

Advance-CTR: Statewide Infrastructure to Improve Health in Rhode Island through Clinical and Translational Research

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ABSTRACT

The universities, hospitals, government agencies, and community organizations in Rhode Island (RI) are well-positioned to bridge gaps between basic and clinical science. RI's manageable size, population demographics, and organizational structure present opportunities to test and implement impactful, transformative clinical and translational research. However, the state's resources had not been optimally coordinated to develop a multi-institutional, clinical and translational research infrastructure to improve clinical practice effectiveness and impact health care in RI. The objective of Advance Clinical and Translational Research (Advance-CTR) is to bridge these gaps by creating a statewide hub to coordinate and leverage existing research resources and provide new career development support and funding for academic researchers, particularly junior investigators. Research support offerings are responsive to a wide variety of needs and readily available via a service request form on AdvanceCTR.org, the first of its kind on a statewide level.

KEYWORDS: institutional development award, clinical and translational research, junior investigator funding, research services hub, NIGMS

INTRODUCTION

In 2016, Advance-CTR was created as a statewide network of academic and hospital partners, funded (U54GM115677) through the Institutional Development Award Program Infrastructure for Clinical and Translational Research (IDeA-CTR) established by the National Institute of General Medical Sciences (NIGMS). The IDeA-CTR program has three aims to ultimately address state health needs, particularly within medically underserved communities: (1) provide infrastructure and resources for clinical and translational research, (2) develop competitive clinical and translational research programs, and (3) promote clinical and translational research collaborations.¹ Advance-CTR offers complimentary research resources and services to investigators and provides statewide awards programs aimed toward junior investigators that offer career development and mentoring. Requests for applications for awards and announcements

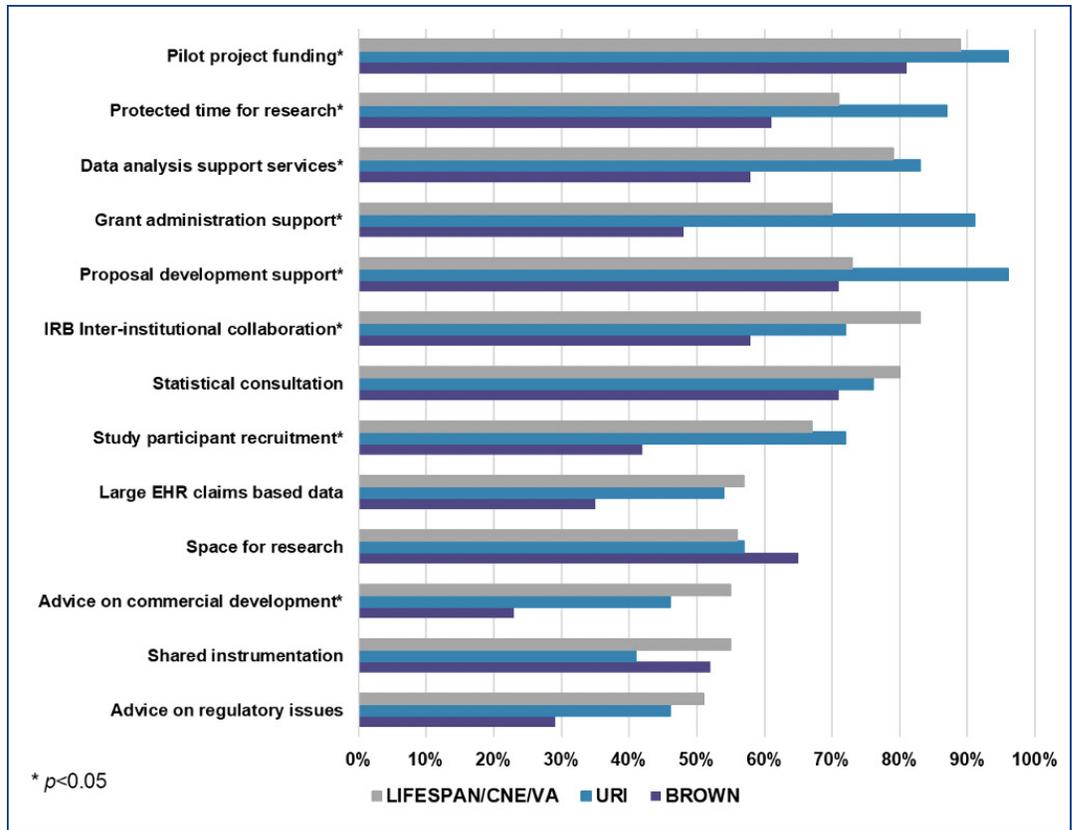
for professional development opportunities and training are listed on AdvanceCTR.org and promoted in the Advance-CTR weekly newsletter. Using an online form, researchers can request guidance from experts to design and conduct clinical trials and observational research, use health care databases, apply advanced methods for statistical analysis, and engage research participants.

Following receipt of its award, Advance-CTR first sought to identify barriers to clinical and translational research in Rhode Island (RI) through a survey of investigators across our statewide partner network.² Prominently, investigators identified the absence of pilot funding for broad clinical research, the lack of accessible biostatistics support, limited biomedical informatics expertise, and the challenge of sufficient protected research time as major obstacles (**Figure 1**). The survey found limited general awareness of the availability of the state's Core research services and instrumentation. Respondents also reported a lack of in-patient research facilities, general clinical research infrastructure, NIH-funded clinical research mentors, and programmatic support for clinical and translational research. In response to the needs assessment survey results, the Awards and Service Cores of Advance-CTR created resources, increased communication between its partner institutions, and enhanced pre-existing resources. Each partner site was provided a customized report highlighting results specific to their institution.

Most recently, RI's most vulnerable populations have been highly affected by the COVID-19 pandemic. Partnerships between the academic medical centers, the Department of Health, and the state government have led to early, robust participation in national medication, vaccine, and plasma-based clinical trials. Advance-CTR has sponsored supplemental applications to address the impact of COVID-19 on harm prevention organizations, the creation of a regional biobank that collaborates with the national IDeA-CTR consortium, participation in the National COVID Cohort Collaborative (N3C) data registry (ncats.nih.gov/n3c), and implementation of a National Institutes of Health (NIH) Rapid Acceleration of Diagnostics-Underserved Populations (RADx-UP) initiative aimed at addressing the disproportionate impact of COVID-19 on the Latinx community in RI (3U54AG063546-02S2). Advance-CTR will continue to support research responsiveness to emerging RI health concerns through its services and partnerships.

Figure 1. RI Investigator Needs Assessment Results (2017).

Investigators (n = 171) indicated the most critical barriers to clinical and translational research. Respondents chose their primary affiliation from three options: Lifespan, Care New England or the VA Providence Healthcare System (Lifespan/CNE/VA; grey bars), University of Rhode Island (URI; blue bars), and Brown University (Brown; purple bars).



ADVANCE-CTR PARTNERS

The Advance-CTR partnership includes Brown University, the University of Rhode Island (URI), three academic health systems (Lifespan, Care New England, and VA Providence Healthcare System), and the RI Quality Institute (RIQI). These partners contribute expertise in biological, clinical, public health, pharmacy, nursing, population, and community-engaged research, and undergraduate, graduate, and professional school education. Combined, the three healthcare systems provide care to over 75% of the state’s population, facilitating population-based and clinical research. RIQI is home to the state’s health information exchange, Current-Care™. The RI Department of Health, RI Public Health Institute, and Brown University’s Swearer Center also serve as key collaborators. The culture of collaboration across RI has been strengthened by the inter-institutional and intra-IDEA program cooperation across the Centers for Biomedical Research Excellence (COBRE), IDEa Network of Biomedical Research Excellence (INBRE), Environmental Influences on Child Health Outcome (ECHO) and CTR awards. This is reflected by open access to CTR resources, prioritization of services, recurring PI meetings, shared sponsorship of statewide symposia, and collaboration on newly identified initiatives to expand our network’s capabilities.

ORGANIZATIONAL STRUCTURE

The organizational structure of Advance-CTR is shown in Figure 2. Oversight is provided by two support Cores: a centralized Administrative Core and a Tracking and Evaluation Core. Three Service Cores provide support to RI investigators: Clinical Research Design, Epidemiology, and Biostatistics; Biomedical Informatics and Cyberinfrastructure Enhancement; and Clinical Research Resources and Facilities. Advance-CTR’s two Award Cores provide funding to foster new collaborations among early-career investigators new to clinical and translational research: Pilot Projects Program and Professional Development. Core Directors direct the implementation and progress of their respective cores, participate in Advance-CTR’s Operations Committee, and coordinate inter-Core collaborations (Table 1). Core-specific Steering Committees provide the knowledge and experience necessary to offer guidance on initiatives and issues. In the Award Cores, these committees also provide crucial input as the “Study Section” for the application review process.

The Administrative Core provides centralized leadership, governance, financial management, organizational structure, and advisory support to develop, maintain, and enhance the Advance-CTR activities. The Administrative Core leads the development, coordination, and implementation of new strategic initiatives to enable highly efficient operational integration across the Cores. In addition to administering

Figure 2. Organizational Structure of Advance-CTR.

The two centralized Administrative and Tracking and Evaluation Cores (grey circles) support two Award Cores (blue circles) and three Service Cores (purple circles).



Table 1. Advance-CTR Core Directors

Name	Core	Home Institution
Elizabeth S. Chen, PhD, FACMI <i>Director</i>	Biomedical Informatics and Cyberinfrastructure Enhancement	Brown University
Christopher H. Schmid, PhD <i>Director</i>	Clinical Research Design, Epidemiology and Biostatistics	The School of Public Health, Brown University
Jason T. Machan, SCM, PhD <i>Co-Director</i>	Clinical Research Design, Epidemiology and Biostatistics	Rhode Island Hospital (Lifespan)
Bharat Ramratnam, MD <i>Director</i>	Clinical Research Resources and Facilities	Lifespan
Sharon Rounds, MD <i>Director</i>	Pilot Projects Program	Brown University
Michelle Lally, MD, MSc <i>Co-Director</i>	Pilot Projects Program	VA Providence Healthcare System
Ira B. Wilson, MD, MSc, FACP <i>Director</i>	Professional Development	The School of Public Health, Brown University
Stephen Kogut, PhD, MBA <i>Director</i>	Tracking and Evaluation	The College of Pharmacy, University of Rhode Island
Anthony Hayward, MD, PhD <i>Co-Director</i>	Tracking and Evaluation	Brown University

the business, financial, communication, and program management functions, this Core develops comprehensive written policies and standard operating procedures that support effective organization and governance. The Administrative Core fosters the growth and long-term sustainability of Advance-CTR to support clinical and translational research investigators’ retention in RI.

The Tracking and Evaluation (T&E) Core supports tracking, evaluation, planning, needs assessment, and data dissemination. The T&E Core implements a participatory evaluation model that relies upon collaboration with Core directors in adapting evaluation plans to the evolving array of programs and services. Key Performance Indicators track output and outcome measures of CTR-related infrastructure, resources, and activity. The T&E Core monitors achievement of short- and long-term overall and specific Core goals and promotes quality improvement through outcomes-based feedback to the Operations Committee and each Core Director. The T&E Core led the statewide needs assessment and collection of baseline data addressing clinical and translational investigators’ needs and created the focus for evaluation planning by stakeholder groups.² This was followed by a participatory Group Concept Mapping (GCM) study involving investigators and research administrators from each of the partner institutions to prioritize efforts to enhance the quality and quantity of clinical and translational research in RI.³ Results of this statewide GCM study have been shared across the CTR/CTSA Evaluators collaborative and were presented at the 2018 meeting of the American Evaluation Association.⁴ The T&E Core conducted a subsequent GCM study with Brown University’s Swearer Center and its community partners to identify leading health priorities from the communities’ perspective.

The Clinical Research Design, Epidemiology, and Biostatistics Core provides services, resources, education, mentoring, and tools to support clinical and translational research. Through their distributed “storefront model,” the Core offers drop-in sessions and service consultations, resulting in >500 consultations to date to faculty at all career levels across our partner institutions. The Core supports investigators in study design, data collection, management, analysis, interpretation, and presentation using procedures that ensure quality control and reproducibility of analyses. They support a full range of quantitative, qualitative, survey, and mixed methods research designs. The Core has developed its seminar series, mini-symposia, and training materials in study design, epidemiology, and biostatistics for clinical investigators, and as well as training in statistical collaboration and consultation by Core statistical staff and student consultants. To increase

accessibility, all resources are available on the Advance-CTR website, shared broadly on the national IDeA-CTR website, CTRnet.org, and the DIAMOND™ web portal hosted by CLIC at the University of Rochester (<https://clic-ctsa.org/diamond>).

The Biomedical Informatics and Cyberinfrastructure Enhancement Core contributes to professional development in biomedical informatics through its consultation program, educational programs, workshops, and other engagement activities that enhance collaborative interactions within RI and across the IDeA network. The Core has implemented widely used standards-based tools, such as OHDSIOMOP and i2b2/SHRINE, to support multi-purpose cohort identification and studies using electronic health record (EHR) data from our affiliates. They enable widespread use of the state's designated health information exchange (HIE), CurrentCare™. The Core also secured access to the HealthFacts RI, an all-payer claims database (APCD) for clinical and translational research. They developed the first statewide instance of REDCap and directed an Advance-CTR award program to fund projects using Big Data. This Core will host the IDeA-CTR Network Biomedical Informatics Consortium's Coalition that builds collaborations across each of the CTR award programs on a national level.

The Clinical Research Resources and Facilities (CRC) Core provides services, resources, and professional development opportunities to support clinical and translational research. This Core is an easily accessible center that provides investigators with a space to perform study visits and trained Research Nurses and Coordinators to perform study measures and phlebotomy. The Core provides expertise in clinical trial study design and budget development, resources for biospecimen processing and storage, and support for IRB applications, particularly for junior investigators. The Core supports the education and certification of research personnel at each of our partner sites, including training for Good Clinical Practice (GCP) and Public Responsibility in Medicine and Research (PRIM&R), and professional certification in Clinical Research by the Society of Clinical Research Associates (SOCRA).

The Pilot Projects Program (PPP) Core addresses the identified statewide gaps in pilot funding to support clinical and translational research investigators to ultimately impact state health priorities. Special consideration is given to community-engaged projects that address health disparities and other research priorities. The PPP Core has significantly enhanced the quality and quantity of clinical and translational research in RI by awarding 33 Pilot Projects spanning the T0 to T4 research spectrum and by developing multi-disciplinary research collaborations among co-PIs across the state. This Core has received proposals from 454 unique applicants across our statewide consortium. The 59 awarded investigators have subsequently received 26 independent, extramural awards. The PPP Core coordinates the

annual statewide Emerging Areas of Research Symposia, which brings together all RI IDeA program staff and faculty.

The Professional Development (PD) Core offers training opportunities that promote the career development of clinical and translational research investigators. These opportunities include a monthly trans-institutional seminar series where investigators present their research-in-progress and receive feedback from peers and Advance-CTR leadership. A two-year Mentored Research Award program has funded 11 scholars, and to date, 10 have received extramural funding. This Core provides partner-wide, web-based training in interdisciplinary clinical and translational research-oriented topics (e.g., team science), and in-person and web-based training focused on the commercialization of research findings. The PD Core sponsored faculty from each of our partner organizations to become qualified to implement the evidence-based curriculum for mentor training developed by the National Research Mentor Network (NRMN) and the Center for the Improvement of the Mentored Experience (CIMER). To date, 8 trainers have applied this curriculum to train 105 RI faculty to become more effective research mentors to junior faculty. In partnership with the Brown Division of BioMed, the PD Core supported Advance-K's creation, a formally structured, year-long, intensive program to guide selected early-career faculty to prepare and submit individual career development awards. This program was formed specifically to address the challenges of clinician scientists' ability to secure release time and obtain the mentorship needed to develop career development plans and awards.

LEADERSHIP AND SHARED GOVERNANCE

The PD/PI of Advance-CTR and the chair of the Operations Committee is James Padbury, MD. With Program Coordinator Edward Hawrot, PhD, he co-leads a centralized Administrative Core that provides an integrated and efficient structure for program management. The Administrative Core includes a Director and a dedicated Manager for the Award Cores, the Service Cores, Communications, and Data Management. This administrative structure provides close integration across the multi-institutional Cores, assurance of best practices with and between administrative functions, and balance across our network of partners. Advance-CTR is advised by highly engaged Operations, Steering, Internal, and External Advisory Committees, with oversight and guidance provided by key stakeholders from our partner sites. The leadership approach is based on institutional integration and balance, representing every stakeholder in our network. The Operations Committee oversees Core management and productivity; allocation of resources, educational initiatives, and training programs; supports projects at individual institutions; contributes to building and space decisions, the distribution of infrastructure resources, and decision-making

for program evaluation. The Steering Committee assures accountability for operations, coordination, resource management, data tracking, and program effectiveness across the Advance-CTR partner institutions. The Internal Advisory Committee includes leaders from partner institutions and community representatives who contribute to the strategic vision and allocation of Advance-CTR resources. The External Advisory Committee advises Advance-CTR leadership, providing formal recommendations and support.

HIGHLIGHTS AND ACCOMPLISHMENTS

In response to investigator needs and keeping with the health priorities of RI, Advance-CTR funded 53 awards to projects that span the translational research spectrum. Funded projects address top RI health concerns, including mental health disorders among adults, children, and adolescents, and research on opioid use at the individual, patient, and community level. Advance-CTR gives priority consideration to projects that address community health priorities, are conducted in communities, and employ community partners. Awarded research has utilized computational approaches across various areas: in health services, analytical decision support, and machine learning approaches to sophisticated diagnostic algorithms. In the past 4.5 years, 42 investigators supported by Advance-CTR (awardees and direct service users) have generated 61 extramural grants totaling \$14.3M for a return on investment of 3 to 1. Additionally, Advance-CTR Core Directors and investigators have received supplemental awards for Alzheimer's Disease Risk Assessment, participation in the N3C CTSA/CTR COVID-19 Data Registry, and in the RADx-UP consortium.

The Service Cores continue to meet investigators' needs through complimentary service consultations, original seminars and symposia, and resource creation. There is a particularly high demand for consultations in biostatistics, research design, and qualitative methods. In response, the Biostatistics Core has provided 639 consultations to 295 unique investigators as of December 31, 2020. Likewise, the Cores have provided individual and group training for NVivo qualitative software, which was previously unavailable on a statewide level, as well as consults for survey creation, design, and analysis. The Biostatistics and Biomedical Informatics Cores have led a joint effort to provide REDCap assistance to investigators. In contrast, the CRC Core has supported costly clinical research certification training to administrators at its hospital partners. One of the most impactful services that Cores have provided is its matchmaking of early-career investigators with mentors and faculty experts at different institutions. The Service Cores have facilitated dozens of cross-institutional collaborations between investigators of diverse disciplines that have yielded extramural funding, publications, and ongoing partnerships.

SUMMARY

Advance-CTR leverages resources to establish clinical and translational programs that were either not previously available or siloed within single partners with a statewide consortium of partners. Notably, Advance-CTR introduced pilot, career development, and big data awards along with faculty development programs. Advance-CTR has created three consultative Service Cores, all of which were previously limited in availability at the statewide level. As a result, Advance-CTR serves as a research hub and training umbrella for the entire RI clinical and translation research investigator community. Advance-CTR aims to enhance patient-centered research and accelerate health discoveries that benefit RI's communities, and impact the state's leading health needs.

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