

**MetroHealth Medical Center**

**RESEARCH DAY 2023**

**Abstract Submission Form**

**Poster Title:** Augmenting Implanted Neuroprosthetics with Targeted Health Monitoring for Spinal Cord Injury - the LIFELINE

**Authors:** Kevin Kilgore, Michael Fu, Dario Cabal, Shravan Khare

**Presenter's Name:** Kevin Kilgore

**Location of Laboratory:** OBC-MCRR

**Category:** Physical Medicine and Rehabilitation

---

---

We are working to develop an implanted health monitoring device with the goal of increasing life-expectancy for individuals with spinal cord injury (SCI) by providing early warning of critical complications, enabling early detection and increasing the efficacy of medical intervention. To achieve this goal, we are developing an implanted device that can measure health status and predict disease states. The proposed implanted device, called the "Lifeline", senses health-related parameters, including temperature, electrocardiogram, photoplethysmogram, inertial measurement, and acoustic signals. It is sized to fit inside a vascular tunneler sheath for surgical placement. The Lifeline device will be incorporated into an existing modular implant system, the Networked Neuroprosthesis (NNP) System, that is already being evaluated to provide motor function for individuals with SCI.

The expected outcome of the Lifeline-enhanced NNP System is the capacity to provide advanced warning regarding the top causes of increased mortality in individuals with SCI, enabling earlier detection and medical intervention that may ultimately increase overall life expectancy. The causes of early mortality include pneumonia, urinary tract infection (UTI), pulmonary embolism (PE), and autonomic dysreflexia (AD), which are unique to, or more prevalent in, people with SCI (particularly tetraplegia). The addition of the Lifeline device to the NNP System is the first step towards an implantable "life-saving neuroprosthesis". The overall benefit of the Lifeline-enhanced NNP System for SCI is twofold: 1) the high expectation of a functional benefit from the motor neuroprosthesis (original NNP System), and 2) the potential life-extending features of the implanted health monitoring (Lifeline). In summary, the relative risk of the added Lifeline implantation is very low and the potential benefit is extremely high.

At the completion of this project, we anticipate having a single modular system that will be capable of providing both improved health and improved function for anyone with SCI, thus prolonging life while, at the same time, increasing independence and quality of life. This system will also provide the foundation to begin broader assessment of the risk-benefit profile of implanted health monitoring in at-risk populations. This project is supported by the NIH R01-EB031911.