

Project Statement
MEDSense: An Accessible Pill Cap Dispensing/Cutting Device

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I. Statement of Need:

An easily accessible pill cap that dispenses the correct amount of medication at a set time is needed for patients with a wide variety of disabilities. It is difficult for some patients to remember when to take their medication, as well as how much medication to take. It may also be a problem for the patient to cut a pill in half if a half dosage is prescribed. This product, MEDSense, an easy-to-use pill dispenser with the ability to cut pills, is needed to aid these patients in their daily medication routine.

Many of the patients described have several problems that need to be taken into account during the design of this pill cap. Some of the serious problems that affect the patients' ability patients to take their medications are vision loss due to macular degeneration, hearing loss, loss of or decreased strength and motion in one hand or arm, memory loss and Dementia. Some minor problems that affect these patients that must be kept in mind while designing this pill cap are being in a wheelchair, loss of legs, neuropathy in the hands, hand tremors, having small children and being easily intimidated by high-tech machines.

II. Brief Preliminary Requirements:

The clients for this project have a wide array of disabilities that need to be considered when designing this project. One disability that was present in numerous patients was hearing loss. The level of hearing loss among the clients differed from minimal hearing loss to progressive hearing loss. The design of this device must take into all forms of hearing loss. Hearing loss can be a major problem for individuals because many alerts use noise to get an individual's attention. To allow patients who have both minimal and extensive hearing loss there would have to be one or more visual alerts. Another disability seen in the client list was vision loss. Vision loss necessitates two aspects of the device. The first requirement of the device for use by people with vision loss is an auditory alarm to notify clients when to take their medication. Combined with the visual alert necessitated by clients with hearing loss, the auditory alert would allow the system to have a multi-modal alert system. A multi-modal alert system would ensure that all patients with hearing loss, vision loss or both could use this device. The second requirement for the device related to vision loss is a clear display panel. The display panel should be simple and allow clients with vision loss to easily see each element of the display to minimize confusion.

Another disability seen among the clients was muscular degeneration or difficulty using one's hands. Since this problem plagues many people, a pill-cap that did not require fine motions of the hands would be desirable to the clients of the project. Memory loss is another problem with people both young and old. If a person continually forgets to take their medications the consequences could be very dangerous to the patient. One of the aims of this device is to notify the user of the device when to take their medication and dispense the correct amount. Notifying the user of the device however is not enough for this project. The device should also notify someone offsite that the patient did not take

their prescribed medication. This would allow a doctor, nurse, family member or living assistant to monitor the medication taken by the person.

Another major problem with the dispensing of the medication for people with disabilities is the dosage of the medicine. Some dosages require half of a pill or one and a half pills. Cutting pills could be difficult for those with decreased motor functions and painful for those persons with arthritis. Furthermore it is difficult to cut a pill directly in half so that the proper amount of medication is delivered to the patient. To get the full benefit of the medication, the dosage must be as exact as possible. This device aims to allow clients to take half pills when necessary by cutting the pills for them. This would eliminate the difficulty in cutting the pills and perform a more accurate cut than could be done by a person.

III. Limitations:

One of the biggest limitations to this device is the ability to accurately cut the pills into the desired prescription. Many users have disabilities that may limit them to using the device, so proper notification and dosage is required. Jamming and other mechanical problems, size and portability issues need to be addressed. The device also needs to be inexpensive, easily accessible and not complex. Due to some of the severity of the users' disabilities, dispensing their medication into an easy-to-use container is necessary. The maximum expense for this device is 2000 dollars and the time frame to design and build the device is eight months.

IV. Other Data:

While there is certainly no doubt that the majority of time spent designing any medical device will be focused on meeting the required specifications to produce a functional prototype that fits the user's needs, it is often the additions that are not required that make one system stand out from the next. In an increasingly competitive medical technology market, it is assumed that each marketed device will serve its primal purpose. It is, then, the additional features unique to each device that allows certain models to excel well beyond its competitors. With that in mind, the MEDSense pill dispensing device will be designed to perform its desired task while also addressing additional factors such as environmental safety, patient safety, patient privacy, security, and system durability.

Considering the premise that MEDSense is specifically being designed to ensure that a patient takes their medications, it is important that there be limited access to the scheduled pill dispensing programming options. A security device will be installed that will require some type of qualification to access the programming of the device. This qualification should only be given to the pharmacist to ensure that patients, users or third party members do not tamper with their schedules or dosages.

Additionally, patient safety and durability are of the utmost concern for any design process. Any malfunctioning of the device could lead to mild or serious injuries by the users or by third party members. As most people take their medications with water, it is

important that the MEDSense be entirely waterproof to avoid electrical damage and possible injury. Also a facet of durability and/or safety is whether or not the device is childproof. Children often mistake medicine pills as candy and will unknowingly consume pills that are left lying in a tray. Therefore, it is important that this design ensures the safety not only of the user, but also of any unsuspecting third party members.

In today's market, there are electronic pill caps available to patients that remind them when to take their medication. However, none of these currently used devices provide the ability to cut the pills into halves. This feature will differentiate MEDSense from the other products on the market.

V. Questions:

What size and shape pills will be used in this device?

What are the dimensions of the device? Can it be a stand-alone device or does it have to act as a bottle cap?

Who will be filling the device?

Who will be programming the prescription schedule?

How will the accuracy of cutting the pills be measured?

How will different size and shape pills be detected in the device?

How will the device sense if the pills have or have not been taken?

How simplistic should the device be?

How long should the battery life in the device last? Can it be plugged into an outlet?

How should the offsite alert work? Does it need to link with the dispensing device?

Does this device need to dispense more than one medication?

Does this device need to be waterproof?

Does this device need to be childproof?

Should we have voice instructions?

How large should the font be on the output screen?