“Memedicine”: Contextual Inquiry

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Reminding the Forgetful

For nearly half of all Americans, taking prescription medication is just another routine part of everyday life. According to a 2010 report from the National Center for Health Statistics, from 2005 to 2008, 48 percent of the population had a prescription for at least one drug and 21 percent were taking three or more prescriptions simultaneously. These prescriptions may be tailored to relieve any variety of ailments, including high cholesterol, depression, heart disease, and diabetes, and the number of people taking them can only be expected to rise. It is crucial, then, that prescriptions are presented to patients in such a way as to ensure that they are taken consistently and correctly.

A recurring difficulty faced by prescription drug patients is simply remembering when to take their medication. Forgetfulness is not restricted to any particular demographic and can stem just as easily from a busy schedule as it can from spotty memory, so any solution that assists in following the proper regimen will benefit the whole spectrum of patients. Our proposed remedy is a fusion of the time-tested pill bottle and medicine cabinet with the technological power of mobile computing, a multi-part system in which patients are reminded of their dosing amount and schedule by both their enhanced bottles as well as their portable devices. “Memedicine” frees patients of the hassle of memorizing multiple sets of instructions, tracking separate timetables, and lets them get back to doing what medicine was supposed to enable all along: living happy, healthy lives.

The Participants

Our three contextual inquiry participants were chosen to represent various age groups and medical conditions. Medicine and supplements are not only a concern for the elderly, so we wanted our medicine management tool to reach out to people of all ages and conditions, keeping in mind the types of medicine that are taken.

The Young Woman

The first contextual inquiry participant was a female college student in her late teens who takes one pill once a day an hour before eating. She started taking thyroid medication during the summer of 2010 and has, for the most part, gotten into the routine of taking her medication without being reminded. The

environment in which I observed her practice was at her apartment in the morning, before she had breakfast. As the “apprentice”, I asked her about the steps that she took when taking her medicine, the factors she considered in choosing the time to do so, what led her to choose the time, and what could improve her experience of taking her medication.

The Eyedrop-using Pilot

The second contextual inquiry participant was a male airline pilot in his early fifties who takes one set of eye drops twice a day to reduce eye pressure (Glaucoma). He started taking a number of different prescriptions starting over 20 years ago. The environment in which I observed his practice was in his home around late morning. As the “apprentice”, I asked him about the steps that he took when taking his medicine, if there are any problems that he encounters when doing so, issues that prevent him from taking his medicine on time, and what could improve his experience of taking his medication.

The Multi-Drug Male

The third contextual inquiry participant was a male self-employed software consultant in his late fifties. He takes Lamasil and various dietary supplements daily. He has testosterone injections biweekly for bone density. I asked him about his medicine schedule, how often he forgets to take medication, how often he remembers but does not take it (and why), what he uses to remind himself, and what he would consider convenient and easy ways to remember.

Our Findings

Forgetfulness: A Common Theme

The high level themes that all users shared in common was forgetfulness. The frequency with which users of ages between the late teens to late fifties experienced forgetful episodes ranged from one incident every 1.5 months to one incident every three months. Considering the likelihood that older individuals with more significant memory problems will need more assistance in remembering to take their medicine, forgetfulness seems to be the primary problem to tackle within our proposed medicine intake tracking system. Tasks

common to all three participants included pairing the act of taking medicine with another daily routine (e.g. for User 1, planning the time to take medicine by when she wanted to eat), and following instructions from memory without having to refer to given when first prescribed. The latter is most likely true because the three users had been taking their medication long enough to make the act of taking it routine, and none of them had any severe memory issues.

Forgetfulness, Busyness or Laziness?

User 1 was unique, since she represents a younger age group among whom prescription drug use is less frequent than in older age groups. As expected, memory loss was not much of an issue, though she did mention that once in a few months she would forget to take her medicine. Even in the rare case that she did forget her medicine, she mentioned that this was due to the morning rush to prepare for school and not because of memory loss due to age. Instead, she delayed taking her medicine in the morning because of laziness or busyness. This was an issue not discussed in our team prior to the contextual inquiries; as a team, we had not considered implementing any particular sort of incentive other than regularity, control and organization. Another discovery was the tendency of User 1 to place her medicine in various places around her apartment. In the case that individuals moved their medicine, some design ideas such as stationary screens displaying directions and schedules would be less effective.

Forgetfulness and Frequent Travel

User 2 represented those using a different kind of medicine: eyedrops. He stated that his greatest concern was remembering when to take his medicine or if he had already taken it. Though the formula of the medication and number of prescriptions has changed over the 20 years that he has used eyedrops for his condition, his daily routine has persisted. However, with age, he has found himself at times forgetting to take his eyedrops or forgetting to pack them with him on a trip. As an airline pilot, his job requires frequent travel, so making sure he remembers to bring his medicine on trips is extremely important. Unlike the first participant, the only constraint when taking his medication is to space doses roughly 12 hours apart, and to give himself enough time when taking it so that he can close his eyes for a minute or two to make sure that the medicine has thoroughly covered his eyes.

Chronically Forgetful

User 3 represents the chronically forgetful. He relies almost completely on his wife to remind him to take his medicine, and often doesn't bother with supplements even when he does remember, saying it depends on his mood. He tends to remember his medicine times by meals--for example, Lamasil after lunch and supplements during breakfast and dinner--but only if the supplements have already been taken out and put on the table. Because he works in his home office all day, which is quite far from the medicine cabinet, he often takes bottles to his desk in an attempt to remember. Evidently this is unsuccessful as he says he misses many days of supplements. He says he requires outside pressure to take his medications.

Tasks: Existing and New

The existing tasks commonly performed by our participants involve taking their medicine at approximately the same time every day, and doing so by pairing it with some other daily routine, such as preparing to eat, after returning to one's room after eating, or right as one is getting into bed at night.

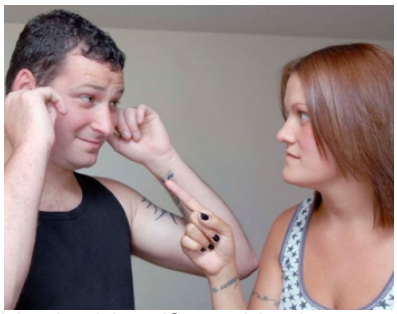
Waking Up Early and Preparation

User 1 claimed that she has always been an early riser, but the need to take medicine an hour before eating further pressed her to wake up at 7am, 6, and sometimes even 5am. She admitted that though she thought this task was worthwhile, too often she would stay in bed from laziness or exhaustion, and not take her medicine until much later. Since this ended up depriving her of sleep, User 1 recently started checking that her medicine and a cup of water is at her bedside before she goes to sleep.

Packing on Trips & Time Zones

User 2 mentioned that in his case, when traveling, he remembers to pack his medicine by pairing everything with another item he will be packing. He gave the example of pairing his razor and shaving cream, and likewise his medicated eyedrops and a nasal spray he has recently started taking to help with his insomnia. User 2 realized that this plan was not perfect, as forgetting both items in the pair would prevent him from being reminded of the forgotten items. Another significant problem was that User 2's trips would take him across the country, and the long flying times and time zones inadvertently mess up his medicine-taking routine. For example, say that User 2 leaves his hotel in New York at 5am local time (2am PST) to fly a flight to Newark. After a layover in Newark, he finishes the flight at Portland. From there, he has a second flight from Portland to Anchorage, and then finally flies back to Seattle. By the time he gets home, it is 10pm local time (PST). He would have had to take his eyedrops before he left at 5am local time in New York, because it is not possible to do so while flying. However this type of flight schedule would mean his 12 hour eyedrops would be spaced out to as much as 20 hours apart. Thus the task of planning to take his medication while he is at work during a long break becomes crucial. The alternative is to wait much longer than 12 hours to take the eyedrops, but User 2 admits that he tries to avoid this situation as much as possible.

Relying on the Wife



User 3 says that when it comes to his important medications, like testosterone and Lamasil, he is pretty good about taking them. If he remembers them, he will take them. However, he is very forgetful and relies often on his wife to remind him. Since he takes a variety of supplements in differing amounts, often he will not bother taking them with a meal if they aren't laid out on the table already for him. When asked why he is so flippant about supplements, he said that since they were pushed on him by his wife and he has no idea what they do for his health, he doubts they work and can't be bothered to care.

Integrating Alarms

Taking the medicine itself takes each user anywhere from 10 seconds to 5 minutes to complete, so the act itself is not tedious. However, as the users' forgetfulness indicates, no matter how simple or quick a task may be, individuals still need a push to remind them to do what is needed for their health. New tasks will address users' need to be reminded. Our application will be available on a mobile device, for those that carry one, and around the medicine cabinet, for those who do not carry a phone. The news tasks for our application revolve around reminding individuals when and what they should take. This gives younger users a friendly nudge, similar in form to a typical alarm clock app. At the same time, older users who are more forgetful can also use this app, but with videos to guide those with mild dementia. Other tasks can include assisting those who travel often by giving a reminder of what medicines to pack, and personalizing the app by including any supplemental vitamins.

Simple Tasks: Adding New Medicine & Taking Your Meds

The first new task with our app would be to add a new prescription into the system so that the user can be reminded of how and when to take it. In the case that a user must take multiple types of medicine, each medicine, whether a pill, eyedrop, or injected, must be recognized by the application so that it can notify the user when the time comes for him or her to take the appropriate medicines. Another easy task would be to go through the directed steps in the app to take one's daily dose of medicine. The design of our app would be such that even a user with mild dementia will be able to easily navigate and take their medication.

Moderate Tasks: Scheduling and Travel Planning

A moderately difficult task could be the scheduling of the time of day at which a user wants to take their medicine, which would also involve personalization of “back-up methods” when a simple alarm does not catch the user’s attention. This arises as a problem when a user does not carry around his or her mobile device with them all the time, and the alarm from the app on the phone may not reach their ears. Such back-up methods may include a call to a land line, the flashing of lights around the house, or some other audio or visual reminder to the user, separate from the mobile device. For users who do not habitually carry around their phone, or who do not own a mobile phone, a necklace with an embedded chip can have the task of beeping and flashing to remind the wearer to take their medicine.

Another moderate task may include setting a vacation medicine packer, so that when leaving on a trip, the user can follow a checklist depending on the medicine that he or she needs to take during that time, and pack accordingly. The task would include verifying and matching the medicine to the list on the app, so that the user does not accidentally take the wrong kind of medicine with them.

Difficult Tasks: Manual Addition of Supplements & Personalization

A more significantly difficult task would be to manually input a supplemental vitamin or other non-prescription level medicine into the medicine scheduler that has a lower risk of overdose or other harmful effects. As supplemental vitamins require less control and are not as potent, some users may find it beneficial to add to their daily intake. This task would allow customization, and is therefore more difficult, but there will still be preventative measures added to the app so that the user does not overdose because of the supplements (e.g. taking iron tablets on top of an iron-rich diet and iron-level enhancing medication could cause serious health risks, and our application will be able to realize when a dangerous overdose or mix like this has happened).

Sketches of Design

Figure 1: Projector/intelligent surface for those who keep their medicine in one place
Figure 2: Big images, emphasis on medicine detail and schedule
Figure 3: Familiar mobile layout, emphasis on alarm, vacation planner, scheduler, adding prescriptions

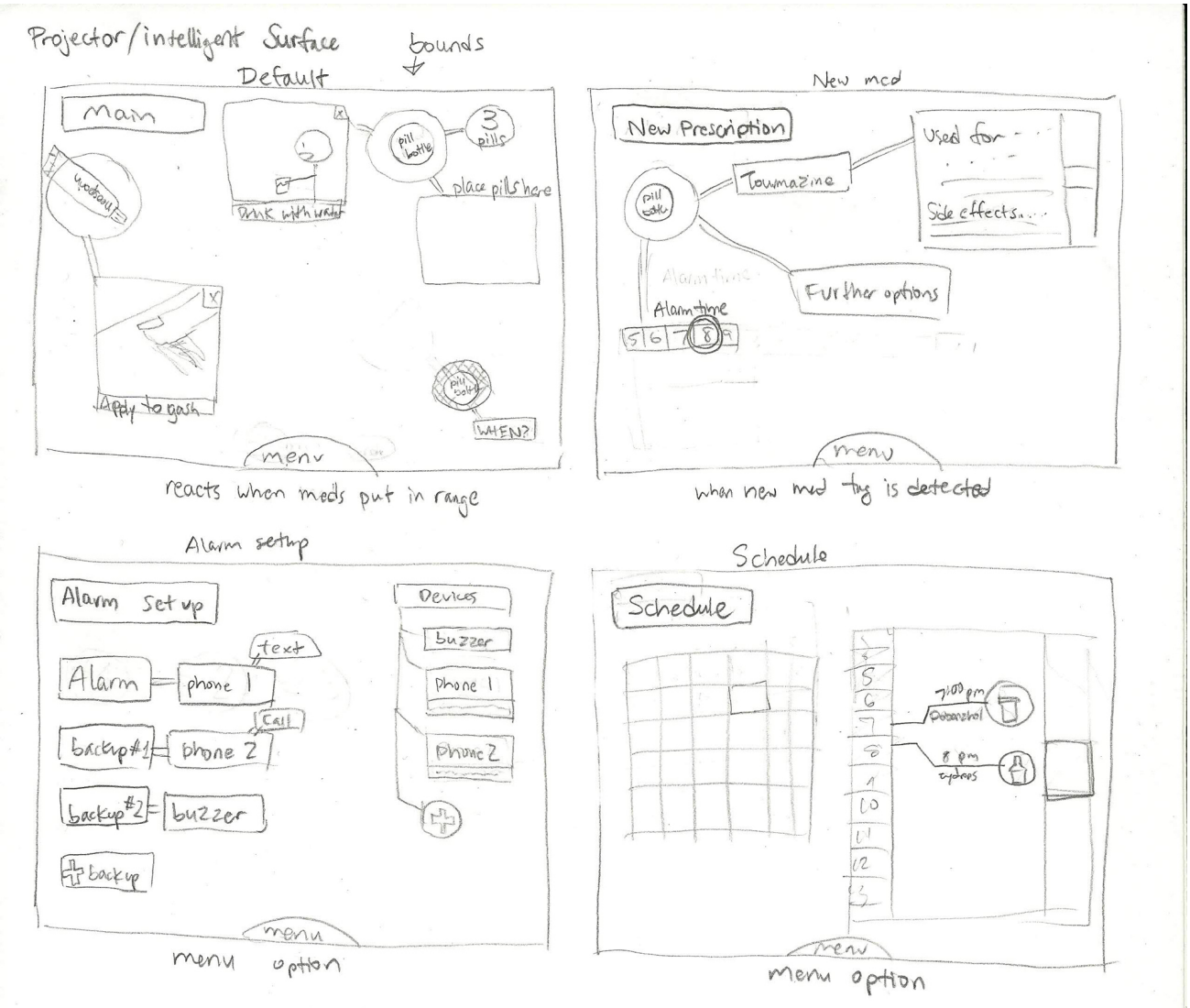


Figure 1: Interactive touch screen to visualize medicine plan and play video of medicine taking instructions

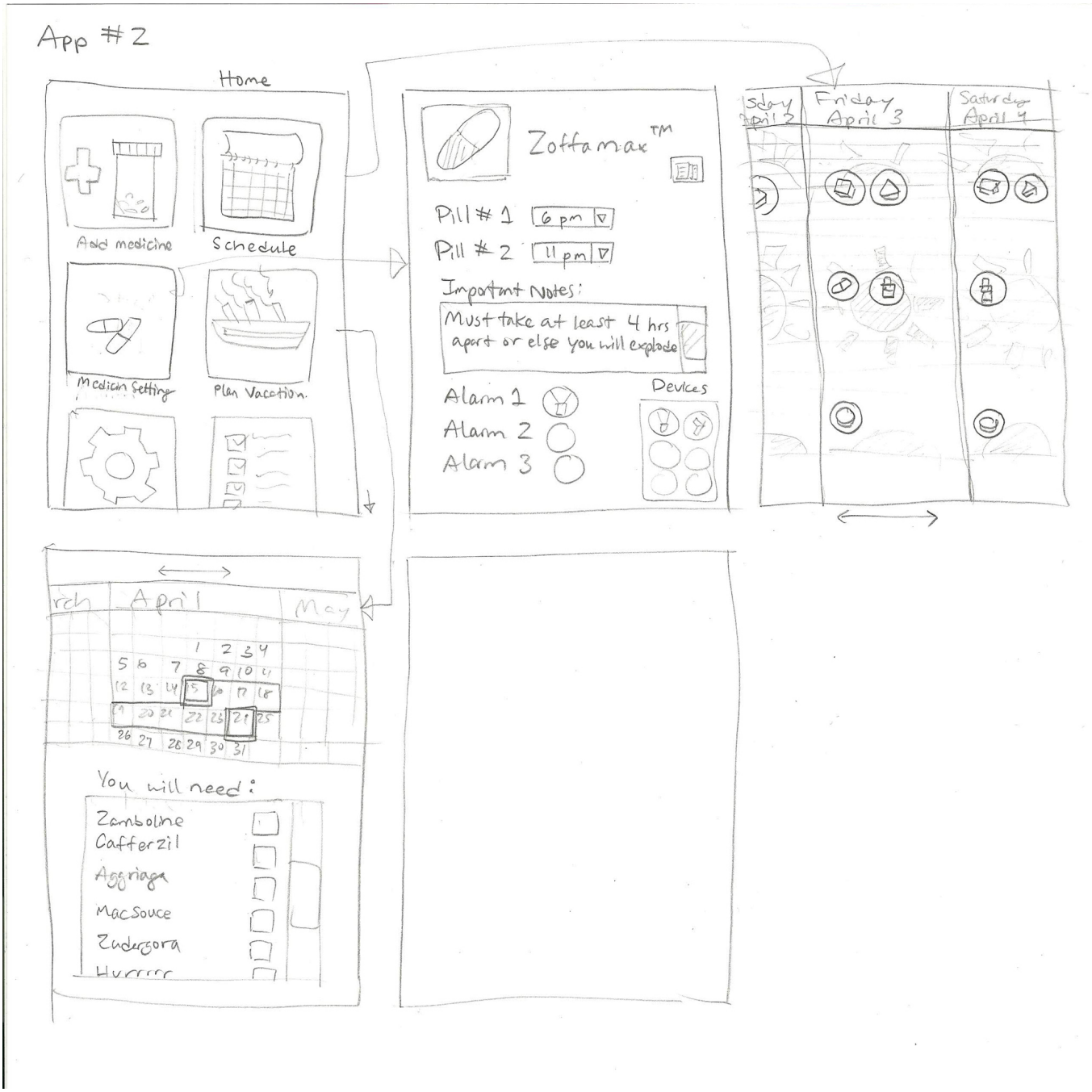


Figure 2: Mobile app details cautions when taking medicine, and integration into planner

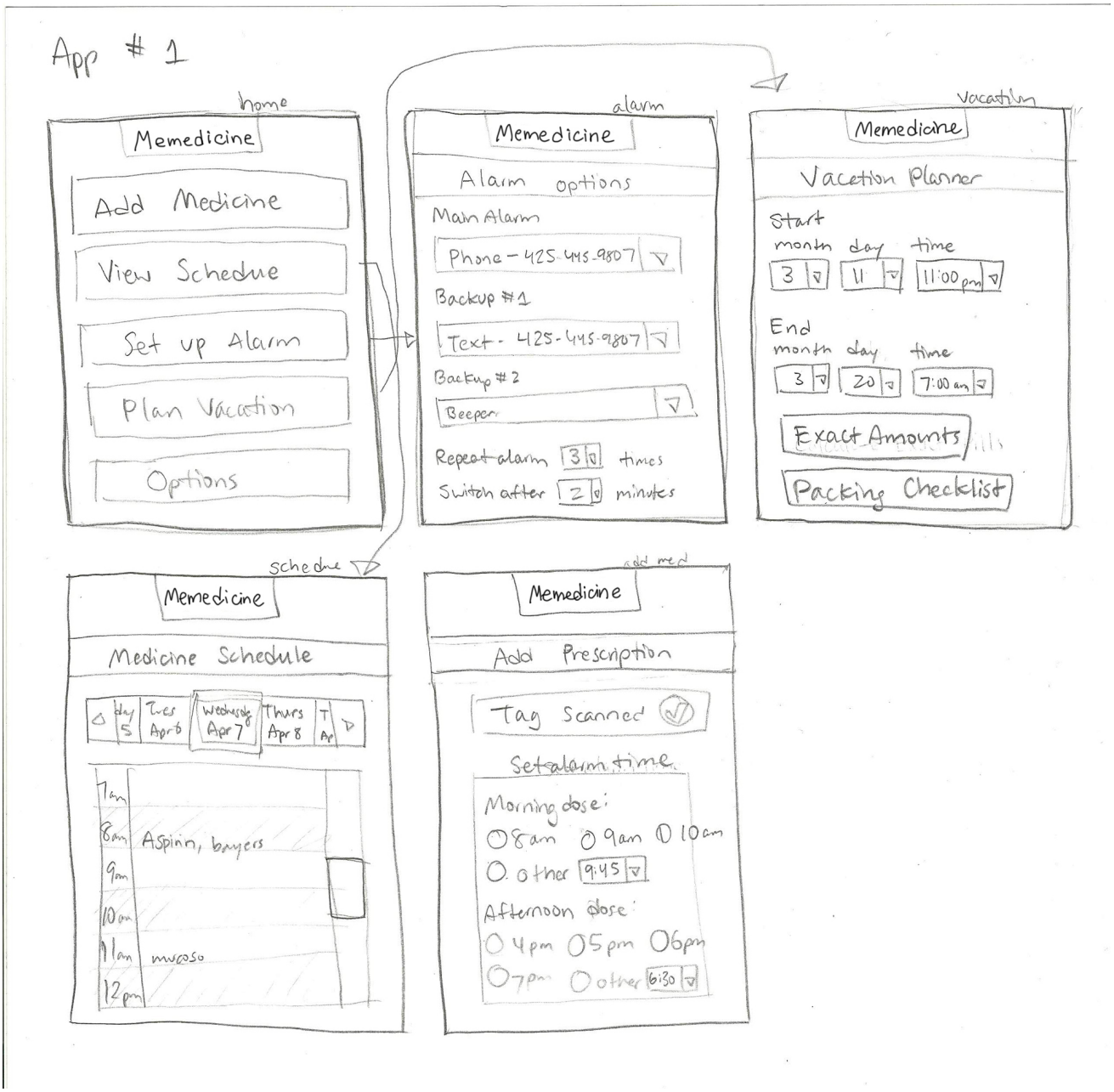


Figure 3: Schedules and adds prescriptions, centered around alarm feature