

Project Statement  
**Accessible Infusion Pump Interface**

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## Statement of Need

For patients with physical limitations, infusion pumps can be difficult to operate correctly. Whether it is a vision problem or an ailment that restricts motor function, disabilities increase the risk of patient error in device operation. For the visually disabled, tactile cues must be added to the interface for proper use, along with auditory confirmation of the input. With current infusion pumps there is not appropriate feedback to the input controls of the unit. This gives an opportunity for erroneous entries without any warning. Due to these errors, over- or under-dosing may occur leading to serious health risks for the patient. Warnings from the interface will need to be communicated through both auditory and visual cues in order to encompass a wide variety of patients' disabilities. Patients in need of an infusion pump may also have learning disabilities or apprehension about technology. To encourage widespread use for all patients, a simple method of operation and short learning curve should be implemented. This would allow a patient to become more independent, especially if there are warnings included in the interface to limit dosing errors. Further promoting independence is a small interface that would ensure portability and patient privacy.

## Basic Preliminary Requirements

Infusion pumps are instrumental for patients' very survival with errors in material delivery, both over- and under- dosages, carrying the risk of detrimental effects for the patients. Often these errors are due to misuse by patients or their care givers, such as miscalculation of dosage levels, data entry error or titration error. Users are often physically limited by age or illness, leading to the above mentioned problem. As preliminary requirements, precautions must be administered by the device to ensure accurate operation. Audio output from the device would assist users with visual impairment on confirming the correct dosages. In turn, the confirmation buttons, as well as operational buttons should be easily distinguishable, both visually and tactilely, in order to prevent over- and under- dosage accidents by the visually and physically limited users. Additionally, visual displays should be considered to allow the hearing impaired to correctly operate the device. The design alone should be easy to learn and operate by the patient and/or caregiver, while being aesthetically pleasing and non-threatening to technology-impaired users. As the infusion pump should be easily accessible, designing a portable interface is a necessity. Taking into account recent commercial infusion pumps from companies such as Alaris Medical Systems, Baxter (Figure 1), Baxa Corporation, and B. Braun (Figure 2), such improvements (mentioned above) for the acoustically, visually, and physically impaired would greatly enhance the marketing of their products for home infusion pumps and greatly decrease errors in drug/nutrient delivery.



Figure 1: Baxter Infusion Pump



*Figure 2: B. Braun*

Considering the importance of home infusion pumps to patient health, the need for an accessible interface is paramount.

### **Basic Limitations**

The first and most basic of all limitations on this project is budgetary. The budget is set at two thousand dollars, which includes money to be spent on the infusion pump for which the interface is designed. The second most encompassing limitation is the pump itself. Whichever infusion pump is chosen to host, the interface will define many characteristics of said interface. The interface must, of course, be able to control the pump by way of electrical signals. It must also aesthetically and securely fit the pump. Portability requirements will limit the size and weight of the interface and will also affect the power source used. Most likely, the unit will be battery operated which limits voltages and currents available for power. Legal limitations may also come into play depending on what patents to similar devices already exist.

### **Questions**

How would a system be developed that ensured that proper dosages are being administered?

How large are common infusion pumps and how small would an ideal “small sized” interface be?

What are the patients expected to know about their own dosages?

What are patients expected to know about working with their own infusion pump?

What tactile and auditory cues are most common for the visually impaired?

Will the pump be assumed to work with strictly blood infusions?

Will the interface need a data interface for a direct modem connection or through a personal computer?

Will the interface need to be waterproof?

What level of comprehension will the interface be geared toward?