Meeting Minutes 9/5

Present: Dr. Maughan, Ed Hall, Amy Macias, Elena Tipton

Location: GJ Senior Design Suite

Time: 8:30 AM

Agenda Item: Client Meeting

- Project doesn't have clear/well defined problem to be solved, and client is not an expert. They will act more like a boss, and we will be responsible for defining requirements for the project, which will largely be raw development work.
    - Project learning will be critical for us, including competitive teardown of a real catheter, etc.
- Other options for "expert" advice:
    - Meet with Crepeau's med school contact
    - Identify other resources who could be helpful
- For client meeting, we need at least 20 questions to ask to better define the needs and constraints of this project, project requirements, scope, budget, etc.
- Since this idea might be used for competitions in the spring semester, ask for any special prototype deadlines, etc. That clients might have as a requirement

Other Items: Dr. Maughan advice on research and project learning

- Could be useful to research prior art in US patents
    - Uspto.gov
    - Google patents
- FDA regulations on internal use- specific to catheters?

Action Items

- ❑ Research and generate meaningful questions for client interview
- ❑ Schedule client interview

Meeting Minutes 9/10

Present: Elena Tipton, Amy Macias

Location: GJ Senior Design Sweet

Agenda Item: Questions for clients

1) Background on where this idea come from

2) What they have so far in terms of ideas

3) Would we be able to contact person with original idea

4) Design flaws with the original design that they know of

5) Any other people who could offer guidance

6) Testing wise, how would you recommend we test

7) Scope of the project / goal for the project

8) What will Dr. Tanners role be

9) How will the interaction between engineering design and entrepreneurship go hand in hand

10) Specific deadlines for competitions involving business aspects

11) Overall budget

Which department will deal with this? Through Molly in ME, or in the Business department?

Through Molly

12) Elaborate more on the fluid going the opposite way

13) Will there be a pump?

14) Elaborate more on the concentered tube

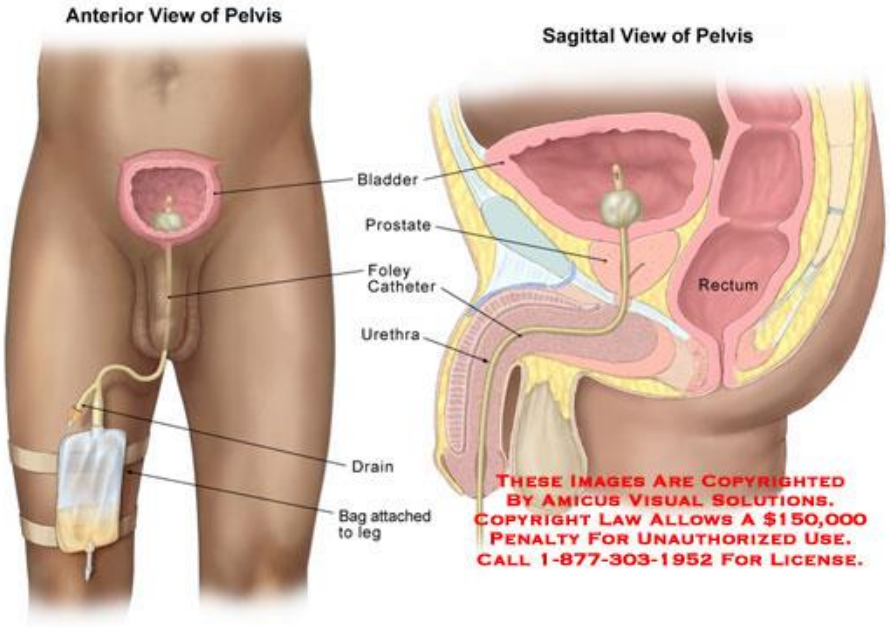
15) Will size matter in terms of testing

16) Will sleeve be attached to leg

17) Are we specifically concerned with the internal section of the catheter or will the whole thing be included in the scope

18) What is an appropriate cost for one of these products?

Foley Catheter Placement



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Meeting Minutes 9/12

Present: Elena Tipton, Amy Macias

Location: GJ Senior Design Suite

Agenda Item: Perfecting Questions / Ideas

- Who is the most suceptible to catheters?
- Prove concept, prove systems individually, test full system
- **Is there a group of people more susceptible to UTIs? Research on sizes of catheters, should probably target that demographic.**
- **We are aiming for a proof of concept on this product; it will take a long time to get anything**
- **Don't worry about how it would be made in production**
- **What are catheters made of?**
    - **Latex, silicon**
    - **PVC**
    - **Long Term:** They can be made from silicone, silicone-elastomer coated latex and hydrophilic polymer coated latex, these materials are known to cause the least friction and tissue reaction 8. They are also less vulnerable to rapid colonisation by bacteria and encrusting by mineral deposits.
- Dr. Perry's new 3D printer
    - Prints in onyx, super flexible- also can do in flashforge, mat'l called ninjaflex
    - Flashforge- double extruder, can do two different materials in one part
- Balloon inside catheter might be problem
- Need to buy a catheter to look at.

  I.e medical supply store or Amazon or Northwest Respiratory & Medical

Meeting Minutes 9/12/2018

Present: Elena Tipton, Amy Macias, Dr. Maughan, Andre Corpus

Location: GJ Senior Design Suite

Agenda Item: Perfecting Questions / Ideas

Questions for Client meeting

- List of questions from small team meeting on Monday
- Dr. Maughan would also like to know where the budget will be managed; with Molly in ME department or in Dr. Tanner's department

Further research needed

- Who is the most susceptible to UTIS by use of catheters?
    - Research on sizes of catheters, should probably target that demographic
- What are catheters made of?
    - Latex, silicon
    - PVC
    - Long Term Catheters: They can be made from silicone, silicone-elastomer coated latex and hydrophilic polymer coated latex, these materials are known to cause the least friction and tissue reaction 8. They are also less vulnerable to rapid colonization by bacteria and encrusting by mineral deposits.
- Need to buy a catheter to look at/tear down
    - i.e. medical supply store, Amazon, Northwest Respiratory & Medical

Design/Prototyping

- Dr. Perry's new 3D printer
    - Prints in onyx, super flexible- also can do in flashforge, mat'l called ninjaflex
    - Flashforge- double extruder, can do two different materials in one part
- Balloon inside catheter might be problem to design around
- Prove concept, prove systems individually, test full system
- We are aiming for a proof of concept on this product; it will take a long time to get anything
- Don't worry about how it would be made in production

Meeting minutes 9/17/18

Agenda Item: Preparation for Client Meeting

Present: Amy Macias, Elena Tipton, Ed Hall

- Getting ready for meeting tomorrow with clients
- Getting a prescription for a catheter sometime soon
    - Amy has connections
- Ed is ordering more Catheters
- 3-way Foley catheter is closest to our design

Meeting minutes 9/18/18

Agenda Item: Client Interview

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan, Andre, Clients

- Meet with business students 3 times a semester to discuss business side of things

- Budget $2500
    - Go through Molly in ME dept. for money
- Main Challenges:
    - How do we get it to stay in place? Balloon, new mechanically deployed mechanism?
    - Medical transfer of catheter, in and out
    - Maintain and measure flow of fluid going in, and fluid/urine going out
    - Materials: Use materials that already exist in medical field, FDA approved
- Deployment, measurement
- Cost effective / ease of care
- Where should we go to see how these are made
- Make it easy to implement
- Produce a devise that works
- Compare flow and effectiveness with new design
    - How can we test this?
- Infection occurs in urethra
- Make a draft of milestones send it to clients
    - Deadline: working catheter by expo / Late October event – Mockup prototypes
- What makes this Idea unique
- Go on google patent
- Does not necessarily have to be a balloon structure you can look at mechanical properties
- Ruptures are monitored and after a certain amount of time catheters are pulled out to let it heal
- Kysen Palmer

  Palm9315@vandals.uidaho.edu

Meeting minutes: 9/20/18

Present: Elena Tipton, Amy Macias, Ed Hall

Agenda Item: Working on Budget, Deadline, and product requirement documentation

- Brainstorming ideas for designs
- Worked on budget
- Worked on schedule
    - Both on Excell sheet on One Drive
- Shared initial design ideas
- Went through course schedule and considered important dates on our schedule
- Looked up prices online (I.e catheters, test dummy) and were able to add them to our potential budget list

Meeting minutes: 9/24/18

Present: Elena Tipton, Ed Hall, Amy Macias

Agenda Item: Find a catheter as soon as possible / Product requirements and sketches

- Working on sketches and ideas
- Ordering a catheter
    - Ed ordered multiple types of catheters, will arrive in 3-5 days
        - 3 Way foley and 2 way
- Cannot order Malecot design until budget is completely thought out
    - Malecot design catheter is close to $80
- Leaning towards a Melecot design to replace the balloon in a foley catheter
- Balloon design is posing many problems in our design ideas
- Schedule a 2nd meeting with clients

Meeting Minutes: 9/26/18

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan, Andre

Agenda Item: Work on ideas and sketches

- Come up with 3 best designs to present to clients
- Call manufacturer to get a quote on design
- Weekly meeting rescheduled for Monday @ 12:30
- Look for rubbers on Smootheon.com
    - Platinum silicone rubber paint to make outer tube for prototype
- Value proposition:
    - We are going to reduce the number of UTI's experienced
- Start on product requirements and specifications

Meeting Minutes: 10/1/18

Present: Elena Tipton, Ed Hall, Amy Macias, Dr. Maughan

Agenda Item: Getting Ready for 2nd client meeting

- Meeting with clients scheduled for 10/5 at 8:30 am
- Wednesday group meeting rescheduled for Thursday at 9:30
- Pick 3 best sketches to present to clients
- Put sketches on a PowerPoint to show to clients and discuss
- Start working on system requirements and measurements
    - Technique specifications (measurable)
- Start finding flow rates and dimensions

Meeting Minutes: 10/5/18

Agenda Item: Client meeting #2

Present: Elena Tipton, Ed Hall, Amy Macias, Dr. Maughan, Clients

- Talking about designs

- Does the bladder contract and expand?
- Is the bladder a bowl design?
- Is pain an issue with the malecot design?
- Irrigation system will allow for it not to cause friction
- Talking about product requirements
- Who is our target audience?
- Size is not the most important right now
- Focus on the design and mechanism
- Does the concept work? You can scale it Afterwords
- Buildup happens in the drainage channel as well as the outside
- Kyson's designs were also porous
- Fish scale design would be made from silicone as well
- Kyson has a design that can replace a balloon on a catheter
    - A hook design that you pull on to lock into place
- Should we avoid introducing bacteria into the urethra
    - All of Kyson's design did not go into the bladder
- We will need a way to block off the part of the catheter that is on the outside of the genitals to prevent from saline to escape before going into the urethra

Meeting Minutes 10/10

Present: Dr. Maughan, Andre, Ed Hall, Amy Macias, Elena Tipton

Location: GJ Senior Design Suite

Time: 8:30 AM

Agenda Item: Go over Snapshot and pick a final sketch

- Explore a silver option imbedded into catheter
- Explain project thoroughly when explaining and then explain engineering solution
- When fluid flows out of urethra it will fight off infection caused from bile coming from the back to the front.
- Should we introduce bacteria into the bladder when it flows upward?
- Leaning more towards a porous design, ruled out fish scale design
- Pressure is going to be an issue in our design
    - We will use a pressure stimulator to find out the pressure we will need
    - Get an advanced mechanics of materials book and or talk to a fluid professor to find out the equations we will need
- Tissue rupture is inevitable whether we have a twisted design or not
- "Chinese finger trap" design to go outside of the catheter to create room when contracted is another design idea
- 3-way catheters are less common
    - Only used for people who already have a bladder infection

Group-assessment:

1) Discussed many important topics during meeting which led us to conclude what our action items will be and what we need to complete before next meeting.

Action items:

- ❑ Find the pressure that will be needed to pump the fluid
- ❑ Rule out designs and start a "salad cart" to pick best design
- ❑ Do more research on manufacturing, why is there so much room above balloon?

Meeting Minutes 10/15

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 3:30 pm

Agenda Item: Make a prototype and design validation form

- Design validation form is due Thursday
    - Ask Dr. Maughan what the expectations are
- Ed ordered:
    - HV65FX Latex to make a more suitable prototype
    - 10 ft surgical tubing
- Working on a mini protype using store bought liquid latex
    - Purchased from Walmart
- Thinking of different ways to go about making a prototype
- How will we test our catheters?
    - Need to purchase a test surrogate
- One option: Budget female catheter model with bladder (simulation)
    - Allows for us to see the inside of the urethra and bladder, will cover open side with glass and use molding gel to seal it
- 2nd option: Vesical urethral anastomosis kit
    - Kit that will allow us to assemble a urethra, bladder and genitals
        - Drawback is that it is unrealistic i.e tube like structure

Group-assessment: We were unable to start building a prototype because our materials haven't arrived and the latex mold builder that was purchased is brittle and uneasy to work with.

Action Items:

- ❑ Brainstorm design validation criteria
- ❑ Do more research on surrogate urethra system

Meeting Minutes 10/17

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Library

Time: 12:30 pm

Agenda Item:

I. Prototyping materials- update on shipment arrival date

    a. Plan time to test material/begin first prototype
II. Design Validation Plan (due Thursday 10/18)
III. Testing plan
    b. Catheterization dummy vs. Urethra surrogate, etc.
    c. Goal to acquire testing equipment: 11/16 (from schedule)
IV. Discuss design review, schedule it for before 11/16

- Materials that were ordered will arrive from 17th-19th
- Meeting on Monday to start dipping and making a prototype
- Elena will be attending workshop for wiki page
- Working on Design validation form (Due 10/18)
- Hydrogel has a low friction coefficient, so it mimics urethra
    - Will use this for our testing simulation
- Lifelike urethra will be 15 FR
- Contacting R&D team (Lifelike bio tissue) to make a custom urethra for testing
- 5 weeks to complete design review

Group-Assessment:

We feel as though we are on track. We will start our first protype tomorrow and be able to have a solid presentation using our simulations and prototype.

Action Items:

- ❑ Contact Lifelike bio tissue to get a clear urethra
- ❑ Begin first protype (11/18) rescheduled to 10/24

Meeting Minutes 10/22

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Library

Time: 12:30 pm

Agenda Item: Plan to start prototype on Wednesday

- Come up with a container that is long and skinny enough to hold liquid to be able to dip tube
- Figure out what substance to use to make sure silicone does not stick to rod i.e Vaseline
- Execution:
    - Use dowel and mold spiral around dowel
        - One spiral for irrigation on straight line for balloon, both on different dips (balloon will be dipped first)
    - Elena is getting a resistant band to use for the balloon part of the catheter
        - We will wrap around the band to allow for expansion of the balloon
    - Will require 2 dips into silicone and last layer will be brushed on to make sure it is smooth and thin

Group-assessment:

During Wednesdays meeting we will go over design review. We want to keep our design simple to allow for ultimate comfort. Overall, we feel like we are on track given that our first prototype will be completed by this month.

Action Items:

- ❑ Get balloon material
- ❑ Start prototype

Meeting Minutes 10/24

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Engineering Senior Design Suite

Time: 8:30 am

Agenda Item: Going over design prototype plan

- We will be using resistant bands for balloon part of catheter
- Ed dipped a straw into silicone adhesive and when pulled off it flattened out and stuck together
    - We will need to find a way to pull off the silicone without it collapsing (no lubricant was used on first prototype or cornstarch)
- We will be getting a $32 surrogate urethra for serious testing as well as a pvc pipe for initial testing
- We need to get ready for our design review
    - Sit down with clients and tell them what we have, what our plan is, pros and cons, and then get feedback
- Come up with another prototype that more resembles a catheter
    - We may build around surgical tube so that layer will not need to be peeled off
    - 3D printing is also an option (even with the spiral design)
        - Print out internal and external cavity all in one
        - We will need to hang it vertically
    - Our catheter has 3 channels in total
- We will keep prototyping while designing what we want catheter and use solid works to make a prototype we will then be able to 3D print
- What 3D printing solution dissolves in water? Might be PVA
- We need to add metrics to design validation as well as quantifying and descriptions to each requirement
- Value proposition is due this week

Group-assessment:

We will keep on prototyping both with silicone dip as well as 3D printing. So far, we feel like we are making progress.

Action Items:

- ❑ We need to generalize our value proposition so that anyone can understand it (don't use technical terms)
- ❑ Add metrics as well as descriptions to our design validation
- ❑ Start a design on solid works to start 3D printing
- ❑ Keep on prototyping with silicone dip we have

Meeting Minutes 10/29

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 5:00 pm

<u>Agenda Item: Working on prototype</u>

- We will test oil vs powder to see which is the most effective to prevent sticking
- We will try a blowing technique such as how gloves are dipped dried and then blown off the mold
- We covered a skewer in non-stick cooking spray and then covered it in corn starch
- We will work on wikki page 10/30
- We will also work on a 3D model 10/30

Group assessment: We are on track as far as prototyping however we need to get going on our wikki page.

Action items:

- ❑ Finish prototype
- ❑ Work on wikki page
- ❑ Refine DVP
    - Add metrics
- ❑ Complete 3D model
    - Find out what 3D material dissolves in water

Meeting Minutes 10/30

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 3:30 pm

<u>Agenda Item: Continuation of prototype</u>

- Our first prototype slid off the rod smoothly

- We will be working on the spiral part of our design using twine and wrapping it around the main tube we just made
- We are making our balloon channel first by lining the twine up straight onto the rod and then wrapping the twine around to make the spiral design
- Before we applied the twine, we sprayed it with nonstick cooking spray and then coated it in cornstarch
- Painting on the latex did not work
    - It left it clumpy and uneven
- Next time we will try rolling it in the latex to avoid clumps
- We will meet on Thursday to finish wikki page

Group assessment:

Although our prototype did not come out the way we had hoped, we are still making really good progress

Action items:

- ❑ Work on wikki page
- ❑ Finish prototype
- ❑ Research dissolvable 3D printing material
- ❑ Finish solid works model

Meeting Minutes 10/31

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan, Andre

Location: GJ Engineering Suite

Time: 8:30 pm

Agenda Item: Discussing prototype design

- The twine did not come out of our design most likely because we used twine instead of a metal rod
- We need to keep redefining our prototype
- To start out we will need to get a surrogate urethra as soon as possible (ex tygon, silicone, fishing line)
- We need to start on our 3D design so that we can have a mold
- We need to start on designs for the balloon
    - We could use a water balloon as the band
- Will our silicone be able to cure in a mold with no oxygen?
- Check in with client to update them on the process (explain reasoning)
- Try many other things
- Does a hot sewing needle work for poking holes in the silicone?
- We need to reevaluate our design because with our design we will not have enough pressure to make the fluid exit the urethra

Group Assessment: We need to get going on our prototype since our first one did not go the way we had hoped. We have 2 weeks until thanksgiving break, so we are so a tight crunch, but we are still on track.

Action Items:

- ❑ Contact clients to update them
- ❑ Work on more prototypes
- ❑ Start scheduling design review
- ❑ Buy 3D printing mold
    - Should get here by Friday

Meeting Minutes 11/1

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 3:30 pm

Agenda Item: Starting on a new protype and work on Wikki page

- We are going to put the liquid latex in a contact lens case to see if the latex cures when no oxygen is present
- We are looking into buying a water-soluble 3D printing mold
    - Mold might dissolve when we put in liquid latex so that could pose a problem
- Working on Wikki page
- Ed got the twine to unstick from our prototype now we have 2 fully functioning channels
- Wikki page login:
    - Username: tipt4166
    - Password: infectionprotection

Group assessment: We are reevaluating our designs and thinking about the pros and cons of each one. As of now, we believe we are still on track however we are starting to get into crunch time so for that we will need to pick up the pace so that we have enough time for testing.

Action Items:

- ❑ We are meeting on Sunday to start a new prototype with a smaller diameter
- ❑ Perfect our wikki page
- ❑ Order surrogate urethra
- ❑ On Sunday we are going to the hardware store to find tubing for a surrogate urethra

Meeting Minutes 11/5

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 3:30 pm

Agenda Item: Continuation of prototype

- 1/16 dowel was dipped into latex for a new prototype
    - Another layer was dipped an hour later
- We are continuing our old prototype as well and adding a store-bought balloon to the top of it
    - A balloon will be tried to be made from liquid latex
- We figured out that the latex dip will not cure without oxygen
    - We will see if it will cure when put in the freezer one side open and one closed
- PVA water soluble 3D printing material will be purchased
- A balloon channel will be made from fishing line on our new prototype and then dipped in latex
- Spiral channel will be made 11/6
- We will put a balloon channel on the surgical tubing and then dip it into liquid latex and build off that
- New prototype will have to be redone because it was dropped before it was fully dried, so it deformed
- Surrogate urethra was purchased for $32

Group Assessment: Our prototype is coming together smoothly. Although we've had a few minor setbacks, we are making a lot of progress towards our project. We don't have that much time left before thanksgiving break, so we are going to pick up the pace.

Action Items:

- ❑ Email clients to find a good time to meet for design review
- ❑ Start on spiral 11/6

Meeting Minutes 11/6

Present: Elena Tipton, Amy Macias, Ed Hall

Location: GJ Engineering suite

Time: 3:30 pm

Agenda Item: Continuation of prototype

- First prototype (Our porous spiral design) can inflate balloon with liquid however, we were unable to remove metal spiral from prototype
- PVA was ordered today
- We will be going to the hardware store after our meeting to find a suitable surrogate urethra out of tubing (i.e tygon)
- Second design will be started today (Dr. Maughans design)

Group assessment: Our prototypes are coming out just as we had planned (slowly but surely) as well as our wikki page. Ed will be going to the Wikki review session tonight to finish up our wikki page. We feel as though we are right on track.

Action Items:

- ❑ Work on our second prototype design
- ❑ Finish wikki page
- ❑ Finalize a time for our design validation

Meeting Minutes 11/7

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Engineering suite

Time: 8:30 am

Agenda Item: Discuss prototype designs and Design review presentation

- What are our backup plans if both designs do not work?
    - We need to be able to present these ideas at the design review
- We were able to remove metal spiral from second design and pores were made
- Design review will be scheduled from 4-5 on Thursday 11/15
- Provide background information for audience that will be present at design review
- Design review will be most like a presentation rather than a realistic design review
- Add results from testing to design review presentation
- We could also remove moisture from silicone to see if it will cure
- We will have to print pva from flash forge (1.75 pva)
- Slides are not our presentation
    - What do we want to tell our audience?
    - Use very few words on slides
    - Jean Luke Demont on YouTube demonstrates how to give a good presentation
    - Video tape our presentation, watch it, and critique it
    - Make a video of demonstration so everyone in the audience can see it

Group Assessment: After speaking with Dr. Maughan, we have a good idea of what to expect for our design validation presentation and we are feeling a lot better about it.

Action Items:

- ❑ Keep working on prototype designs
- ❑ Get our presentation ready for design review

Meeting Minutes 11/12

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Amy's House

Time: 3:30 pm

Agenda Item: Working on prototype for Design Validation as well as a new prototype

- We worked on our PowerPoint and will continue to work on it 11/13
- On 11/11, Amy used fishing line as a channel on a 2-way Foley catheter and painted liquid latex on it
- Fishing line seemed to adhere to the already made catheter, so it was unable to be pulled out and we had to start over

- We redid this method with a metal rod and then painted on the liquid latex
- We also made a second prototype today and stuck a metal rod onto a catheter and held it in place with tape along the catheter
    - Rod was first covered in oil and cornstarch
- We then poured liquid latex into a long container and then dipped catheter into it for a smooth layer
- These were both hung to dry overnight, spiral will be done 11/13

Group Assessment: We are feeling a little unsure about our presentation on Thursday however we plan to meet every day until then to practice. Overall, we are making really good progress on our project.

Action Items:

- ❑ Finish PowerPoint to send to Dr. Maughan by 11/13
- ❑ Finish spiral on prototypes
- ❑ Practice PowerPoint presentation

Meeting Minutes 11/13

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 8:30 am

Agenda Item: Going over presentation for Design Review

- Watch a Steve Jobs video introducing the iPhone to get good practice on delivery of the presentation
- Title of every slide must convey the main message of the slide
- Make the opening of the presentation powerful and state goals that can then be further developed by manufacturers
- Say "Let me take you on a journey" as a transition to your next point
- Go over existing designs and take the best features and add our own features; Therefore, our design will be a better result
- How do you prevent infections? Our goal is to irrigate the urethra with medication
- Illustrate a mental picture of what flushing of the urethra looks like
- We will talk about our two main design and pros and cons of both
- How we will plan to test
- PowerPoint chart to talk about schedule
- Take pictures of important features of our design
- Draw up some figures to add to the presentation
- Do not put a thank you slide just end with black screen

Group Assessment: After getting some pointers on our presentation, we will spend today preparing for an effective presentation. We are feeling confident about our layout we just need to practice delivery. Overall, I think our presentation will go well.

Action Items:

- ❑ Refine PowerPoint as a team (11/13)
- ❑ Practice an effective delivery (11/13)
- ❑ Watch videos by Steve Jobs on how to put on a good presentation (11/13)

Meeting Minutes 11/14

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Library

Time: 12:30 pm

Agenda Item: Work on Presentation for Design Validation

- We discussed the differences between dipping and painting of the liquid latex
    - Painting was a huge failure as the latex was completely uneven and metal rod separated from actual catheter, however dipping the catheter seemed to work pretty well although liquid latex has a hard time adhering to actual catheter so if pulled on, the channel we made separates from catheter.
- We worked on presentation and decided who will be presenting which slides
- We also discussed the use of live bacteria to test
    - We will place live bacteria on a control catheter and our design and then flush our design right after and leave the control alone while both are placed in a surrogate urethra. If no bacteria are present on ours after allowing time for bacterial growth, then we will know our design was successful

Group Assessment: Although we haven't had enough time to practice on our delivery, we are still feeling confident about our presentation overall.

Action Items:

- ❑ Work on slides we are each presenting 11/14

Meeting Minutes 11/28

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 8:30 am

Agenda Item: Evaluating everything that is due by end of the semester

- Logbooks due December 7th
- Meeting Next week (Wednesday 8:30 am)
- Meet with Mellissa to figure out how to 3D print
- Printing with PLA
- Try 3D printing ideas, don't wait
    - Try something simple first
    - Platinum cure
        - Works faster
    - Cutting the mold in half
    - Have a backup plan
- Place 3D printing material in 2 zip-lock bags to avoid diffusion
- We will have Life-like urethra ordered by next semester
- Put together a visual plan and schedule

Group Assessment:

If we get our first serious prototype, then we will still be on track with our project. We are struggling as of right now to find time for all of us to meet since finals are coming up.

Action Items:

- ❑ Make first mold
- ❑ Order Printing material
- ❑ Meet dead week and finals week

Meeting Minutes 12/3

Present: Elena Tipton, Amy Macias, Ed Hall

Location: GJ Senior Engineering Suite

Time: 12:30 pm

Agenda Item: Make a plan for 3D printing

- OTPU has not arrived yet so 3D printing of actual catheter cannot be done yet
- We will start on designs for the mold today
- Elena is meeting with Melissa 11/4 to figure out printer settings
- Mold will be done by 3D printing two halves and then clamping them together when silicone is poured in

Group Assessment: As the semester comes to an end and we have begun 3D printing, we believe we are at a good starting point for next semester. We predict we will have our first solid 3D prototype ready by the beginning of next semester so that we can start testing.

Action Items:

- ❑ Elena is printing parts of the mold 12/4 to figure out the settings
- ❑ We are all coming up with ideas for the mold design
    - I.e how to make the channels open in the mold

Meeting Minutes 12/5

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 8:30 am

Agenda Item: Talking about 3D printed catheter and schedule

- If we print at 45 degrees, we will not need support material

- First print a small diameter cylinder with supporting material
- We will have our 3D printed catheter by next week or at least have a good understanding of what the plan is
- Get surrogate urethras ordered today
- Testing wise: how will we validate measurements, what is the plan, how will we measure flow
- 3D print mold as well
- How will we make the port to connect the syringe?
- Mold will be made from PLA however not in the inside
- Find straight wire for channels and straight rod for urine channel
- Figure out press-fits
- Print out a bunch of holes and see which one our wires fit in
- Keep working on this over break
- There is a presentation when we get back from break, have design finalized (beginning of February)
- Demonstrate: Mold or print 3D object that looks like a catheter, prove that we can make a functioning channel, spiral design lets fluid flow out of urethra, prove that money was well spent
- Act on plan/do stuff over break do not just take a month break
- 3 o'clock Wednesday the 12th is our next meeting
- 1:30 Mondays (1/14/2019)

Group-assessment:

Action Items:

- Work on 3D printed catheter
- Make a plan during break

Meeting Minutes 1/14/2019

Present: Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 pm

Agenda Item: Discuss progress and plan moving forward

- Share our design (Design concept review)
- Release documentation
    - Money
    - Have all technical documentation
    - Have all drawings and data
    - Present progress and design (last chance to make changes)
- This is the time to release to manufacturer
    - Take feedback on design
- Release checkpoint
- Design validation
- Is it possible to make a lot of them?
- Manufacturing validation
    - It got made correctly and works
- Platinum or tin cure silicone (compare them) [or a soft silicone (shore A 20-30)]
- 3D printing is not reasonable, however mold is reasonable
    - Prove that the process works
- We need to make a presentation for SWE
- Work on second design prototype
- Find a way to poke holes in the second prototype

Group-assessment: We are starting the semester at a solid point in our project and moving forward we have a solid plan.

Action Items:

- ❑ Order E. coli
- ❑ Start the culturing process
- ❑ Order Platinum or tin cure silicone (compare them) [or a soft silicone (shore A 20-30)]
- ❑ Refine second prototype design

Meeting Minutes 1/28/2019

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Women in engineering presentation, Expo registration, Prototyping

- February 8th Women in engineering presentation
    - Create a story board
- Final presentation is due February 15th
- We will pick a room for presentation and send out a reminder no later than next week
- Expo registration form
    - Explain your project and the value of the work you're doing.
- Elena will do a flow simulation
- Amy will put together a plan for testing with bacteria
- Ed is meeting with Molly to get supplies ordered

Group assessment: We are right on track and are going to hustle to meet deadlines this semester. We will soon have a solid prototype to begin testing.

Action Items:

- ❑ Amy will plan for bacterial growth testing
- ❑ Ed will order supplies
- ❑ Elena is 3D printing a scaled up model 1/17

Meeting Minutes 2/4/2019

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Prototype, Flow simulation, Presentation outline

- Call Dawson Community College and get account number if possible, to get a discount on bacteria

- Elena was able to print a triple lumen catheter (not to scale)
- Make inner hole larger (less thick walls)
- Explore different shapes and geometries for ridges
- Don't depend on somebody else for help (Lucus)
- First conduct and experiment using food dye before using a special kind of dye and computer simulation
- Elena is working on a flow simulation using solid works
    - Will show us pressure (gravity will not be a factor)
- Presentation will be held in ALB 204 or the BE conference room
- Add a "what's next" slide at the end of the presentation
- Wednesday the 13th of February will be our design validation @ 1:30 pm
- Our group will be in a promo video for capstone
    - February 19th-22nd
- Snapshot #3 - March 5th
- What can we do as a contingency if things don't go right with testing?
    - Compress our timeline
- Print a mold on the sindo
    - Use sand paper to make it smooth
- Make a gant chart with schedule and progress
- 8:45 – 9:45 Friday (presentation in front of women in engineering)

Group assessment: We plan to start testing right away as soon as we print another catheter. We feel as though we are right on track to have a successful design validation.

Action Items:

- ❑ Elena will work on flow simulation
- ❑ Create a presentation
- ❑ Update budget and put together a schedule
- ❑ Design an inflatable balloon

Meeting Minutes 2/7/2019

Present: Elena Tipton, Amy Macias, Ed Hall

Location: Library

Time: 11:30 AM

Agenda Item: Work on presentation for Engineering Release Review

- Worked on Engineering Release Review
- We will present Eds design of an inflatable spiral channel to allow more comfort to the patient
- Amy will activate bacteria 2/8/19 (takes up to 5 days to fully activate)
- We will practice our speech 2/8/19 to make sure we are prepared for presentation
- Elena made a smooth mold with the sindo
    - She will print the second half today 2/7

Group-Assessment: We are working very hard to meet deadlines and as of now we are on track with the schedule we made last semester that was presented in the last design validation review. We will start testing this upcoming week to ensure that we have results when we present in front of our clients.

Action Items:

- ❑ Finish Slides
- ❑ Practice presentation
- ❑ Elena will create second half of mold
- ❑ Amy will activate bacteria
- ❑ Ed will work on project costs

Meeting Minutes 2/25/2019

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Prototype/ Bacterial flushing test

- We will use a heating element to keep the temperature constant when doing the bacterial flushing test.
- Our presentation lacked details, so questions weren't answered completely
    - Sparked questions after presentation
- What is the pressure buildup when flushing our catheter?
    - Will it cause abrasion?

- On the sections of the spiral against the urethra, how will those sections be flushed?
- Ask Schiele if there's a way to test with tissues to test abrasion
- We need to get two different totes for our bacterial testing
- We are getting a stiffer 2-part material for our catheter mold

Group Assessment: Overall, our presentation went well according to Dr. Maughan. We must do more research to make sure we are able to answer all the questions posed to us at expo.

Action Items:

- ❑ Ask Schiele for help identifying trauma to tissue (Amy)
    - Contact pressure/ quantify success and features
- ❑ Get a plan in place for the bacterial testing (all)
    - How we are going to keep moisture levels up
    - Heating element
- ❑ Dip with silicone to make balloon channel (all)

Meeting Minutes 3/4/2019

Present: Elena Tipton, Amy Macias, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Bacteria testing, Control catheter, test environment, Insertion testing plan

- 5 newtons of force are the max amount of force that can be applied to the urethra
    - Nurses have a good feel for this when inserting the catheter
- Hopefully GJ engineering suite will be open during spring break
- We need a push or pull gage for testing force
- 3D print a speculum to hold open "urethra"
- Test for tension using a fishing wire and attach it to the catheter and pull it out and measure the tension
- Use a silicone as close to reality as possible
- 50 shore will have a better hold than the material we ordered last time to make the catheter in the mold
- How expensive is a digital force scale?
    - Ed saw one for $50
- We could use a load frame in EP 109
    - Tensile test machine
    - Talk to Dr. Robertson about it

Group Assessment: As we reach the middle of the semester we are at a good place in our project. Over spring break, we will be conducting our bacterial test and then finishing it the week that we get back. We are working hard to finish strong and deliver a fully working catheter to our clients.

Action Items:

- ❑ Contact Bill to see if GJ will be open during break (Elena)
- ❑ Start bacterial test (group)
- ❑ Get a fish scale from Dr. Maughan (group)
- ❑ Talk to Dr. Schiele about identifying trauma to tissue (group)
- ❑ Get ready for snapshot (group)

Meeting Minutes 3/18/2019

Present: Elena Tipton, Ed Hall, Dr. Maughan

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Bacteria testing, Insertion Test strategies, Dr. Schiele's suggestions on physical effects/possible damage

- Getting 18Fr catheters to compare insertion forces to our product
- We could get silicon catheters to be more comparable to our product
    - Otherwise we could compare using ratio of coefficient of frictions
- For test- secure end and suspend the catheter. Use digital scale we got to measure max force required for insertion
- Image processing.. Probably not the best route for us as far as understanding physical effects of catheter on urethra. This method is very complicated
- Tissue injury/wear models? Do research
    - Library website- guides or journals- Web of Science- tissue wear models, surface abrasion
- Slide device along tissue "surrogate" urethra and microscopically observe damages on urethra tissue
    - Estimate cycles per day, say 200 cycles per day
- Coming up:
    - Expo, technical presentation (20 minutes), demonstration, poster board
    - Need to be thinking ahead about these and preparing proactively
- Butane torch smoothing of pla prints? Check out some videos

ACTION ITEMS

- ❑ Insertion test rigs
- ❑ Order agar/sterile swabs
- ❑ Get mold for insertion test done

3/25

4/1 (in notebook)

Meeting Minutes 4/8/2019

Present: Elena Tipton, Ed Hall, Dr. Maughan, Amy Macias

Location: GJ Senior Engineering Suite

Time: 1:30 PM

Agenda Item: Bacteria testing, progress, Results this week, Insertion test update, EXPO preparation

- Bacterial test results (1)
    - Flushed 3 days
    - Swabbed and let it grow for 3 days
- Bacteria test results (2)
    - Flushed 5 times (6 times in total)
    - Will swab after 6 days
- Take photos and add them to the poster
    - Also add a simple procedure
- Ed will conduct and insertion test 4/8
- We upped the durometer on our next catheter to make it harder
- We will use a 16 FR catheter instead of the 18 FR catheter for the insertion test
- Understand body diameter
- Print another mold so that ribs turn on to be 16 FR
- Are we on the path for having a functional test?
- How accurate is our reading?
- What is our range of acceptability, how close is close enough?
- We need lubricant for our insertion test
    - Ed will redo the test on 4/8
- Test dummy has been purchased, should be here in the next couple of days
- We have made a draft for the expo poster
    - We will incorporate results of tests
- We have 3 weeks until expo
- 2 more weekly meeting with Maughan until expo
- We will have presentation slides done by next meeting with Dr. Maughan
- Get a pump that will have the catheter pumping regularly for our presentation at expo (Ed has one)
- Bring laptop with presentation (possibly)

Group- assessment: We have gotten a lot done the past few months and we feel as though we will be completely ready for expo in 3 weeks. We have a couple things left to complete, but for the most part we have completed most of our tasks.

Action Items:

- ❑ Amy will record results of bacterial tests after 6 days 4/12
- ❑ Ed will conduct an insertion test 4/8
- ❑ Elena will work on making a human anatomy poster for our expo presentation
- ❑ We will add more details onto our poster (show it to Maughan on 4/15)
- ❑ We will work on presentation and show it to Maughan on 4/15 as well

Meeting Minutes 4/29/2019

Present: Elena Tipton, Ed Hall, Dr. Maughan, Amy Macias

Location: GJ Senior Engineering Suite

Time: 1:30 PM

<u>Agenda Item: Wrapping up</u>

- Do not disclose information to the public
- Dr. Maughan said our presentation was good
- Talk to Dr. Crepau and see what stuff he wants to hang on to and what stuff we need to get rid of
- Keep a hard copy of our report as well as a digital copy
- Outline all the details of construction and results
- Structure it like a report with a technical part
    - Intro, concepts, why we chose our design, testing techniques, results and discussion/future work, methods
- Turn everything in by Friday (before finals)
- Share file with Dr. Maughan
- Wednesday @ 12:30 we will put together our portfolio