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Executive Summary

Hospital acquired infections are the cause of thousands of deaths every year in the United States alone. Hand washing has been proven to be the way to reduce hospital acquired infections, but adherence is variable. We are developing GoKlean, which uses RFID technology embedded with in a small ID card to identify and record hand sanitation. In addition, GoKlean engages the user by providing instantaneous feedback through a color coded lighting system and a vibrating motor which functions to remind the user to wash his or her hands. This will help to minimize the spread of infections to both patients and medical professionals.

Problem & Clinical Need

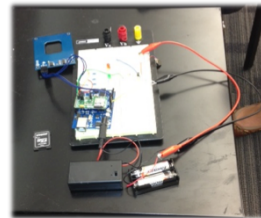
Each year there are an estimated 1.7 million hospital acquired infections, leading to an estimated \$6 billion of health care costs each year. Although the hand sanitation policies for most hospitals is to sanitize when entering and exiting a patient's environment, according to 2003 CDC data, only 48% of physicians report actually complying to these policies.

Market

The customers for our device would be hospitals and hospital administrators, while the end users would be the doctors and nurses wearing our device. Despite what appears to be a high cost to the hospitals, this device should reduce the incidence of hospital acquired infections and thus reduce the cost of this to the hospital. GoKlean will not only have an effect upon thousands of hospital employees that will use the device on a daily basis but also the three million people that visit hospitals each year.

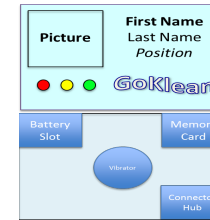
Novelty

GoKlean keeps hand sanitation a priority. This is done via the color coded LED lights and reminding mechanism. This device provides real-time alerts to the user signaling when they have spent the proper amount of time sanitizing their hands. In addition, this device provides a counting and tracking system using RFID technology in order to hold the user accountable.

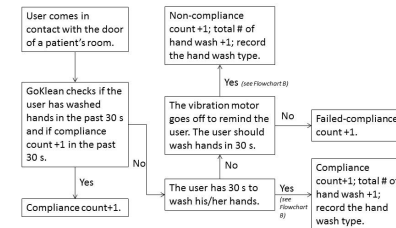


Design Specifications

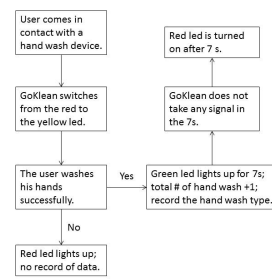
GoKlean incorporates a reminding mechanism. When the user comes to close contact with the door of a patient's room, GoKlean checks whether the user has washed his hands in the past 30 seconds. If the user has not done so, GoKlean would vibrate for 3 seconds to remind the user to wash his hands. If the user has washed his hands right before entering the room, the vibration device will not be triggered. After reminding the user, GoKlean gives the user the next 30 seconds to complete a successful hand wash. See *Flowchart A*.



Final Finalized Prototype



Flowchart A. Use cases for GoKlean reminding mechanism



Flowchart B. Use cases for GoKlean LED indications

GoKlean is designed to record and save hand washing data on a micro SD card as a comma-separated values (CSV) file, which can be transferred easily to SQL database to be examined later. GoKlean records the total number of hand washes performed by each individual, the type of sanitation used, the number of times the individual washed their hands after vibration goes off, and the number of times the vibration device is activated. This data can be easily assessed and analyzed using Excel, MATLAB, SQL, and other software.

The software is successfully developed on the arduino board to actively engage the users in hand sanitation practices. When the user comes in contact with a recognized hand washing station, GoKlean switches from the red to the yellow led, signaling the user that GoKlean is engaged and he should be washing his hands. When hand washing is successfully performed, determined by the required length of duration of the hand wash device, GoKlean lights up the green led to notify the user. Otherwise, the light will turn back to red indicating an unsuccessful hand wash. See *Flowchart B*.

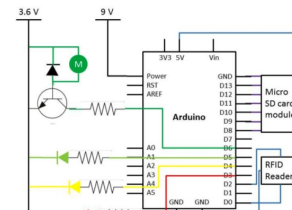


Figure 1. Schematic of GoKlean Prototype

Estimation of Product Costs

Estimated costs of materials are provided in the table below. Raw material costs are based on bulk materials available in the U.S. and labor overseas. This estimate of \$28.64 per unit is an overestimate.

Part	Device Cost (\$)
LEDs	0.12
Resistors	0.12
Wire	.05
Diode	.04
Transistor	.05
Motor	2.50
PCB	4.00
Battery (AA)	0.60
ICs	3.00
Plastic (PE) (for case)	0.10
RFID reader (IC)	8.06
SD card slot/shield	10.00
Total Cost	28.64

Regulatory Pathway

This is a compliance and monitoring system that will never interact with a patient or put the user in harm's way. As a result, this system does not need FDA approval and is not subjected to any regulations. The only impediment to implementation is the cost. As most medical centers are non-profit and normally run by a director and board of trustees, this governing body would have to approve its implementation and budget accordingly.

Acknowledgements

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