Project Proposal

Accessible Incontinence Control Device

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Executive Summary

The following proposal is a detailed explanation of how an accessible device that will help patients with disabilities control urinary incontinence can be designed. The RERC-AMI design competition is our actual client, but we have a few fictional clients and their needs will be considered for all aspects of this design. Engineering principles will be followed to determine the best cost efficient design fulfilling all of the needs of the clients. An informative description of the project’s goals are outlined which includes the device requirements and its overall capacities.

Other device models have been closely considered such as the InterStim, among others. The patents for these devices will be considered and examined in the proposal so as not to infringe on them. Throughout this proposal a description of the intended design, methods, and goals will be outlined, which should meet the needs of the “clients” and display an effective plan of engineering. This design should create a urinary control device that meets certain technical and “human” requirements. The device needs to allow emptying of the bladder when desired and prevent emptying of the bladder otherwise. It should provide the user with a clear and understandable indication of the status of the bladder.

1. Introduction

1.1 Background (client and disability)

Urinary incontinence is a major problem for both men and women. Urinary incontinence occurs more rapidly with an increase in age. Patients who suffer from urinary incontinence sometimes develop it as a result of other diseases such as pathology, spinal cord injuries, brain trauma and other diseases. Urinary incontinence occurs when patients have a dysfunctional bladder. A dysfunctional bladder may cause overflow of urine or partial release of urine from the bladder. An overflow of urine from the bladder occurs when an inactive bladder muscle doesn’t fully contract occurring in a less active bladder resulting in swelling or stretching of the internal sphincter. When this swelling occurs, it opens and unwanted leakages leading to embarrassment and discomfort of the patients. When the swelling of the internal sphincter occurs, it leads to other nerve damages and the body is unable to detect when the bladder is full and should contract. The overflow of urine causes skin irritation and external infection. The partial release or no release of urine from the bladder often results in urinary tract infection and internal infections causing the patients to be in a lot of pain.

For this project a fiction list of potential clients was provided. There were three clients who could benefit from the use of an accessible incontinence control device. Keisha is an 84 year old female stroke victim with hemiplegia on the right side of her body. This means a device would have to be created that she could control using only one hand. In addition to incontinence she suffers from memory and hearing losses. Jerry is an 82 year old male Parkinson’s patient. Besides incontinence his symptoms include tremor, rigidity, decreased range of motion, and some dementia. Jamie is a female 44 year old who suffered a T11 spinal cord injury. She is confined to a manual wheelchair and she wants better urinary control when she is playing basketball.
1.2 Purpose of the project

The purpose of the device is to assist any patients with a dysfunctional bladder by controlling the flow and release time of urine from the body. This device will be designed so that the patient or caregiver will be able to control their urine flow. This incontinence device will be discrete, durable, and easily used by patients with disabilities. The device that will be designed will provide accurate readings of the status of the bladder by receiving signals from the bladder to the screen on the monitor and will then potentially vibrate as an indication to the patient or caregiver that the bladder should be emptied. The device designed will also be designed so that it can be used for both male and female patients. If the device is implantable, it will not cause any adverse effect, toxicity to cells, and absorption of proteins and will be biocompatible with body fluid, pH and temperature. The implantable device will be able to remain in the human body for at least 30 days without any adverse side effect. The urinary incontinence device will be lightweight, cost efficient, environmentally friendly and easy to use.

1.3 Previous Work Done by Others

1.3.1 Products

1.3.1.1 Commercially Available Products

Since urinary incontinence is such a common problem there are several commercially available incontinence control devices. The available products encompass a wide range of device types, a few of which are summarized in this section. There are also various behavioral modifications, such as pelvic muscle exercises and diet modification, and medications available to treat urinary incontinence. A urethral insert, which is like a small tampon, can be used by women with incontinence problems and inserted into the urethra for limited amount of time. In Figure 1 below a urethral insert is shown next to a Q-tip and a tampon for size comparison. The particular insert shown is a Reliance® urethral insert.

![Figure 1. Reliance® Urethral Insert. (www.obgyn.net/women/articles/sm_slide6.jpg)](www.obgyn.net/women/articles/sm_slide6.jpg)

A pessary is also available for women with incontinence. A pessary is a stiff plastic ring inserted into the vagina. The pessary is removed regularly for cleaning. It is effective for use by women who have incontinence due to a prolapsed uterus. One commonly available is the 2.25” Rusch Pessary shown below in Figure 2.
An artificial urinary sphincter can be used by men or women. It is a fluid filled ring that is implanted around the neck of the bladder. It is controlled by a valve implanted under the skin. The AMS 800, which is American Medical Systems version of an artificial urinary sphincter, has three components. It contains a cuff, a control pump, and a pressure regulating balloon. The device is shown below in Figure 3.

The InterStim® system is an example of a sacral nerve stimulator. The device is implanted under the skin of your abdomen, and it resembles a pacemaker. It emits electrical pulses through a wire that is connected to the sacral nerve. By stimulating the nerve the bladder can be better controlled. The device can be seen in Figure 4.
Catheters are also commonly used by patients with incontinence. Catheters are soft tubes that are inserted into the urethra to drain the bladder. Male patients have the option of using external catheters which are attached around the penis similar to a condom.

Some patients opt to monitor bladder status in an attempt to control incontinence problems. A device that allows patients to do this is a BladderScan® from the company Verathon Medical. The BladderScan® device is a small portable ultrasound device that calculated and displays bladder volume based on a three dimensional image that is generated. The BVI 6300, shown below in Figure 5, is one of the devices in the BladderScan® product line.

![BladderScan® BVI6300](http://www.verathon.com/PDFs/0900-1081-01-86.pdf)

**1.3.1.2 Previous Student Design Projects**

A device extremely relevant to this project was developed by student Angelene Ozolins in the 2007 Australian International Design Awards. This student developed a device called “AssureFlow”. The device was a two element incontinence control device. The first element was an internal valve comprised of three concentric tubes. The inner two tubes, which were the functional tubes of the valve, were made of a shape memory alloy. The second element of the device design was an external actuator that was used to heat the shape memory valve, thus modifying its shape. As the valve cooled the original shape would be resumed. When the valve was cool it effectively was closed, blocking urine from flowing out of the bladder. As the valve changed shape upon heating, the urine present in the bladder was able to flow through the valve and exit the body. Actuator, which resembled a remote control, also stored information about the patient’s daily urinating patterns for potential use by a physician.

A second relevant device was created for the 1990 NSF competition by a team at the Texas A&M University. This team developed a micturition alarm for use by caretakers at a medical facility. The device was able to provide visual and audible signals that a patient’s absorbable pad needed to be changed. The sensor was placed within, or outside, a patient’s absorbent pad. Fluid provided continuity across the terminals of the sensor producing current flowing through the op amps. The op amps then powered the relay, which provided indication that the absorbent pad was wet and needed to be changed. The sensor was reproducible and easily cleaned. It was also cost effective, and it was made of speaker wire.
### 1.3.2 Patent Search Results

A Google patent search revealed that there were well over a hundred US patents. A brief and by no means exhaustive listing of the patents most relevant to this project is provided below. When a final design is selected a more specific patent search will be run to find all patents for devices similar to this project. The device developed in this project needs to make significant improvements over the currently patented devices and it cannot infringe upon any existing patents.

- **US Patent #243396**: This patent was the earliest patent found for a catheter. It was filed March 25, 1881 and it was issued June 28, 1881. According to the patent, this catheter is an improvement on catheters available at the time. At the time catheters were made of straight glass tubes. The improvements made on this particular catheter were a tapered end and a curved shape that more closely approximates the shape of the passage it is going to be inserted into.

- **US Patent #5234409**: This patent was filed on November 9, 1992 and issued August 10, 1993. The female incontinence control device in this patent is inserted into the urethra. It is unlike a catheter in that it has a ball valve allowing controlled, as opposed to continuous, urinary discharge. The device can be contained either completely within the labia majora, or it can extend all the way into the bladder. In both cases the valve lies externally, just outside the urethral orifice, and can be manually opened and closed by the user. The device, in addition to having a conduit to move urine, also has a structural component which holds it in place.

- **US Patent #5030199**: The incontinence device in this patent, which was filed December 11, 1989 and issued July 9, 1991, is a female incontinence control device that functionally resembles the device in patent #5234409 above. It is also an insert whose valve lies just external to the urethral orifice. The valve on this device is magnetic and can be opened and closed using a portable magnet.

- **US Patent #4932938**: This patent was filed May 5, 1989 and issued June 12, 1990. The device in this patent is an indwelling catheter. The catheter has a valve on the external end to allow for user control embodiments of the device as well as continuous draining embodiments. The valve can be left open and the catheter can be connected to a fluid drainage bag, or the valve can be opened and closed by the user to control when drainage occurs. In some cases the device includes an inflatable urethral cuff.

- **US Patent #4800900**: This patent was filed September 25, 1987 and issued January 31, 1989. It is an external cloth strap that is useable by male incontinence patients. The strap encircles the penis. It also contains compressible pads with an inflatable sac between them. The sac can be inflated via a syringe and a tube. When inflated the device puts pressure on the penis, and therefore the urethra, blocking the passage of urine from the body.
US Patent #7160277: This patent was filed January 27, 2006 and it was issued January 9, 2007. It is a male incontinence control device. It is a sheath that is fitted over the penis. A viscous gel and elastic strap is used to both secure the sheath on the penis and to seal it to make it leak proof. A tube is connected at the distal end of the sheath to discharge urine that has been collected by the sheath.

US Patent #6527702: This patent was filed January 26, 2001 and it was issued March 4, 2003. The patent is for a urinary flow control device. It contains an elongated hollow element that is capable of discharging urine. The device is inserted into the urethra in such a way that the proximal end lies inside the bladder. The proximal end contains a two compartment element. The first compartment collects fluid from the bladder. There is a flow control assembly between the two compartments. When bladder pressure increased the flow control assembly opens and fluid moves into the second compartment. The urine in the second compartment can be selectively discharged by the user and it will pass out of the body through the elongated element of the device.

US Patent #5823972: This patent was filed June 6, 1996 and it was issued October 20, 1998. It is a two part device that can measure bladder pressure and urine flow. The first part of the device is an inflatable cuff that is mounted to the penis. The second part is a catheter that has a pressure transducer on the end of it. The transducer end of the catheter is inserted into the urethra to a point beyond the penile cuff. The cuff can be inflated to prevent urine flow and deflated to allow urine flow. The pressure transducer can sense the presence of urine in the urethra. The signal from the transducer is sent to a signal processor and the results are then printed.

US Patent #7128707: This patent, filed on July 25, 2005 and issued on October 31, 2006, is an artificial sphincter cuff which can be implanted around the beginning of the urethra. The cuff is made of electroactive polymer which can be expanded or contracted by an external electrical actuation device.

US Patent #6319208: This patent was filed on December 3, 1999 and it was issued on November 20, 2001. The device is a small floating recorder floats in the bladder and telemetrically relays information to an external receiver regarding urinary tract pressure. It can be used for diagnosing urinary tract diseases or as a monitoring system for a patient with urinary incontinence.

2. Project Description

2.1 Objective

As it has already been stated, the purpose of the device is to assist any patient with a dysfunctional bladder by controlling the flow and release time of the urine from the body. There are a few methods could be utilized to design a functional device. Ultimately the final design will be the optimum way of controlling urine flow that best improves the quality of life of the patient.
The first status indicator method is to design a device that measures the impedance of the bladder externally by using skin surface electrodes; this would be a way to monitor the status of the bladder’s filling and aid in incontinence control. The second proposed method is to control urinary incontinence by measuring the volume of urine in the bladder; this method is based on a volume monitor using ultrasound, which is a painless process. A third potential way to monitor the status of the bladder is to use a fluid level or float sensor. The positive aspect of this method is that the device could float in the bladder without being attached either internally or externally so as to cause the patient discomfort. However, electrical protection of the patient would need to be carefully considered. Additionally the status needs to be relayed to an external user interface to keep the patient updated on their status. In any method, the device may need to be implantable and thus biocompatible with body fluids, pH and temperature. In most cases metals should be avoided, as should bioactive materials that would degrade in vivo. There are also a variety of control features that our device could contain. Sacral nerve stimulation, a catheter, or a valve implanted into the urethral could all be considered.

So, in review, our device should consist of an internal implantable part (incontinence device, electrodes) and an external one (control, monitor). It will use either electrical or ultrasound signaling to inform about the urine volume in the bladder. A transducer, a battery, a receiver as well as a sensor will be needed for the ultrasound method. The unique features of our device will be that the status indicator and the control component will be incorporated into one device. Also, the device will be able to be used by any sex patient with a wide variety of disability levels.

The main goal of this project is to create a device that succeeds on many levels. Initially it obviously needs to successfully monitor bladder status and control incontinence. However, the device also needs to be cost effective. It needs to be marketable and attractive to incontinence patients. And the final aspect of the device that needs to be considered is a successful way to package and market the device.

2.2 Methods

Before any designs for a potential accessible incontinence control device can be successfully created it is important to understand the urinary system of the body. Understanding how it should work provides a better understanding of how the system could go wrong, and in turn how it could be fixed or controlled.

The bladder is a storage vessel for urine and is lined by a special waterproof skin called transitional cell epithelium. There is a similar lining in the ureters and urethra. The bladder is enveloped in a criss-cross of muscle fibers. As the bladder fills, these muscle fibers relax in such a way that the pressure within the bladder remains constant at less than 10 cm of water. The normal adult bladder holds approximately 400 ml of urine and when more than this amount has entered the bladder the pressure starts to rise and the desire to void urine is felt. If this cannot be conveniently done and bladder filling continues, the feeling becomes very urgent and eventually uncontrollable. Normally, adults are able to hold on after the first feeling of urgency, but children find this more difficult and in babies the bladder empties automatically. In some cases the
bladder can stretch to well beyond its normal volume capacity if a blockage completely prevents passing urine.

The nerves controlling the bladder belong to the autonomic nervous system and, although such nerves usually function automatically, the bladder is a special situation where voluntary control works together with autonomic. Failure to override the autonomic nerves to the bladder with voluntary control results in urinary frequency and potential bed-wetting. Figure 6 below gives a visual overview of the function of the urinary system from the point of the bladder to urine leaving the body.

![Diagram of the urinary system](image)

**Figure 6.** The process of urination.

Incontinence is an inability to control when you pass urine. In adults there are two main causes of incontinence, weakness of the pelvic floor and sphincter muscles, or over-activity of the muscles surrounding the bladder. Difficulties in controlling the bladder can also occur in older age, in the case of spinal injuries, or illness. Our device needs to be able to address as many of the types of incontinence as possible and be able to help the patient’s cope with incontinence without a significant decrease in quality of life.
This device consists of two basic phases that will work together to aid the patient in controlling their urinary incontinence. Phase 1 is a status indicator. This portion of the design needs to be able to measure the approximate amount of urine in the bladder. The device then needs to be able to relay that information to the user. This component will be very important in giving the user a sense of control over their urination patterns. They will not need to continuously expel urine like with certain catheters, and they will also not find themselves instructing the device to release urine when it is not actually necessary. There are two main routes that can be taken to accomplish this. The first option is that the device can be constantly monitoring the status of the bladder and alert the patient after the volume of urine in the bladder has reached a certain threshold. The patient, or caretaker, would then know it was an appropriate time to empty the bladder. The second option is that the device could measure the status of the bladder only when directed to by the user. The patient could then consider the results and determine whether they want to release the urine from the bladder.

Designing a urinary incontinence device by measuring the electrical impedance of the bladder externally by using skin surface electrodes will be a feasible way to control urinary incontinence and monitor the status of the bladder. This impedance device will measure the degree of fullness of the bladder by an electrical stimulator system. The signal will be sent from the bladder to a volume indicator to a small control screen that will display whether the bladder is full or not. The electrodes will be placed on the internal part of the bladder wall or externally on the abdomen so that there are no adverse side effects and damages to any surrounding muscles and organs. The electrodes will then send signals to the processor, which will then send an output value to the screen as the bladder expands indicating it is getting full. This urinary incontinence device will be wireless so that the patients or caregiver will be able to wear this device all the time. A possible idea would be to incorporate the electrodes into some sort of belt that can be worn daily. This would make the status indicator portion of the device convenient and discreet.

Another proposed method to control urinary incontinence would be to measure the volume of urine in the bladder based on a volume monitor using ultrasound. Ultrasound would be an effective method because it is would be a painless procedure. There is no radiation involved so this limits the amount of side effects on the patients. The ultrasound bladder volume device would monitor the volume of urine in the bladder by scanning the status of bladder externally. The ultrasound device could be designed to either monitor the bladder continuously or to just scan when the patient wants to check their bladder status. The continuous monitoring ultrasound would have a long battery life and be durable. The sensor on the ultrasound transducer would tell when the bladder inflates and rises above the symphysis pubis by the ultrasound waves. These ultrasound waves will send the signal to processor then to the receiver which will display on the screen that the bladder is full. This urinary incontinence device will be wireless, noise free and light weight. A general schematic of how the ultrasound scanner would work is shown below in Figure 7.
A third potential method for measuring the status of the bladder is a float sensor or a liquid level sensor. The sensor, which could float inside the bladder, would be able to send an electric signal via wire to the alarm component of the incontinence device. If this is the design option that is chosen extra care would have to be taken to protect the patient from electrical shock.

The second phase of the device design is the urinary control component. This is the part of the device that is going to prevent involuntary voiding. It will also be a system that will allow the patient or their caretaker to selectively empty the bladder of urine at appropriate times. Ideally, an appropriate time would be immediately after it has been indicated to the user, via the first phase of the device, that the bladder is approaching a full state.

This portion of the device needs to be easily controlled by the user. In the case of some of the potential patients dexterity and range of motion may be limited. This precludes the use of anything that requires intricate manual manipulation to control. One of the potential patients also has memory loss while a second client suffers from dementia. For these reasons this component should be simple to use without any complicated process involved that would be difficult for the patient to remember. The urine flow control component, as well as the status indicator, needs to be portable. This means that if it requires a power source a battery must be used instead of a wall outlet. It also means that the system must operate independent of a computer. A microprocessor will be used to accomplish this necessary requirement. In order to be a portable device, the components should be either completely contained within or on the patient’s body or the control component would be a small and discreet remote control or PDA type device.

The main possibilities for urinary control components of the device are sacral nerve stimulators, indwelling catheters, or valve devices. The final choice between these options will be based on reliability, user friendliness, and budget, as well as how well they can be coupled with the status indicator portion of the device. Each of these would likely function on an implantable basis. This is because we determined that it would be too difficult to develop an external functional device that would be suitable for all potential patients due to the large external anatomical differences between the urinary tract of males and females. Because the device will be an in vivo device the material it is fabricated out of will need to be carefully considered. Metals have been largely eliminated due to the tissue necrosis that can occur as a result of ion release during metallic corrosion. Titanium has excellent corrosion resistance in vivo and is the exception. A polymer material will likely be used for the implant, especially if the indwelt catheter if the final design selection, and we will also need to be careful that a bioinert polymer is selected as opposed to a polymer that will degrade in the body.
The sacral nerve stimulator option for urine flow control would have to be implanted in the abdominal area. It would function by sending electrical impulses to the sacral nerve and thereby controlling incontinence. The sacral nerve is the nerve that controls the muscles of the bladder and the urinary sphincter. The basic function of sacral nerve stimulation is in Figure 8 on the next page.

![Diagram](image)

Figure 8. Sacral nerve stimulation method for controlling urinary incontinence.

A problem with using this technique would be that we would need to make sure there were safety measures built into our design that would protect the patient for electrical injuries if the device malfunctioned. Also, this method would be harder for the user to control urination times. Unlike a valve method or catheter if the user stops the electrical impulses to the sacral nerve urination might not occur spontaneously. Also, since there would be no physical barrier to stop urine there would be a higher likelihood of accidental urination. The benefit to using this type of control device would be that it would be controlled wirelessly by a remote. The remote for this component of the device could be coupled to the external user interface portion of the status indicator component of the total device, and the user would then have only one piece of external equipment to manage.

An indwelling catheter would function to empty the urinary bladder. It would be made of a flexible plastic, most likely a material similar to latex. Typically catheters are reinserted each time the patient wants to empty their bladder. In cases of long term use where the catheter is left in it usually empties continuously into a drainage bag. In our device the catheter would have a valve on the end so that the patient could control urine flow.
In order to use an indwelling catheter sterilization and cleaning methods would need to be considered. Our indwelling catheter would need to show improvements in sterilization and cleanliness over currently available catheters. Current catheters can be left in for only up to two weeks, and it is a requirement for this project that the device can remain inside the patient’s body for 30 days. Also, latex catheters can cause irritation and a development of latex allergies after prolonged use. Infection is also a common problem.

The catheter would be very compatible with the pressure transducer method of monitoring status of the bladder. The transducer could be attached to the internal end of the catheter. It could then relay a signal to an external component of the device to alert the patient or caretaker if the pressure in the bladder has increased to a high enough level to indicate that the bladder is ready to be emptied. This “alarm” could be worn by the patient on the leg strap that holds the external end of the catheter. It could be a vibrating alarm so that patients who are hard of hearing will not miss an audible signal. It could not be visual because it will most likely be concealed under clothing. If the alarm needs to notify a caretaker the piece could be removed from the leg strap and made accessible to the caretaker. In this case an option visual alarm might be helpful. The potential setup of this complete device is shown below in Figure 9.

Figure 9. An indwelling catheter with a pressure transducer, a method to both monitor and control the bladder.
A valve device that would be implanted into the urethra has the most options as far as controlling urine flow. The valve could be completely internal and controlled by an external actuator. Alternatively the valve could emerge from the end of the urethra and be directly controlled by the user. In this case it could be magnetic or mechanically controlled. In either situation, internal or external, the valve would have to be attached at the end of a tube-like device that would reside in the urethra. The device should also have some sort of anchoring feature, one option being a balloon like end that would expand in the bladder, which would keep it in place. A basic diagram of this component’s features is included below in Figure 10.

![Figure 10. A urethral valve implant.](image)

The materials selected for this valve device should be as bioinert as possible. The less reactive the materials are the longer the device can remain indwelling. If it remains indwelling for relatively long periods of time this would be more convenient for the patient than having to remove and replace the device on a frequent basis. One major downside to this method of incontinence control is that if a caretaker were to operate the device it would be much more privacy invasive than the other options.

The final design of the accessible incontinence control device can potentially be any combination of the status indicator components and urine flow control components that have been discussed. A more careful analysis of each method and its interactions with the others will have to be conducted before the final decision is reached.
3. Budget

The budget for this project is still in the early stages. There is a $2000.00 limit, and the preliminary estimates are below the maximum amount; however, we are still waiting on a price estimate for the BladderScan ultrasound device from the local Verathon Sales Representative. We suspect that it will be an expensive component and we will need to select one of the other status indicator devices to use in our design. As the design becomes finalized the budget will be much more exact. The preliminary budget estimates are displayed below in Table 1. It should also be noted that the final device design will not utilize all of the components listed in the table. For example, the Gems Ultrasonic Scanner or the BladderScan would be selected. Since the two components perform the same essential function we would not need to purchase both.

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Table 1. Preliminary Budget Analysis

One major factor that needs to be considered in this particular design project is how we are going to test our device. Depending on the final design, a catheterization simulator is a potential option for a simulated testing environment. The price range for these devices varies depending on whether the product actually simulates the release of urine. For our purposes that would be the optimal situation. Considering the expense that a catheterization simulator adds to our project expenditures we should explore the possibility of borrowing such a device from the University Of Connecticut School Of Nursing if one would be available.

The preliminary budget is mostly composed of estimates because we have not made any final decisions on which manufacturer’s products we will be ordering for the objects we decide to purchase. For example, we have made no concrete decision to purchase a wireless receiver from Ming’s should we need one. Once decisions on what is needed are made it would be wise to do extensive research to try to find the best value products. The total amount for the preliminary budget is below the $2000.00 limit. Understanding that these are just estimates, the budget is subject to change dramatically. The BladderScan price is unknown at this point. The use of this product in the project will be determined when a price has been established.
4. Conclusion

The urinary incontinence device will provide discrete control of the patient’s bladder. The device is unique because it will have the ability to indicate the status of the bladder and alert the patient when it is time for urinary release. Although both of these technologies are currently available, our device will provide the benefit of both being available in one device. Another unique factor of our device is the universal functionality. Many devices on the market today are appropriate for either males or females. Our device will function equally as well for either sex. Additionally, our device will be accessible for patients who have a variety of handicaps and health issues. This is important because many people who suffer from incontinence do so because of other, sometimes extreme, health problems. Additionally, the remote control will be small and user friendly for optimum control of the device. The implantable device will allow for everyday activity for the patient and allow for normal activity without worrying about bladder control.

In this stage of the project the budget is still under construction and is subject to various changes. The budget is currently at $1380.95, but this is an estimate only. There will most likely be additional unforeseen expenses throughout the course of the project.

One major issue that our device would encounter on the market is that it would be competing against multitudes of other incontinence control devices. Because urinary incontinence is such a widespread and lifestyle changing problem there are already many products that deal with the issue. Our goal is to create a device that includes enough significant changes and improvements over currently available devices that it stands out on the market and could potentially be a successful commercial product were it to be carried to a completed level beyond the prototype we are building for this project.
Works Referenced


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Note: Google Patent Search was used to look up the patents discussed in this report. A Google search was also conducted to find prices for the items in Table 1.