Glaucoma Medication Reminder

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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.

Background

Glaucoma, also referred to as a "silent killer", is a disease that affects the eye. Glaucoma is caused by a build up in ocular pressure. This pressure occurs as a result of aqueous humor being drained too slowly from the eye. Blindness can result as consequence.

In order to reduce the pressure in the eye and prevent blindness, several treatments are possible. Eye drops are one of the most affordable and used methods. Still, they can be difficult to remember, especially in cases where the patients are required to take multiple types.
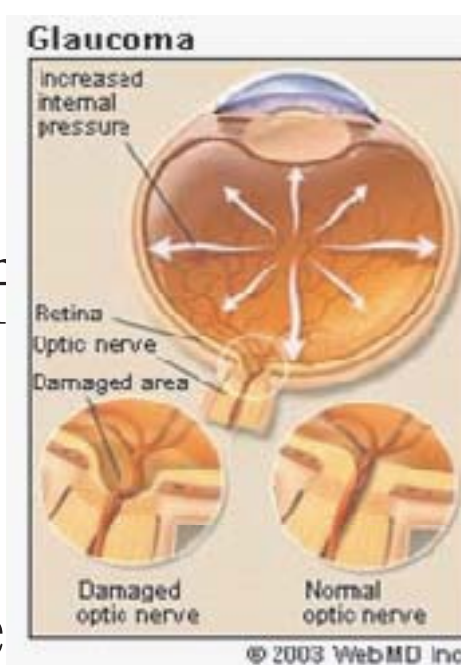
Purpose/Motivation

The purpose of this design is to allow glaucoma patients to less stressful lives by reminding them to take the medications at varying times. This will help prevent potential blindness that may result from non-compliance.

Current Technology

Current technology does not have certain features targeted towards glaucoma patients. For instance,
• Most devices with multiple timers are confusing for patients to use
• None are visually accommodating due to small screens or buttons

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

Design	Egg-timer	PDA
Ease of Construction	3	4
Client Usability	7	8
Cost	10	8
Size	3	5
Battery Life	5	3
Durability	3	4
Necessary Features	7	8
Total	38	40

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 allow 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.

Pros

1. Simple for the patient to use
2. Easy for the doctor to program
3. Prevents patient tampering
4. Audio and visual alert
5. Volume control
6. Cost effective
7. Small

Cons

1. PDA "sleeps" when timers are not going off to preserve battery
2. No current time on the main screen
3. Buttons and screens are fairly small
4. PDA is intimidating

PDA Screens

Home Screen / Scheduling Screen
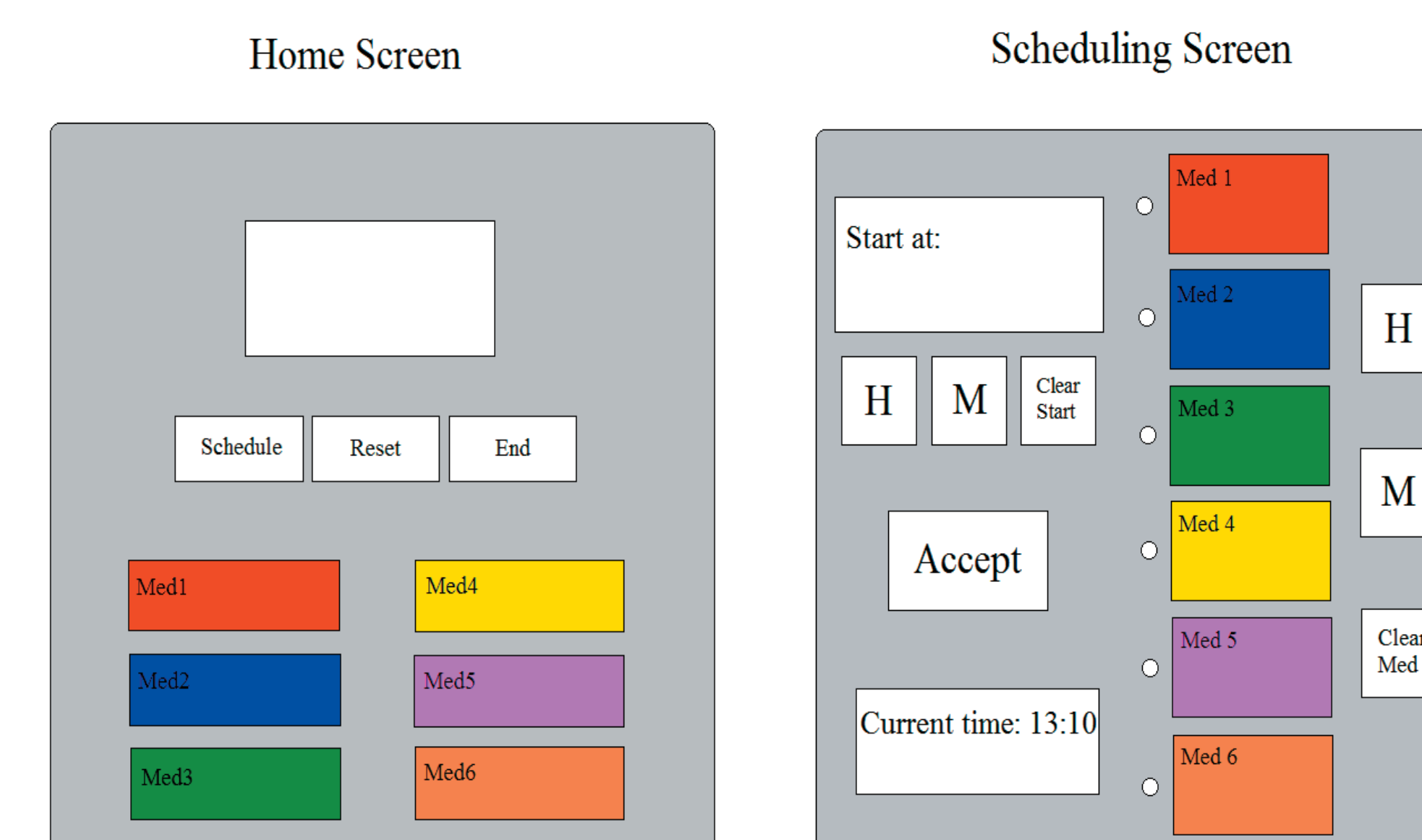
Future Work

In the future the program will be modified for the PDA by putting the current time on the main screen and making the screens and buttons larger so they are easier for glaucoma patients to read. After the program is improved, it will be translated onto Visual Studio 6.0 so that it can compiled 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

1. Simple
2. Cost effective
3. Audio and visual alert
4. Easy for doctor to program
5. Large buttons and screens

Cons

1. No locking mechanism
2. No volume controls
3. Only four medications
4. 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

(1) Unknown. "All You Need To Know About Compliance." The Glaucoma Foundation. 2006. April 2003. http://www.glaucomafoundation.org/news_story.php?i=17

Acknowledgments