SPARC Stage Two Strategic Planning Summary

National Institutes of Health

Office of Strategic Coordination—NIH Common Fund

September-November 2020

This meeting summary was prepared by SPARC program staff. The views expressed in this document reflect both individual and collective opinions of the respondents and participants and not necessarily those of the National Institutes of Health.

On September 18, 2020, the National Institutes of Health (NIH) Common Fund's **Stimulating Peripheral Activity to Relieve Conditions (SPARC)** program released a Request for Information (RFI; NOT-RM-20-025), which sought input from investigators, potential partners, and other subject-matter experts on high-impact collaborative goals to build on SPARC's progress to date. The data collected was divided into two topic areas:

(1) high-impact goals for advancing bioelectronic medicine with a scope appropriate to a collaborative effort between government, industry, and/or academic partners, and

(2) the most and least valuable functionalities provided by currently supported central data and knowledge resources for advancement of bioelectronic medicine on a 5-10-year time horizon.

Based on the input gathered, on November 12-13, 2020, the NIH Office of Strategic Coordination (OSC) convened a virtual 2-day meeting to foster discussions among academic, government, and industry experts to identify methods to improve the SPARC program and partnerships across government, academia, and industry within the neuromodulation field.

These responses have been collected, analyzed, and grouped into several categories. The meeting was divided into multiple discussion sessions and four presentation sessions that focused on:

(1) different public-private partnership (PPP) models,

(2) how public funding can drive partnerships between academia and industry,

(3) investigator responses to the SPARC RFI (NOT-RM-20-025), and

(4) perspectives from large and small companies and institutes.

The information from the RFI and workshop focused on a common theme, the importance of collaboration across government, academia, and industry to facilitate development of mechanistically validated devices that can successfully translate into clinical workflows and impart maximal benefits onto patients. These discussions are summarized in the following topic areas, please note that the views expressed in this document reflect both individual and collective opinions of the respondents and participants and not necessarily those of the National Institutes of Health:

Improvements to the Development Pipeline through Public Funding

Investors are more likely to become involved in research projects with established preclinical and first-in-human studies; however, most granting mechanisms do not support projects throughout the entire development pipeline, causing projects to get stuck in the "valley of death." Increased public funding may help to engage industry investors, as well as foster industry-industry collaborations, during preclinical stages of device development. Even very small publicly funded awards and grants have immense convening powers and can initiate large and successful partnerships. Large companies can experience more structural barriers or limited communication among its internal divisions, causing certain ideas to be lost or blocked; thus, public funding may provide academic investigators with the leverage needed to approach a larger company with an idea that aligns with industry's objectives. Researchers develop many devices to target only a few known neuromodulation pathways. Many of these devices are never directly compared, but—through public funding—devices could be tested across pathways to assess whether they are paired with the best pathway to optimize therapeutic benefit.

Implications for Deploying Devices for Other Indications

Frequently, devices are tested for use in indications other than the original one targeted during device development and FDA approval or clearance. One concern is that serious adverse events observed during alternative use(s) of the device may negatively impact the success—and widespread adoption—of the device for the original indication. This concern is greatly reduced when the licensing owner(s) of the device enforces that all subsequent studies are performed under the same institutional review board (IRB)-approved protocol as the first study.

Regulatory Support

Regulatory considerations delay timelines and drive up costs; thus, additional support in this area, possibly through a dedicated regulatory support center or use of templates, would be invaluable to the field. NIH's Blueprint Neurotherapeutics Network and Blueprint Medical Technologies (presented at the National Advisory Council for Biomedical Imaging and Bioengineering, May 2020) supports the non-research needs of small molecule drug development or device-based projects; thus, these programs could serve as a template for a similar SPARC-derived resource.

Supporting All Stages of Development

Feedback from the RFI and workshop highlighted the need for supporting device research from bench to clinic. For example, investors and researchers could convene together to de-risk projects at earlier stages in the process, while investigating and validating pathway mechanisms. It was also suggested that consideration of mechanism and measurement validation should become part of future proposals.

Prize Competitions

Prize competitions can help to connect academic and industry partners to assess novel and innovative technologies and validate the device's mechanistic capabilities. Previous programs at DARPA (e.g. Robotics Challenge, SubT Challenge) and prize competitions at GSK have helped to foster collaborations and focus on innovation in novel areas. Both clinical achievements (e.g., number of investigational device exemptions awarded) and clinical outcome targets should be considered when judging these competitions.

Intellectual Property Strategies

The precompetitive space within the neuromodulation field includes unpatentable mechanistic discoveries (e.g., biomarkers, targets, and nerve pathophysiology) that will lead to downstream intellectual property (IP) generation (e.g., devices and methods), which is patentable. Entering the IP generation space is often inevitable for most partnerships and increases the need to solidify IP intentions upon partnership inception in order to prevent miscommunication and misalignment of goals. Prior to becoming involved, potential investors may want to observe that the study will eventually lead to IP ownership and licensing, that is, produce value. Pre-partnership IP discussions should take time into account because many observed competitive advantages (e.g., a specific cell type) may become precompetitive over time. For investigators looking to focus on the science rather than on device development, and those that have additional barriers to partnering with industry, alternative strategies were proposed both in the Summit and the RFI feedback of creating open source neuromodulation devices or open access manufacturing libraries, which will help inform future device designs.

Balancing Partnership Contracts

Many partnerships never actualize because academic-industry agreements are too restrictive about IP generation; partnerships require some flexibility to allow research to occur productively. Industry lawyers seek to secure IP ownership, whereas precompetitive-focused lawyers seek compromise to ensure that research is achieved.

Reimbursement Differences Between Pharma and Devices

Whereas pharmaceutical companies can reapply for patents upon each improvement of a drug (which results in new pricing and coverage), device patents cannot be updated and do not experience the benefits of new pricing and coverage. This reality causes partnerships to be highly protective of IP. Improving reimbursement strategies may reduce the competitive nature of the field and facilitate more flexible partnerships. The FDA is working with the Centers for Medicare & Medicaid Services with the goal to improve reimbursement strategies for devices.

SPARC Outputs, Data Sharing, and Community

There is a need to develop a scientific community around SPARC-generated resources; this community could be leveraged to answer key questions in real-time, either through conversations with users or through a tool that could identify relevant publications and data related to the question at hand. This community may develop through labs designed to perform secondary analyses on SPARC-generated resources. Such a community will likely be drawn to a resource that holds data or tools that cannot be found elsewhere, such as substantial human neuromodulation data. Additionally, from the RFI feedback, interoperable computation models (similar to OTA-20-004: Targeted Needs to Achieve SPARC Program Goals), cloud storage/computation models (e.g. Sim4Life), SPARC knowledge bases, and applications for using artificial intelligence (AI) and machine learning (ML) would help inform bioelectronic medicine development. Taken together, this feedback reemphasized the need for (1) investigations into the mechanisms underlying device success, (2) enhanced regulatory support and animal models for preclinical studies, and (3) early stage, first-in-human feasibility studies. Demographics of the intended patient population should be considered when developing devices (e.g., not all devices are suitable for an older adult population).

Acknowledgements

We thank SPARC program staff, investigators, and industry participants for providing the feedback, expertise, and information included in this summary.