Testing

The Operations Manager at Vanderbilt's Center for Experiential Learning and Assessment (CELA) has agreed to assist in testing our device and in any other way possible. He has put us in contact with one of the Biomedical Engineers on the CELA staff, Mujtaba Mir. Mr. Mir will be helping us test our device's response to changes in pH and pressure. We have described what we will need to test (physiologically relevant pH and pressure) and are awaiting a response from Mr. Mir regarding the possible equipment available at CELA.

Quotes

As mentioned in our most recent presentation, we have identified three possible parts to miniaturize the feeding tube to bring it down to the micrometer scale. The parts are the pH microsensor by Presens, the NMPH2B Beetrode micro pH electrode by World Precision Instruments, and the OPP-M pressure sensor by OpSens Solutions. We have requested quotes for all three products and have received a quote from Presens.

According to Presens, the pH microsensor comes with its own transmitter which would make connection to a computer incredibly easy. Discussion with a Presens representative led to the conclusion that this transmitter would be necessary to use the device given the software that is needed to received readings. The representative offered a quote for the transmitter and sensor of about $700. $600 is to rent the transmitter for 4 weeks while $100 is to buy the sensor (which is disposable and thus cannot be rented). A quote for purchase is currently being investigated.

Based on the quote from Presens, the sensor and its pricing aren't truly compatible with our design. We need a sensor meant to integrate into our host circuit, not function on its own. We also are incredibly concerned about the pricing of this sensor. This price is very prohibitive and contradicts a point in our needs assessment of making a cheap device (however, this would still be cheaper than gastric bypass by several thousand dollars).

We have yet to receive a full quote from either World Precision Instruments or OpSens, but both have acknowledged our requests and have promised to get back with us in the next few days.

Parts

All parts for the proof-of-concept prototype have been ordered. The BMP pressure sensor has arrived after a small delay with the supplier, Adafruit. Both the Ezo pH circuit and the pH sensor have yet to arrive. We have talked to Ms. Anthony in the BME office to get updates on the delivery of these parts.

The pressure sensor, the BMP180, should be easily integrated into an Arduino microcontroller. We have begun looking into the appropriate connections to an Arduino. We believe that once the sensor is connected, it will function with the provided code, requiring maybe a few slight adjustments. We will need consistent access to an Arduino. This will mean either ordering our own Arduino or getting swipe access to the Instrumentation lab.

Meetings

We will meet with Dr. Abumrad next Monday (Feb 22) to discuss the design of our first prototype. Specifically, we want to discuss the choices of pH and pressure sensors. We need to find the optimal balance between our budget and the size of sensors, and we will have some suggestions from Dr. Abumrad on this consideration.

In addition, if we do decide to continue pursuing fiber optic-based sensors, we will be meeting with Dr. Mahadevan-Jansen. Because we are relatively unfamiliar with fiber optic connections, we would like to go over some of the more detailed aspects of the connections with her.

Project description

PROJECT TITLE: FeedRite Feeding Tube

TEAM MEMBERS:
Katherine Jones, BME
Alexander Heilman, BME
Graham Husband, BME
Ying Lin, BME/ChE

ADVISERS:
Naji N. Abumrad, MD

SPONSOR:
Naji N. Abumrad, MD

PROJECT DESCRIPTION:

1. need being addressed: describe briefly the science behind or significance of research
    a. Gastric bypass is expensive, high risk, narrow patient population compared to those who would benefit, highly specific requirements
    b. existing alternatives use fluoroscopy that exposes the patient to unnecessary doses of radiation
    c. non-radiation options are expensive and unreliable
2. overall goal
    a. safer, less expensive, reliable way to place feeding tube

    b. comparable to gastric bypass
    c. lead to weight loss and potentially reversal of Type II Diabetes
3. main components of the project design
    a. pH sensor and pressure sensor to detect changes in physiology of the gastrointestinal system pertinent for proper placement of the feeding tube (stomach--duodenum--jejunum)
    b. removable wiring and sensors
    c. arduino to communicate between sensors and computer
    d. tubing surrounding electronics to serve as feeding tube
4. advantages over previous solutions
    a. no radiation decreases risk to patient
    b. low cost (larger patient population)
    c. no anesthesia necessary (larger patient population)
5. functions intended or anticipated
    a. bridge until lifestyle changes necessary for weight loss and management
    b. weight loss
    c. reversal of Type II Diabetes

ILLUSTRATION