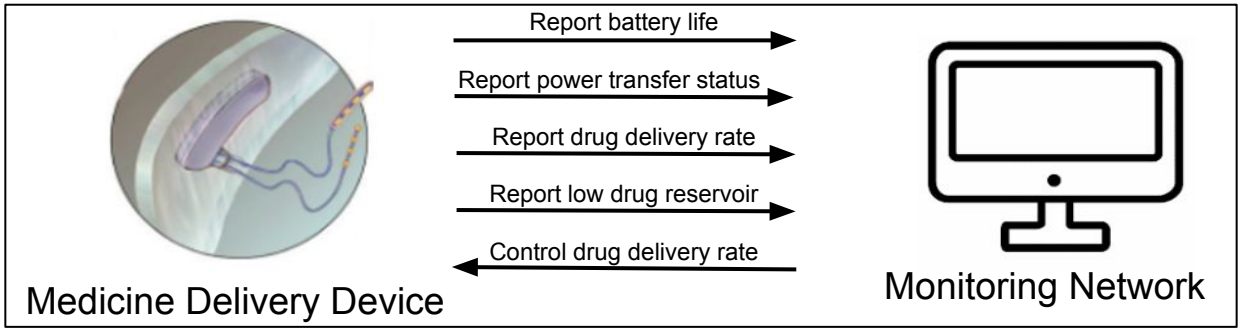
Secure, Real-Time Drug Delivery Monitoring for Neurologic Pathology



- **Goal:** Develop a secure system to ensure the safety of continuously monitoring and delivering medicine via the world's first skull-embedded device that delivers medicine across the blood-brain barrier and into the brain.
- **What Students Will Do:** Construct all necessary hardware and software to reach goal and integrate into final device design (current prototype status described in following slides). They are invited to attend our weekly Center for Neuroplastic Surgery Lab meetings.
- **Size Group:** 1-2 students

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- **Deliverables:**
  - Develop hardware and app with Bluetooth connectivity that can:
    - Report low battery life, report power transfer status, report drug delivery rate, report low drug reservoir volume, control drug delivery rate of device into patient
  - Ensure and test security of Bluetooth/wireless control system
- **Skills:**
  - Secure software app development
  - Hardware prototyping and security/penetration testing
  - Bluetooth experience
  - CS/EE background or applied cryptographic algorithm design experience
- **Mentors:**
  - Center for Neuroplastic Surgery
    - Dr. Chad Gordon (PI), cgordon@jhmi.edu
    - Dr. Mehran Armand (Co-PI), mehran.armand@jhuapl.edu
    - Information Security Institute, Anton Dahbura, atd@hublabels.com
    - Deborah Weidman (Project Lead), weidman@jhu.edu
    - Supported by the JHU Department of Neurosurgery, Department of Plastic and Reconstructive Surgery, Department of Mechanical Engineering, and JHTV

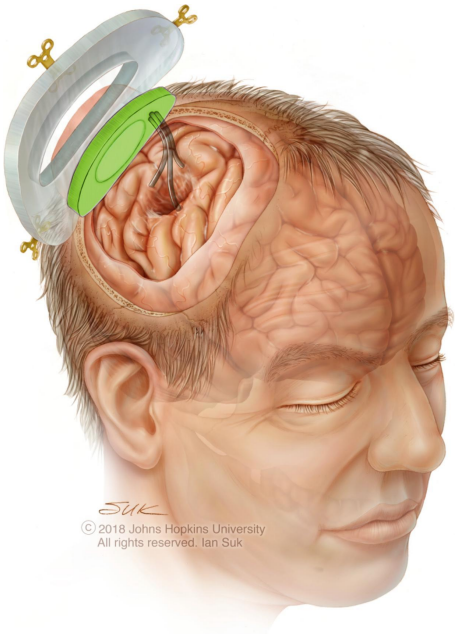
Project Background: The First **Chronic** & **Direct Medicine Delivery** Implant

Initial Target Patient Population: Glioblastoma multiforme (GBM) brain tumors have a 90% recurrence rate with an average 15 month survival rate.

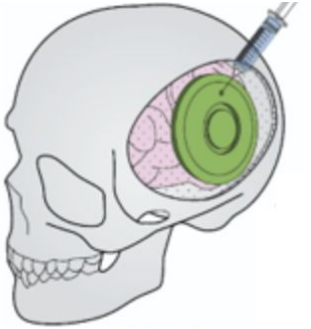
Project Goal: To develop a skull embedded and MRI-compatible, actively pumping therapeutic delivery device to target the GBM resection site.

Advantages:

- Bypasses the blood-brain barrier (BBB)
- Utilize skull implant space to access the brain
- Allow for continued MRI-surveillance
- Unobstructive design allows patients to live freely

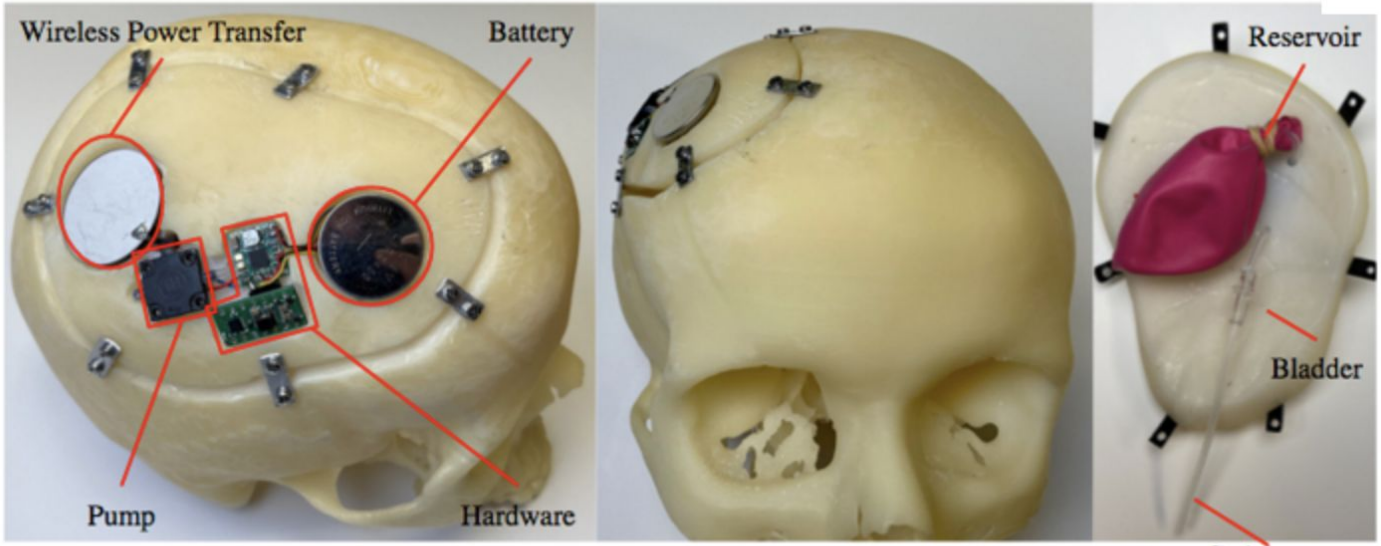


Device Overview



Underside

Key Features: *Refillable, modular, drug-agnostic, MRI-compatible, and Bluetooth controlled*



GORDON C, ET AL. "*MAGNETIC RESONACE IMAGING COMPATIBLE, CONVECTION-ENHANCED DELIVERY CRANIAL IMPLANT DEVICES AND RELATED METHODS*" (*Patent-pending*)