**Glaucoma Medication Reminder**

Team: Chris Webster¹, Mike Oldenburg¹, Ksenija Bujanovic¹, Jessica Hause¹; Advisor: John Webster¹; Client: Leo Wang²

¹Department of Biomedical Engineering, ²Department of Ophthalmology & Visual Sciences
University of Wisconsin - Madison, Madison, WI 53706

**Abstract**

Non-compliance is the most common cause of blindness in glaucoma patients (1). Constructing a medication reminder, targeted specifically for these patients, is an attempt to allow them to easily comply with the treatment during their daily routines. In order to ensure client satisfaction, two different designs were constructed. Four separate kitchen timers make up the egg-timer design which satisfies patient’s requirements. The other, a program written for a PDA, is sophisticated and innovative but potentially intimidating for patients. In the future, both of the designs need improvements.

**Problem Statement**

Develop a portable electronic device which can alert a glaucoma patient when it is time to take their next dose of medication. An audio signal will be necessary because many of the patients are severely sight-impaired. The device needs to be programmable for up to six different medications that can be used in different dose regimens. A reset mechanism, types of reminder signals, durability/portability, power options, and power level indicators all must be taken into consideration.

**Specifications**

- Remind patients when to take each medication
- Remind for up to six medications
- Reset button to turn off alarm
- Programmable by doctor with locking mechanism
- Digital screen
- Large buttons
- Big, black numbers
- Low battery indicator
- Not too large
- Battery operated

**Design Matrix**

<table>
<thead>
<tr>
<th>Design</th>
<th>Egg-timer</th>
<th>PDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of Construction</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Client Usability</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Cost</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Size</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Battery Life</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Durability</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Necessary Features</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>40</td>
</tr>
</tbody>
</table>

**Modified PDA**

The PDA idea was the main design chosen. In order to implement it, a simple program was written in Visual Basic and will be translated for a PDA. The design was equipped with the following features:

1. One main screen:
   1.1 A color coded screen for each of six different medications
   1.2 A main screen that begins to flash when the timer goes off
   1.3 Password protected “schedule” button, “reset” and “end” button
2. A password protected scheduling screen:
   2.1 Current time screen
   2.2 A main screen with “hour” and “minute” buttons to set the time that the program begins to run
   2.3 A color coded screen for each of six different medications that allows for their separate scheduling
   2.4 An “accept” button that accepts the given settings and returns the patient to the main screen and a “clear” button

This designed program fit well with the client requirements. However, since the specialist used Visual Studio 5.0, an old version of this program and thus, the program needs to be translated from Visual Studio 5.0 to Visual Studio 6.0 in order to compile it for a PDA.

**Egg Timer**

The modified egg timer was constructed with four simple kitchen timers, colored LCD lights and plastic. It is equipped with the following features:

1. A separate timer for each of the four medications including:
   1.1 A main screen with the current timer status
   1.2 Large, black numbers against a gray background
   1.3 A scheduling screen to set the timer
   1.4 “Hour”, “minute”, “start/stop” and “clear” buttons
   1.5 Memory that allows for restarting the timer
2. Colored LCD lights for each of the four timers

The device fabricated was much simpler than the PDA design, however, it fell short of a number of significant client requirements. In order to meet those requirements, a fair amount of microprogramming would have been required. Unfortunately, that required a significantly larger budget.

**Pros**

- Simple
- Cost effective
- Audio and visual alert
- Easy for doctor to program
- Large buttons and screens

**Cons**

- No locking mechanism
- No volume controls
- Only four medications
- Large device

**Future Work**

The modified egg-timer design is a good prototype. However, in order to improve it, a specialist will need to be hired to do the microprogramming and start over from scratch using our existing design and PDA program as a basis for a new one.

**Testing**

In order to test the two designs, a number of volunteers with visual impairments were asked to attempt to use the prototypes. Upon using the products, the volunteers gave feedback on what they thought should be improved. This feedback was then used when finalizing the designs.

In the future, the designs will be further tested by giving them to glaucoma patients to use on a daily basis. After testing the products, the patients will be able to tell exactly what needs to be improved on the designs. This will make the products as effective as possible for other glaucoma patients.

**References**


**Acknowledgments**

The group would like to thank Ms. Liane Seyk for all the firsthand suggestions and help. Also, we would like to thank Mr. Tom Bujanovic for creating the code used for the Modified PDA design. Finally, we would like to thank our advisor, Professor Webster, for all the different ideas and encouragement.