

Product Design Specifications: Intracranial Pressure Sensor

Team Roles:

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Function: Shunt failure in hydrocephalus patients is difficult to detect. The current pressure sensor system is complex and bulky. Other detection methods can be inaccurate. Our client needs a more simple, inexpensive, and reliable implantable intracranial pressure monitor for patient care. The first step to developing this product is to design it on a large scale. A large prototype exists and our goal this semester is to design a user friendly interface to read the ICP pressure accurately.

Client Requirements:

- Must not interfere with sensor telemetry
- Must apply proper range of pressure (-30 to 100 mmHg)
- Must apply constant pressure over a long period of time
- Must be able to apply a known and accurate pressure
- Must be able to test drift-stability
- Testing protocol must be standardized and accurate
- 3mm max width, 15mm max depth
- Interface must show ICP pressure and the pulse rate

Design Requirements:

1. Physical and Operational Characteristics

a. Performance Requirements: The interface must be real-time and give accurate positive and negative ICP pressure readings. It also must give a pulse rate in real-time.

b. Safety: It must be accurate; otherwise false readings could lead to unnecessary surgery.

c. Accuracy and Reliability: The interface must be real-time that must be in close proximity to the actual pressure. The accuracy of the device will be improved continuously throughout the semester.

d. Life in Service: Components should have a life span of 20 years.

e. Shelf Life: Storing the product will have no effect on its ability to perform

f. Operating Environment: This device will be used in a traditional lab setting, but should be operable anywhere, including patients' homes.

g. Ergonomics: There should be a low learning curve, but interpretation should be done by licensed professionals.

h. Size: The sensing device should be a maximum of 3mm in diameter and 15mm in depth. The interface has no size requirement.

i. Weight: Not applicable

j. Materials: Not applicable

k. Aesthetics, Appearance, and Finish: The interface system should look professional, yet easy to interpret ICP pressure.

2. Product Characteristics

a. Quantity: Our team will be developing one computer program.

b. Production Cost: The cost should be reasonable in comparison with technologies and materials used. The interface should cost less than \$500.

3. Miscellaneous

a. Standards and Specifications: Electrical components should be compatible with data scanner device and inductive power source.

b. Customer: The client would like an interface that can show the ICP pressure, the change in resonant frequency from the sensing device, and the pulse of the patient.

c. Patient-related concerns: The final product will require multiple patient related concerns, including: out-growing device, infection, replacement or recalibration of device, comfort, and interaction on daily use. However, this product has no interaction with the patient.

d. Competition: Currently there are other devices on the market that have the same relative use. However, these devices are inaccurate and prone to failure.