Blood Pressure High
Try taking another measurement in one minute. To ensure a good reading, please follow the tips.
Measurement Tips

Blood Pressure Tips

- Be still

- Make sure you haven't had any caffeine, tobacco, or exercise in the last 30 minutes.

- Wait one minute before taking another measurement.

- Make sure you are sitting down, with your back supported by a chair and your feet on the floor.
<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, lbs</td>
<td>120</td>
</tr>
<tr>
<td>Blood Pressure, mmHg</td>
<td>incomplete</td>
</tr>
<tr>
<td>Heart Rate, bpm</td>
<td>incomplete</td>
</tr>
</tbody>
</table>

**Goal:** Measurement Reminder!

- **Weight:** 120 lbs
- **Blood Pressure:** incomplete
- **Heart Rate:** incomplete
Weight: 120 lbs
Blood Pressure: 168/102 mmHg
Heart Rate: 75 bpm

Blood Pressure High
Try taking another measurement in one minute. To ensure a good reading, please follow the tips.

View tips | OK
Blood Pressure Tips

• Be still

• Make sure you haven't had any caffeine, tobacco, or exercise in the last 30 minutes.

• Wait one minute before taking another measurement.

• Make sure you are sitting down, with your back supported by a chair and your feet on the floor.
February 1, 2016

Weight: 120 lbs

Blood Pressure: incomplete

Heart Rate: incomplete

Measurement Reminder!
7:00 am
Weight, Blood Pressure, and Heart Rate Measurements

120 lbs

Completed:

Weight: 120 lbs
Blood Pressure: incomplete
Heart Rate: incomplete
February 1, 2016

**Measurements**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>120 lbs</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>175/95 mmHg</td>
</tr>
<tr>
<td>Heart Rate</td>
<td></td>
</tr>
</tbody>
</table>

**Comment**

**Measurement Reminder!**

7:00 am

- Weight
- Blood Pressure
- Heart Rate

**Done**
<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>120</td>
<td>lbs</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>175/98</td>
<td>mmHg</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>75</td>
<td>bpm</td>
</tr>
</tbody>
</table>
How are you feeling?

**TODO: Blood Pressure** 7:07 am
Call your care coordinator, Denise Myers.

**Measurement recorded** 7:07 am
Click to view completed measurements
February 1, 2016

How are you feeling?

TODO: Blood Pressure 7:07 am
Call your care coordinator, Denise Myers.

(111) 222-333

Call  Cancel

Click to view completed measurements

Comment  Measurements
How are you feeling?

Weight
Daily Average: 120
120 lbs
Today, 8:54 PM
Feb 3 4 5 6 7 8 9

Blood Pressure
170/90
Today, 8:53 PM
Feb 3 4 5 6 7 8 9

Heart Rate
75 bpm
Min: 75 Max: 75
Today, 8:55 PM

Hi Mrs A

Clinical Goals
11 Goals

Personal Goals
4 Goals
Hi Mrs A

Clinical Goals
11 Goals

Personal Goals
4 Goals

1. Remain independent

2. Keep visiting with friends and doing my daily activities

3. Be able to visit out-of-town family by plane

4. Feel healthy
Hi Mrs A

Clinical Goals
11 Goals

1. Control systolic blood pressure to lower than 130/80 mm Hg but not less than 90 mmHg

2. Oxygen levels with ambulation or while sleeping – keep O2 saturation at >91-92%

3. Keep HbA1C levels at 7% or less

4. Keep heart rate between 60-80 bpm
How are you feeling?

Appointment Reminder!

9:00 AM

Appointment with cardiologist Dr. Hart tomorrow at 9:00 AM

Comment  View Appointment
How are you feeling?

Appointment Reminder!

Appointment with cardiologist Dr. Hart tomorrow at 9:00 AM

Comment

View Appointment
How are you feeling?

Your son Commented on your 9:00 Am Appointment Reminder. Click to view.

Appointment Reminder!

Appointment with cardiologist Dr. Hart tomorrow at 9:00 AM

Comment  View Appointment
Hey Mom, I’ll come pick you up at around 8:30 AM tomorrow. Don’t forget to bring your ID.
How are you feeling?

Appointment Reminder! 9:01 AM

Appointment with cardiologist Dr. Hart tomorrow at 9:00 AM

Comment

View Appointment

Son

10:22 AM

Hey Mom, I’ll come pick you up at around 8:30 AM tomorrow. Don’t forget to bring your ID.

Thanks. See you tomorrow.
How are you feeling?

Appointment Reminder!

Appointment with cardiologist Dr. Hart tomorrow at 9:00 AM

Comment

View Appointment

Son

Hey Mom, I’ll come pick you up at around 8:30 AM tomorrow. Don’t forget to bring your ID.

Thanks. See you tomorrow.
Appointment with cardiologist Dr. Hart

Feb 2, 2016 9:00 AM to 10:30 AM
Location: 2020 Kittredge Str, Berkeley, 94704

Note: Please bring your ID
February 1, 2016

How are you feeling?

Screening Questionnaire
Complete every 2 weeks

Comment
Symptoms

URGENT: Call Denise
Blood Pressure too high!

Comment
Measurements

Measurement recorded
Click to view completed measurements

Comment
Measurements
In terms of anxiety, select the number that best describes how you feel now.

- No anxiety
- Worst possible anxiety

1
In terms of anxiety, select the number that best describes how you feel now.

1 2 3 4 5 6 7 8 9 10

No anxiety 3 Worst possible anxiety

Next

Skip this question
You ranked your anxiety as 3 on a scale of 1-10.

Have you felt this anxious for two weeks or longer?

Yes, continuously.

Yes, off and on.

No
You ranked your anxiety as 3 on a scale of 1-10.

Have you felt this anxious for two weeks or longer?

Yes, continuously.

Yes, off and on.  

No
Are you re-living or facing events in ways that make you feel more anxious, like dreams or flashbacks?

- Yes, continuously.
- Yes, off and on.
- No
Are you re-living or facing events in ways that make you feel more anxious, like dreams or flashbacks?

Yes, continuously.

Yes, off and on.

No

Next
Are you having panic attacks, periods or spells of sudden fear, discomfort, intense worry or uneasiness?

- Yes, continuously.
- Yes, off and on.
- No
Are you having panic attacks, periods or spells of sudden fear, discomfort, intense worry or uneasiness?

Yes, continuously.

Yes, off and on.

No
How much does your anxiety affect your daily activities at home or at work?

- Yes, significantly.
- Yes, some.
- Not at all.
How much does your anxiety affect your daily activities at home or at work?

- Yes, significantly.
- Yes, some.
- Not at all.

Next

Skip this question
How much does your anxiety affect your sleep?

- Significantly.
- Some.
- Not at all.
How much does your anxiety affect your sleep?

- Significantly
- Some (selected)
- Not at all

Next

Skip this question
Do any of these apply to you?
Select all that apply.

- Waiting for test results
- Financial problems
- History of anxiety or depression
- Withdrawal from alcohol or substance use
- Living alone
- Recurrent or advanced disease
- Not exercising

Next
Skip this question
Do any of these apply to you?
Select all that apply.

Waiting for test results

Financial problems ✓

History of anxiety or depression

Withdrawal from alcohol or substance use ✓

Living alone

Recurrent or advanced disease

Not exercising

Next

Skip this question
Are you feeling any of the following?

- Fatigue
- Shortness of breath
- Pain

No
Are you feeling any of the following?

- Fatigue
- Shortness of breath
- Pain

No
Thank you for completing the Screening Questionnaire.
February 1, 2016

How are you feeling?

Screening Questionnaire
Complete every 2 weeks

.Comment

Symptoms

URGENT: Call Denise
Blood Pressure too high!

.Comment

Measurements

Measurement recorded
Click to view completed measurements

.Comment

Measurements