A Warning Device for Surgical Patients to Prevent Post-Surgical Dehydration and Consequent Need for Emergency Care

Overview
Post-surgical dehydration is a dangerous complication common in outpatient care following a gastrointestinal surgeries. Severe dehydration leads to readmittance to a hospital in up to 9% of patients, leading to higher costs incurred by both hospitals and insurance companies. Current methods manually measure fluid intake/outtake and are neither effective nor user friendly.

Objectives
The team’s objectives include selecting a reliable measurement system for recorded body water percentage, developing an algorithm to analyze transient hydration changes, and designing an app interface to improve patient care and compliance.

Approach
- Customer needs were generate in an initial group meeting with the sponsor, as well as a site visit involving interviews with multiples surgeons and physicians
- Weekly conferences were held with sponsor for updates and feedback
- Generated multiples concepts for each function of measuring body water, analyzing hydration states, and communicating information to physicians
- Selected Bioelectric Impedance Analysis (BIA) via a “Smart Scale” and performed tests to determine its reliability and accuracy
- Explored various algorithms for detecting dehydration via water level trends and nominal thresholds
- Utilized app development tools to create a user interface to improve patient compliance in a user-friendly environment

Outcomes
- The BIA smart scales selected showed high precision and reliability results that supported its use as a clinical tool
- An algorithm was developed in MATLAB that could filter and analyze time-dependent collections of hydration states to detect moderate and severe dehydration
- An app was designed to promote a user-friendly and patient compliant environment that could enable patient-doctor communication
- This system is a novel way to reduce hospital readmittance via preventative care