

Title: Duke Multidisciplinary Education and Research in Translational Sciences (Duke MERITS)

Principal Investigator: Gayathri Devi, MSc., PhD; Associate Professor

Departments of Surgery and Pathology; Women's Cancer Program, Duke Cancer Institute; School of Medicine

Collaborator	Title	Department	Role in this Project
Ranjan Sudan, MD	Vice Chair, Education Medical Director, SEAL	School of Medicine/Surgery	-Supervisory Role -Clinical Advisor
Mark Dewhirst, DVM, PhD	Professor, Radiation Oncology Associate Dean of Faculty Mentoring	School of Medicine/Radiation Biology	-Grant Development Advisor -Basic Science Collaborator
Debra Brandon PhD, RN, CCNS, FAAN	Associate Professor, Director PhD and Postdoctoral Programs	Duke University School of Nursing	-Nursing Faculty Advisor and Collaborator
Stephanie Freel, PhD	Program Director, Faculty Mentoring	School of Medicine/Pharmacology and Cancer Biology	-Outcomes and Data Management Collaborator
Gina Della Porta, MHS	Research Development Associate	School of Medicine/Dean's Office	-Project Management Collaborator

I. Focused question: How can we improve the ability of basic science and clinical faculty in medicine and nursing to collaborate effectively and create the next generation of translational research scientists? In keeping with the mission of Duke AHEAD, this faculty development program will foster innovation in health professions education and create a community of education scholars with a solid understanding of translational research.

II. Background: Duke University has a phenomenal strength in its basic and clinical scientists and this was indeed highlighted in a recent Department of Surgery retreat. At the same time, it also became apparent that these groups work in silos with expertise in one specific concept, clinical research area, or technique. This leads to narrow research focus, limited cross-collaboration, and duplication of efforts not only within departments but also the institution. A recent report [Alberts, 2014] has discussed the urgent need for changes in education and training of the biomedical research community at the national level. The pursuit of new drugs, biomarkers and improved patient care must include education and training across the translational spectrum from basic to clinical research.

Duke MERITS will facilitate cross-disciplinary collaboration with the aim of training basic and clinical faculty in translational sciences [Mankoff, 2004] and in turn also prepare them to train the next generation of translational researchers. This is expected to enhance Duke's research profile and standing in years to come. We envision that this program will facilitate interprofessional efforts, which we define as a **team science** approach to identify the clinical 'roadblock' and then seek an innovative approach or technology to help overcome this 'roadblock'? The common goal is to gain fundamental new insights that will result in significant improvement of the existing 'Standard of Care' and meet the challenges of dwindling extramural support.

During the past decade, Dr. Devi (PI) has built a strong translational and basic research laboratory with continuous federal, foundation, and industry-sponsored funding and is uniquely positioned to conduct this project. The breadth of Dr. Devi's education efforts, internal and external collaborations is depicted in **Figure 1**. Dr. Devi realized that her graduate students in both the Duke PhD and Medical Scientist Training Programs, in addition, at NCCU (where she holds an Adjunct Faculty position) had little understanding of clinical and translational medicine and started a new graduate course to address this need. The course,

"Translational Aspects of Pathobiology (786)", is now in its second year and is supported by the Department of Pathology. Dr. Devi was honored as a nominee for the 2014 Duke SOM Research Mentoring Award. She has also received funding support from the SOM in 2014 to create the Duke Consortium in Inflammatory Breast Cancer (IBC), a multi-disciplinary group of researchers that will meet monthly with a goal of fostering translational research in a rare, understudied cancer.

Challenges to be addressed by Duke MERITS:

- Research silos make it difficult to find collaborators
- Authorship issues i.e., Associate Professor with Tenure (APT) process uses first and last authorship as a measure of productivity and collaborative science makes it harder to gauge individual impact
- Bias regarding who is qualified to comment on or influence one's field
- Niche sentimentality, as researchers become focused only on a narrow area of research

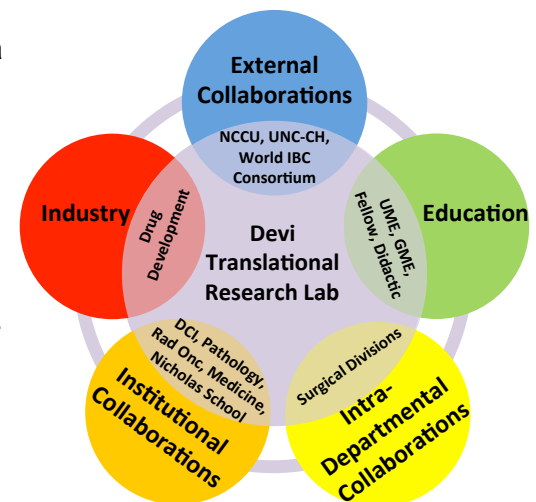


Figure 1: Ongoing PI collaborations and education efforts

Although funding sponsors, such as NIH NCATS, are placing an increased emphasis on driving team science, adoption of interdisciplinary research has been slow and only a few studies have examined the factors that impede interdisciplinary efforts in research-intensive environments. One such study [Stokols, 2008] identified numerous constraints ranging from “lack of adequate technical infrastructure” to “lack of training to enhance team members’ readiness for collaboration”. Indeed, a survey of Duke SOM faculty conducted by the Office for Faculty Mentoring revealed an extensive sense of siloing of expertise and lack of common infrastructure. However, specific, measurable barriers remain unclear. To optimize our program design, we will first identify and then further define the critical barriers and deficiencies that currently prevent interdisciplinary research efforts between investigators.

III. Specific aims:

Aim 1: To offer a multi-modal faculty development series to promote team science, improve didactic teaching, and incorporate innovative resources to promote interdisciplinary approach to translational research at Duke.

Aim 2: To provide module-based hands-on-training sessions in bench to bedside research and training in translational grant writing to facilitate the development of multidisciplinary research collaborations.

Aim 3: To define metrics and outcomes measures so faculty can track their progress and identify impact of their collaborative research in translational sciences.

Innovation Statement: This interdisciplinary training program uses an innovative approach that brings basic and clinical sciences faculty together for shared learning experiences that will encourage collaboration and foster creative teaching methods among faculty. While we recognize that many of the features of this program are offered in various programs across campus, it is important to note that Duke MERITS’ innovation lies in its ability to bring together clinical and basic sciences faculty to participate in a program that combines multiple teaching modalities and can be tied to measurable outcomes.

IV. Methods:

Aim 1: Develop faculty educational series to promote team science, improve didactic teaching, and incorporate innovative resources to promote interdisciplinary approach to translational research at Duke.

- **Task 1:** Development of a Duke MERITS website within the Department of Surgery web infrastructure that also links to Duke AHEAD. Initially, the website will provide information about the program, faculty affiliates and links to course modules. The long-term goal is to include a searchable list of faculty and their research areas to facilitate ‘self service research matching’ for potential collaborations.
- **Task 2:** Annual Research Retreat with didactic units, workshops, and discussion sessions to encourage networking, discussions to identify translational research areas of mutual interest, and foster collaborations. In the first year, the agenda will be modeled after the PI’s successful SOM GME course- Translational Aspects of Pathobiology (786) in Duke SOM.
- **Task 3:** Offer an online course with user-selected modules through the Duke Sakai portal. The PI and teaching assistant currently have a website through Duke SAKAI for didactic teaching (SAKAI : PATHOL.786.01.Sp14 : Home). The course will be offered based on faculty needs to be a full service online teaching resource that includes video presentations (pending copyright and necessary permissions).

Research Topic	Mode
Advocacy	L
Bioinformatics and Pharmacogenomics	W, L, T
High Throughput, High Content Screening and applications	W, L, T
Clinical Applications of Metabolomics and Proteomics	L, T
Global Health	L
Disparity Research	L
Linking behavioral and physiologic data to biological mechanisms	W, L
Regulatory Affairs, IND development Part I	W, L
Computational Toxicology, Virtual Tissue	L, T
Regulatory Affairs, IND development Part II - Preclinical	L
Regulatory Affairs, IND development Part III (CMC)	L
Medical Devices- Innovation and Regulatory	L
How to run a clinical trial- Components	W, L, T
Biostatistics, Observational and Mixed Methods	W, L
Qualitative data analysis for trajectory studies	W, L, T
Financing	L
Bench to Bedside Research – A story	W, L
MEDBLUE (include patent/IP issues)	L
Business Model Development	L, T

Legend: W=Web-based course module; L=In-person lecture; T=Training workshop

Proposed research topics and the manner in which training will be provided to faculty are provided in **Table 1**.

Aim 2: Provide module-based hands-on-training sessions in bench to bedside research and training in translational grant writing to facilitate the development of multidisciplinary research collaborations.

- **Task 1:** Basic sciences faculty conducting translational research in the Department will have opportunities to observe clinical procedures relevant to their research areas. This will include shadowing and/or observation of clinical procedures using Duke's high-fidelity medical simulation resources in the Surgical Education and Activities Lab (SEAL). Modules for simulation will be developed in collaboration with Dr. Sudan (Collaborator). Collaborator, Dr. Brandon along with her colleagues Drs. Knobel and Silva at the SON will also assist in developing modules in chronic illness symptoms science; how to link behavioral and physiologic data to biological mechanisms in the basic lab setting and outcomes methodologies.
- **Task 2:** Clinical faculty and medical residents interested in translational research will have opportunities for hands-on lab research experiences (PI is developing a hands-on technical training course in commonly used wet lab work. This will also include tours of laboratory animal facilities and IACUC writing/reviewing assistance. PI is an IACUC committee member and is involved in developing similar curriculum, which will be customized for this program in collaboration with Dr. Vanderford and Ron Banks at Duke OAWA.
- **Task 3:** Faculty and senior fellows will participate in grant writing training. In the first phase of this task, we will work to enhance faculty participation as both applicants and mentors in existing multidisciplinary grant writing programs. In the second phase, we will collaborate with Dr. Dewhirst at Office for Faculty Mentoring and Office of Research Development to develop an adapted program for medical residents.

Where possible, all training sessions including laboratory experiences and mock study sessions will be filmed using Google Glass or a similar device, which will record audio and video from the learner's perspective. The documented experiences will be incorporated into modules to be offered via the Duke MERITS website and/or Duke Sakai.

Aim 3: Define metrics and develop outcomes measures so faculty can track their progress and identify impact of their collaborative research in translational sciences.

- **Task 1:** Identify gaps to be measured. Specific, measurable barriers to interdisciplinary research remain unclear. To optimize our Program design, we will first identify and then further define the critical barriers and deficiencies that currently prevent interdisciplinary research efforts between investigators.
- **Task 2:** Design Program assessment and data capture tools. Program assessments will be stratified across 3 functional metric categories: 1) participant data, 2) Program engagement, 3) and outcomes.

To identify measurable barriers in Task 1, we will employ a combination of facilitated focus groups and semi-quantitative surveys. First, to define measurable and changeable factors, small focus groups will be centered across 3 primary groups; all three groups will include both basic and clinical researchers within the Department of Surgery and the School of Nursing: 1) Senior faculty (Associate or Full professor), 2) Junior faculty (Instructor, Assistant professor), and 3) fellows and postdocs. These focus groups will use identical scripts to assess the factors shown in **Table 2**. Second, to measure the defined factors from the focus group, we will issue a sliding Likert scale-based survey across the disciplines described above. This will provide us with a baseline from which to gauge Program impact and changing attitudes and cultures. These anonymous survey data will be captured and stored using the DTMI supported and secure RedCap survey form.

Table 2. Factor groups for collaborative research within disciplines
Prevalence of existing collaborations and programs
Acceptability of existing collaborations and programs
Structure of existing collaborations and programs
Functionality of existing collaborations and programs
Barriers to initiating collaborative projects
Barriers to success for collaborative projects
Acceptable forms of intervention (face to face, e-learning directed, e-learning self-directed, social technology)

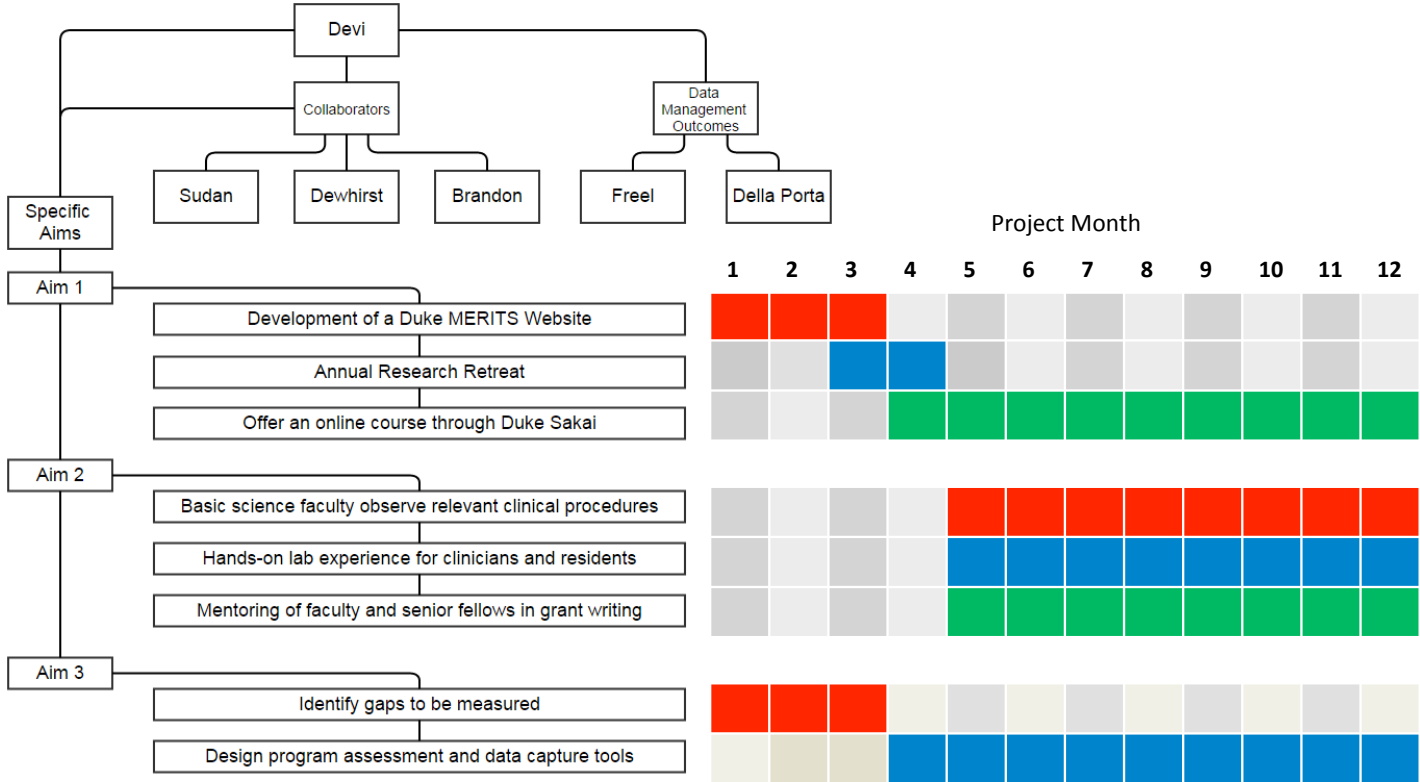
V. Outcomes and measures: As described above, we propose that a culture of interdisciplinary science can lead to more impactful research and more innovative science. However, in order to assess the value of our program against these goals, we must define programmatic success and identify the specific outcome measures that indicate success or failure. Therefore, as our third aim, we will develop the outcome assessment tools necessary to gauge the impact of our programs on both the participating faculty and the research culture within the Duke Department of Surgery. This aim serves as a foundation for a more lengthy longitudinal assessment of specific program outcomes that will be conducted as a second phase extension of this project. This second phase will broaden the program audience beyond the sphere of the Department of Surgery and will include optimization of metrics based on an accordingly broader needs assessment.

continuation of this effort, if successful. Initially, Duke MERITS will include faculty, staff, and trainees from within Duke Medicine. Based on the success of the program, it can be expanded to outside organizations through the Duke Massive Open Online Course (MOOC) Program and via partnerships with North Carolina Central University, UNC-CH, and Duke University – Singapore.

X. Opportunities for subsequent scholarship: The evaluation methods and data to be collected by this project will result in submitted publications, and provide a model that can inform the development of other similar training programs and be competitive for extramural support of education grant proposals. Additionally, the fostering of research collaborations may increase scientific productivity and grant proposal submissions.

XI. Broader Impacts: Successful outcomes would allow for the Department of Surgery to incorporate this program as a required training component for onboarding of new faculty, and allow for expansion to translational researchers in other departments, centers and institutes at Duke University, as well as outside of Duke at partnering institutions. Additionally, a more closely knit research community with a broad scope of expertise is likely to generate more innovative and more thoroughly vetted ideas, which will lead to better science. This will increase the standing of Duke among research-intensive schools and bolster the ability of junior investigators to establish themselves in the professional landscape, which may positively impact recruitment and retention. Duke MERITS will also enhance faculty careers in translational research, and can be part of institutional and departmental recognition in faculty career development.

XII. Timeline:



XIII. References

1. Alberts B, Kirschner MW, Tilghman S, Varmus H. Rescuing US biomedical research from its systemic flaws. Proc Natl Acad Sci U S A. 2014 Apr 22;111(16):5773-7.
2. Mankoff SP, Brander C, Ferrone S, Marincola FM. Lost in Translation: Obstacles to Translational Medicine. J Transl Med. 2004 May 18;2(1):14.
3. Stokols D, Misra S, Moser RP, Hall KL, Taylor BK. The ecology of team science: understanding contextual influences on transdisciplinary collaboration. Am J Prev Med. 2008 Aug;35(2 Suppl):S96-115. Review.
4. Pollard CL, Wild C. Nursing leadership competencies: Low-fidelity simulation as a teaching strategy. Educ Pract. 2014 Jul 1. pii: S1471-5953(14)00086-9.