Designing and Manufacturing Equipment for Mock Temporary Pacing Wire (TPW) Surgery

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i Background: TPW Installation with Electro-Anatomical Mapping

Currently, **about 50% of TPWs** installed in emergency settings are sub optimally placed and **can lead to life-threatening outcomes** [1]. Dr. Giles' lab is developing a portable method to use 3D imaging to accurately place the TPW in emergency settings. This research is especially relevant for Arrythmia patients in rural or remote locations that lack suitable operating rooms.

1 Field Generator Stabilizer Clamp

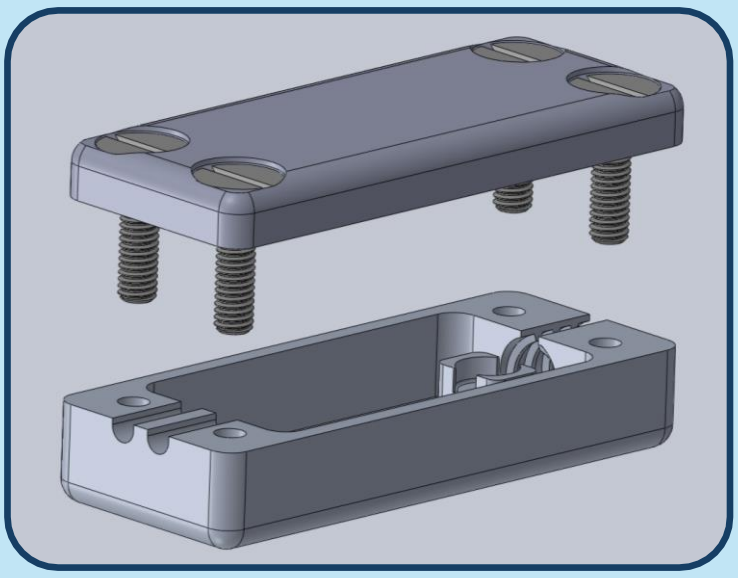
The 3D imaging requires a magnetic field generator to be suspended above the patient. I designed a system that attaches the field generator's mounting arm to any table and keeps it stationary while operating.

What I learned: 3D CAD Software (SolidWorks), Engineering Drawing, Tolerancing, Efficient Design Principles

2 Luer Lock Adapter/Wire Holder

The TPW is fragile at the point where it interfaces with the field generator and frequently broke. To fix this, I designed a wire holder that protected the wires through internal strain relief that did not magnetically interfere with the field generator.

What I learned: SLA/FDM 3D Printing, 3D Slicing Software (Ultimaker Cura/Prusa)



3 Palpation Probe

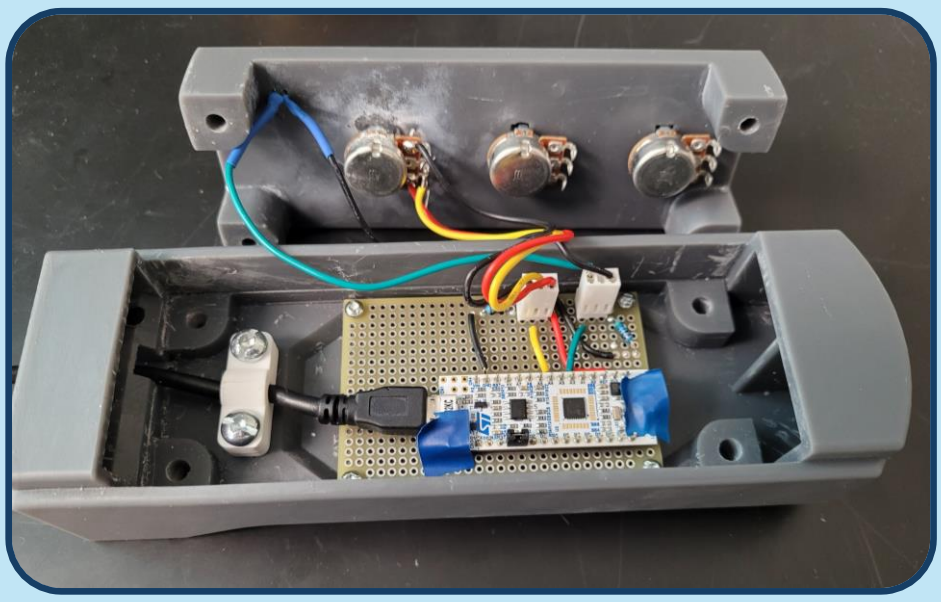
Before inserting the TPW, a surgeon will use a palpation probe to register the patient with the system. Using available 6DOF sensors, I designed a rigid, ergonomic palpation probe with non-ferrous materials for use in mock surgical trials.

What I learned: Ergonomic Design Principles, Combining Different Materials

4 Mock Temporary Pacing Box

To control the pace of the TPW and simulate operations in a real surgery, I designed a pacing box based on the Medtronic Model 5348 [2]. This was the most complex design project that I did due to the large size and electronics integration.

What I learned: Sauntering, Heat Warping, Design Flexibility



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Bibliography

1. C. Day, private communication, Aug. 2024.
2. Medtronic, "Temporary External Pacemakers - Pacing Systems," *www.medtronic.com*, Nov. 2023. https://www.medtronic.com/us-en/healthcare-professionals/products/cardiac-rhythm/pacemakers/temporary-external-pacemakers.html (accessed Aug. 28, 2024).