Accessible Infusion Pump User-Interface

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Outline

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  - Project Objectives
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- Optimal Design
  - Accessibility Enhancements
    - Visual
    - Auditory
    - Tactile
  - Safety

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- Timeline
- Project Highlights

INNOVATION
With current infusion pumps, there is no appropriate feedback to the input controls of the unit. This gives an opportunity for erroneous entries without any warning.

For patients with physical limitations, infusion pumps can be difficult to operate correctly.

Disabilities increase the risk of patient error in device operation.

At least one patient from our client list suffers from some form of a vision problem, a hearing impairment or an ailment that restricts motor function.

- Carpal tunnel syndrome
- Parkinson’s disease
- Arthritis
- Partial paralysis

INNOVATION
Project Objectives

- Design a portable, steadfast, low-cost user interface to allow easy operation of a medical infusion pump

- Reduce input errors
  1. Auditory Output
  2. Distinguishable Confirmation Buttons
  3. Visual Display

- Increase Independence
  1. Simple Operation with Short Learning Curve
  2. Small and Portable
  3. Promote Privacy

- Cost-Effective
  1. Budget < $2,000
Previous Work Done by Others

- A research team from the University of Texas Health Science Center at Houston studied and prototyped an interface for an infusion pump. They accomplished this through the usability Engineering Lifecycle to develop ideas and create solutions to design errors.

- A group from Chalmers University of Technology Department of Human Factors Engineering in Göteborg, Sweden also researched infusion pump interfacing. To create a baseline, they used the facilities current infusion pumps and problems were recorded via video-recording, think-aloud protocols, and surveys. No prototype was created but the information was passed to the clinicians and developers to produce a better product and avoid misuse.

- Doctors and researchers from Columbia University’s College of Physicians and Surgeons along with members from the University of Texas Health Science Center also did clinical research on infusion pump interfacing. This was accomplished by assigning ratings to problems and creating a catastrophic error group. However, no prototype was created but the information was given to the infusion pump field and market.
Products

- Abbott – Aim Plus, Lifecare 5000 Plum and Plum XL - [www.abbott.com](http://www.abbott.com)

- Baxter – Colleague - [www.baxter.com](http://www.baxter.com)

- B Braun – Outlook Safety Infusion Systems - [www.bbrounusa.com](http://www.bbrounusa.com)
Products (Cont.)

- Cardinal Health – Alaris®, Alaris® SE pump, MedSystem III® -
  [www.cardinalhealth.com/alaris/](http://www.cardinalhealth.com/alaris/)

- Curlin Medical – PainSmart, 4000 CMS, 4000 Plus, and 2000 Plus -
  [www.curlinmedical.com](http://www.curlinmedical.com)

- Sigma International – 8000 and 6000 series pumps -
  [www.sigmapumps.com](http://www.sigmapumps.com)
Patent Research

- D268,206 - Medical infusion pump
  March 8, 1983 – Kosako

  Describes the infusion pump as a complete unit including the main body with interface.

  Medrad, Inc. generic medical device interface design patent.
5,664,270 - Patient interface system - September 9, 1997 - Bell, et al.
   Patent for interfacing a multitude of medical devices into one remote controller for ease of use and independence.

   This patent allows the infusion pump to be loaded with a library of drugs which could be selected from or added to by the user.

   This patent describes the need for a more-readily usable interface for electronics devices but it could be implemented for a medical device.
Visual Enhancement

- 20 x 4 Character LCD
- Large Characters to allow patients with limited vision to operate infusion pump
- Currently using LabVIEW front panel output
Auditory Enhancement

- Voice output through LabVIEW Software
- Text to Voice Module
- Auditory Output for every visual equivalent
- Speaker upgraded due to low volume
Tactile Enhancement

- Large Distinct Buttons
- Trigger Pressure Tuning
- Intuitive Integration with SW Structure
- Minimal Number
- Single axis joystick for scrolling
Enclosures

- Glued black ABS plastic
- Backs bolted on to allow access to inner electronics.
- One enclosure houses pump, stepper equipment and all necessary power circuits
- Interface is separated to clearly distinguish functionality and adjustability
Mounting and Brackets

- Mounting block to hold majority of weight to IV pole
- Flat brackets for wiring and flexible arms
Inside the Box

- Blackfin Microcontroller
- Intuitive Prompting Software Design
## Budget

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Budget Remaining: $791.83
Project Highlights

- Project Uniqueness
  - Reduce Calculation Errors
    - Visual Display
    - Distinguishable Tactile Cues
    - Auditory Output
  - Navigation Ease with Reduced Learning Curve
- Cost-effective Device for Biomedical Corporations
- Increasing Company Credibility
- Satisfied/Healthier Patients

INNOVATION
Acknowledgements

- Dr. John Enderle
- Bill Pruehsner
- Dave Kaputa
- Ted Barbeau
- Michael Phillips
- Paul Dufilie
- Chris Liebler
Are there any Questions?

Let’s get ready to infuse!!!!!!!!!!!!!!!!!!!