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Week 2 Report – Through February 1, 2008  
Accessible Incontinence Control Device  
Team 8

**Work Completed**

Over the past week the majority of the work done on the incontinence control device has been research. During the team meeting last week the research done over break was discussed. The focus of the work done over break had been to investigate a specific pressure transducer to use for the status indication subunit of the device. Several models were investigated and a few companies were contacted. After hearing back on January 25 from the final company that had been contacted the group decided that although in theory the pressure transducer design that had been developed would work, it would be economically impractical, and impossible, to obtain a small enough, accurate enough pressure transducer that would function in a wet environment.

During the past week I have focused my research on three major points. I investigated the dimensions of the bladder and how it expands while filling, possible mechanisms for measuring the status of the bladder, and I investigated possible test set-ups we can use to mimic the bladder and determine if our device is working properly.

After getting specific information about the dimensions of the bladder when empty as compared to when full and investigating possible ways to directly measure the changing volume of the bladder I determined that a stretch sensor would be the most effective and affordable way to replace the pressure transducer to measure the status of the bladder. The resistance across a stretch sensor changes as the sensor is stretched. The increasing resistance across the sensor as the bladder expands could be used to calculate a rough percentage for how full the bladder is. This method would not be as accurate or specific as the pressure transducer, but it would be sufficient to give the patient control over their voiding patterns.

There are two main configurations that the stretch sensor could be used in. It can either be stretched around the circumference of the bladder, or it can be placed at the top of the bladder between the two ureters. This might be the better option if a way could be found to secure the sensor in that location because it is a know fact that the distance between the two ureters, which is typically 2.5 cm, expands to about 5 cm when the bladder is full. The two possible stretch sensor configurations are shown in Figure 1 below. There is an electrical connection between the stretch sensor and the device housing that will hold the micro pumps that control the artificial sphincter for the urinary control subunit.
Over the course of the past week I also looked into possible test set-ups to use for testing our device. Originally our team thought that this would be low priority at this point in the project because we would not need the test set-up until the final prototype is ready to be tested; however, we will need a test set-up to check our progress on several intermediate steps of the project.

The test set-up needs components to mimic the bladder and the urethra so it can demonstrate both the status indication portion of our design and the urine flow control. A simple test set-up that I decided on is shown below in Figure 2.

Since a device is needed to act as an artificial bladder I came up with a list of possible objects that could be used and experimented with them to see how they would function. Each
object was filled with about 2 cups of water (the maximum amount that would be in the bladder typically) with just one hole. They were then filled with two cups of water with a second smaller hole present to mimic the urethra. This second hole was kept closed to show what would happen when the urinary control subunit is engaged and then it was released to show what would happen when the subunit was disengaged. The test was also run with rubber bands affixed to the objects to mimic the stretch sensor. Results are summarized in Table 1 below.

<table>
<thead>
<tr>
<th>&quot;Bladder&quot;</th>
<th>Size</th>
<th>Results of Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latex Balloon</td>
<td>12&quot; round when fully inflated with air</td>
<td>held only ½ cup water without being forced in under pressure, when forced held 2 cups easily. circumference with 2 cups of water = 11.75&quot;. roughly oval shaped. all tests were successful. flow leaving &quot;urethra&quot; was very fast.</td>
</tr>
<tr>
<td>Water Balloon</td>
<td>4&quot; round</td>
<td>held less than 1/8 cup unforced but can hold 2 cups forced. circumference with 2 cups of water = 12.5&quot;. all tests successful. flow leaving &quot;urethra&quot; was fast.</td>
</tr>
<tr>
<td>Child's Ball</td>
<td>16.5&quot; circumference</td>
<td>passed all tests but is the wrong size and too rigid. expansion was instantaneous not gradual.</td>
</tr>
<tr>
<td>Ziploc Freezer Bag</td>
<td>1 quart</td>
<td>passed all tests, but wrong shape.</td>
</tr>
<tr>
<td>Baby Bottle Liners</td>
<td>12 oz.</td>
<td>did not pass tests. not flexible enough. held water but did not expand.</td>
</tr>
</tbody>
</table>

Table 1.

**Future Work**

The most important work that needs to be done in the coming week is that a decision needs to be made immediately regarding the status indication sub-unit and the test set-up and necessary parts need to be ordered. Also, the timeline for the project will need to be completely revised due to the change in design. The group needs to enter the hand on building phase of the project during the coming week. Most major research should be completed by now.

**Project Review**

I feel that the group is slightly behind schedule on the project due to set backs resulting in the fact that one of the parts we ordered over break was shipped without some components. The company has been contacted and the missing parts have been shipped so we should be back on track soon. I think that significant headway has been made on developing a test set-up but in the coming weeks the group will have to put in extra time in the lab to make up for the set backs.
Hours Worked

Hours worked on the project this week totaled 11.5. This amount of time is slightly under what it should be, and for the rest of the semester more time per week will need to be spent working on the project.