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Building a Long Distance Training Program to Enhance Clinical Cancer Research Capacity in Puerto Rico

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Abstract

Barriers persist in the development and delivery of effective cancer therapies to under-represented minority populations. In Puerto Rico, cancer is the second leading cause of death, yet cancer research awareness and training opportunities remain somewhat limited on the island. These limitations hinder progress toward decreasing the cancer health disparities that exist within the Puerto Rican population. The predominantly Hispanic population of Puerto Rico is the focus of a partnership between the Ponce Health Sciences University-Medical School and Ponce Research Institute (PHSU) in Ponce, Puerto Rico and the H. Lee Moffitt Cancer Center in Tampa, Florida. The Partnership goals are to reduce these barriers through an integrated, multipronged approach of training and education alongside outreach and research components. This report describes the approaches, successes and challenges of enhancing clinical cancer research capacity on the island and the unique challenges of a partnership between two institutes physically separated by long distances. Once fully developed this model may be exportable to other Latin American countries where the need is even greater.

Keywords

disparities; education; Hispanic; oncology; research; training

Introduction

Cancer continues to exert a major toll on healthcare and mortality within the United States across all populations. Hispanics are currently the fastest growing minority group representing 16% of the US population, and it is anticipated that by the year 2050 one out of every four Americans will be Hispanic [1]. Importantly, cancer is already a leading cause of

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death in Hispanic Americans, and in Puerto Rico cancer is the second leading cause of death after heart disease (14,011 new cases of cancer and 5,197 cancer deaths were reported in 2010 accounting for 17.7% of all deaths) [2–5]. The US Commonwealth of Puerto Rico (PR) has a total population of approximately 4 million, with various racial and ethnic backgrounds. Although most cancer-related studies regard Hispanics as one homogeneous group this can mask differences found in the various subpopulations based on country of origin. Further, disparities in cancer occurrence between PR and the United States are known to exist, including diagnosis at a more advanced stage in the Hispanic population compared to non-Hispanic [6] and barriers to care [7]. Additionally, Hispanics remain significantly underrepresented in US clinical trials (5.6% of total participants) as assessed from the Clinical Data Updates System of the National Cancer Institute [8]. This hinders application of the results to the Hispanic population and limits access to state-of-the-art care for this population. These facts highlight the ongoing need for conducting research that aims to elucidate the social, cultural, environmental, and biological factors that contribute to these disparities. Moreover, these disparities underscore the importance of developing a systematic and integrated approach to cancer prevention and control which is tailored to the specific public health and cultural needs of the Hispanic population.

Cancer research awareness and opportunities are somewhat limited on the island of Puerto Rico, particularly outside of the San Juan metropolitan area. Ponce Health Sciences University (PHSU) is a private, bilingual, center of higher education located in the Southern coastal city of Ponce (population ca. 200,000). The recently created Ponce Research Institute (PRI) within the PHSU is a non-profit organization that serves as the only major research institution in the southern part of PR. PHSU-PRI provides critical access to research experiences for trainees at all levels, from high school onwards. In 1977, the Pontifical Catholic University of PR established a School of Medicine, which evolved in 1980 into the Ponce School of Medicine, and then in 2014 became PHSU. PHSU is fully accredited by the US Liaison Committee on Medical Education, the Middle States Commission on Higher Education and the Council of Higher Education of PR. It has graduated over 1,700 physicians who are currently serving the Hispanic minority population in PR as well as in numerous US cities where Hispanics constitute a major ethnic subpopulation. The graduate program leading to the degree of Doctor of Philosophy (Ph.D.) in Biomedical Sciences was initiated in 1988. Additionally in 1999, PHSU started a graduate program leading to the degree of Doctor of Psychology (Psy.D.), and currently also offers a Ph.D. in Clinical Psychology (both accredited by the American Psychological Association). In 2002, PHSU began offering a Masters in Public Health Program, and now also offers a Doctor of Public Health (DrPH) in Epidemiology (both accredited by the Council on Education in Public Health-CEPH). Both programs focus on the health needs of the emerging Hispanic community in the U.S. and Puerto Rico, further broadening its educational programs. Thus, PHSU has transitioned from a free-standing medical school to a health sciences university with multiple training programs, all of which address the under-education and under-representation of minorities in the health sciences, and demonstrates an institutional commitment to minority education. PHSU-PRI's mission is to provide high quality education, research and health services in medicine, and other healthcare fields to the

population it serves, through an innovative health sciences curriculum, while preparing students to be ethical practitioners and scientists.

As a Hispanic-serving institution, PHSU understands the pressing need to train Hispanic researchers and health care providers. The 2010 US census data reveals that this will continue to be an increasing need as the Hispanic population is growing four times faster than the general population [1]. This also includes a 36% growth in the PR population. Hispanics continue to lag behind, receiving the fewest (8%) science and engineering bachelor's degrees of any group [9]. Data from the National Science Foundation also reveal that although there have been increases in minority enrollment in science graduate programs across the US, the percentage remains significantly below their representation in the population (Hispanics 7.1% vs 11.9%; Black 7.8% vs 13.8%). Further, the American Association of Medical Colleges report only 8.5% enrollment of Hispanic students in 2012, significantly lower than in non-minority groups (white 57.5%) [10,11], and less than 8% of all U.S. Medical School graduates in 2013 (<2% Puerto Rican) [12]. This underrepresentation extends to practicing oncologists with less than 3% reported as being Hispanic [13].

The H. Lee Moffitt Cancer Center & Research Institute (MCC) is a free-standing NCI-designated cancer center. As a non-profit organization, located on the campus of the University of South Florida, MCC has grown to be a nationally recognized comprehensive cancer center. Research at MCC focuses on basic and population science and translating findings into improved cancer prevention and treatment. Its culture and organizational structure underscore a basic value: collaboration and interdisciplinary teamwork, making it an ideal partner to collaborate with PHSU to provide unique training opportunities and help address health disparities in the Hispanic population. It is now recognized that the size and demographics of the oncology workforce heavily influence patients' ability to access high-quality cancer care [14,15]. The partnership between our two institutions thus aims to reduce these disparities through an integrated, multipronged approach of training and education alongside outreach and research components.

Approach

Background of the Partnership

The partnership between the Ponce School of Medicine and Health Sciences in Ponce, PR and the H. Lee Moffitt Cancer Center & Research Institute in Tampa, FL was initiated in 2002. In 2006, support through the National Cancer Institute, from the Cooperative Planning Grant for Comprehensive Minority Institution/Cancer Center Partnership (U56) initiative fostered the formation of an academic partnership between our two institutes. During the planning grant period, the infrastructure and framework of the training programs were established. In 2012 the Partnership received additional support from the National Cancer Institute, under the Comprehensive Partnership to Advance Cancer Health Equity (U54) program to fully implement the partnership goals. Integral to the success of the overall partnership is the Partnership's Training and Career Development Program. The program supports and integrates trainees at multiple levels including medical students, medical fellows, and PhD students from both institutes as well as junior faculty. A central

component of the program is the reciprocal exchange of trainees which allows clinical and research experiences at the Moffitt Cancer Center for the PR students and similar experiences in PR for students from the Moffitt Cancer Center and its affiliated University of South Florida medical and graduate programs.

The overall long-term objective of the Partnership's Training and Career Development Core (Training Core) is to increase the numbers and success of basic science investigators and clinical research scientists focused on enhancing cancer research for the PR population. This will also lead to enrichment of the US workforce with well-trained Hispanic researchers. Our approach is to identify promising young investigators and provide them with focused mentored training in cancer research and clinical cancer research along with intensive career development training. A key component of this program is the leveraging of the Moffitt Cancer Center's emphasis and expertise in translational cancer research to enhance the trainee's ability to conduct research that will impact cancer treatment in the Puerto Rican population. A second key aspect is that the Training Core encompasses both basic scientists and clinical researchers. This diversification in trainees provides a unique opportunity to bring together both groups under one umbrella, and through this interaction foster the trainees' deeper understanding of how to engage in translational research.

Structure of the training program

The first step in building a partnership training program is the establishment of clear leadership at both institutions and integration of the leadership group into one team. The Training Core is led by a cancer research principal investigator at each institute and supported by additional faculty representing both the educational component of the minority serving institute and the clinical research component of both institutes. Communication is essential and particularly challenging when the two institutes are 1200 miles apart and separated by an ocean. The Partnership leaders have regularly scheduled monthly meetings by videoconference or teleconference and in-person meetings at least twice each year. In the initial planning stages in-person meetings were required at a higher rate but once the program was established videoconferences were found to be sufficient for maintaining the interactions. Communication is also supported by the development of a shared cloud computing resource where all transcripts of meetings, evaluations, trainee tracking, and other Training Core records are stored and shared.

The Training Core recruits trainees at multiple career levels to create a pipeline of cancer researchers to reach our overall objective of reducing cancer health disparities in the Puerto Rican population (Figure 1). We interact with Puerto Rican science undergraduates on the island through their education programs, open houses and outreach activities, and promote awareness of opportunities in our partnership for a career in cancer research through one of two tracks: either the Basic Science Cancer Track or Clinical Research Training Track. Students who choose the Basic Science Cancer Research Track are mentored at the PhD graduate level in the PHSU Biomedical Graduate Program and guided toward pursuing post-doctoral fellowships in cancer research. Students who choose the Clinical Research Training Track enter the PHSU Medical degree program and receive oncology training during medical school and as clinical oncology fellows. The Partnership is also a key component of

the Oncology and Hematology fellowship training program based at the San Juan Veterans Administration Medical Center (SJVAMC) and the San Juan City Hospital (SJCH). The fellowship program is accredited by the Accreditation Council for Graduate Medical Education (ACGME) and includes required research and clinical training rotations at both the Moffitt Cancer Center and PHSU. Importantly, trainees have the opportunity to progress through the levels of the career pipeline within the Training Core in order to receive continued mentoring toward an independent career in cancer research. An added value component of the Training Core is incorporation of medical and PhD students from the Moffitt Cancer Center and the University of South Florida (USF). These students receive health disparities training and cultural immersion while participating in research projects at PHSU laboratories. The extended interactions within and across institutions provide a unique environment which is mutually beneficial for the careers of both the minority and non-minority trainees.

The primary purpose of the clinical cancer research training component of the program is to address the problem of the chronic shortage of Hispanic clinical research scientists on the faculty of academic health centers in the U.S., including PR. Furthermore, there is a paucity of cancer focused clinical research scientists on the faculty of academic health centers in PR who conduct investigator-initiated clinical research. A direct consequence of this is that clinical research directed at unique problems suffered by Hispanic cancer patients is infrequently designed and implemented, and limited participation in clinical trials affects knowledge of cancer therapeutic efficacy and toxicity for this population. The Training program involves medical students and fellows from Puerto Rico, >95% of whom are Hispanic. This provides a pipeline of clinical investigators to ultimately be recruited to the faculty of the four LCME accredited medical schools in PR. In addition, since many PR trainees wish to practice in the mainland US this training pipeline has the potential to provide a rich source of bilingual Hispanic clinical research scientists for the faculty of mainland institutions. It is notable that the four medical schools in PR produced 24.5% of all Hispanic graduates from the 131 medical schools in the United States in 2013 [12]. Our trainees thus represent a significant source of minority physicians. We believe that this will impact issues related to cancer health disparities in that there will be a greater likelihood that clinical research directed at unique aspects of Hispanic cancer patients will be conducted. Furthermore an increase in Hispanic cancer physicians will likely encourage improved Hispanic cancer patient participation in clinical trials.

In order to encourage students to pursue an academic career in oncology we utilize multiple activities to promote student engagement. The first activity was the creation of a student led Oncology Interest Group. The goals of the Oncology Interest Group (OIG) are presented to the first year medical students at PHSU and students are encouraged to participate through all four years of medical school. The OIG holds regular meetings, with members attending cancer-related seminars and journal clubs, and community based informational sessions ('Charlas') and events primarily aimed at raising cancer awareness within the local community. The Outreach component of the PHSU-MCC Partnership has recently demonstrated that "Charlas" (chats or informal health workshops) are one of the most effective ways to communicate health issues within the Puerto Rican population [7,16].

The second activity was to create research opportunities for the PHSU students to participate in cancer research. Between the first and second year of medical school at PHSU, six students are selected annually to participate in basic or translational science cancer research rotations. Students participating in the OIG are the primary source of applicants but other medical students may apply. The PHSU medical students can select to rotate in either PHSU or MCC laboratories. The research exchange internship primarily occurs during the summer months so as to not interfere with the students' course work. This is necessary due to the large geographic separation of the two institutes. Internships last up to 10 weeks with a minimum of 4 weeks permissible. The availability of shorter internships is important in recruiting medical students into the program given their shorter window of availability, although the majority of students from PHSU have carried out a 7–8 week rotation. Students are selected by a review committee consisting of faculty from both institutes and the selection is based on the students' resume, letters of recommendation and a statement of interest. Evidence of a clear cancer interest is an important review criterion. Once selected for the internship, the Training Core and student work together to identify a mentor matching the students interests. Over 50 mentors are available at the Moffitt Cancer Center and 7 cancer-related mentors are available at PHSU. Prior to travel to the host institute the student and mentor are required to communicate and establish both the research plan and expectations. Reading materials are often assigned to acquaint the student with the research area. Upon arrival at the host institute the students are provided housing accommodations and an orientation of both the institute and the city. In addition, each student is matched with a peer student at the local institute to facilitate integration into all student activities. Students are required to contact their home institute's program leader on a weekly basis to provide a short update on their status. The orientation, the student peer, and weekly reports are important to facilitate smooth integration into the new cultural environment.

Our training program has a unique arrangement of reciprocal training between the two institutions. Medical students and PhD students from the Moffitt Cancer Center and its affiliated University of South Florida are selected for research experiences at the minority serving institute. The application and selection process is carried out simultaneously with the selection of the PHSU students and by the same integrated committee. A primary criterion for selection is a clearly expressed interest in addressing health disparities. The students are provided housing within the local community surrounding the minority-serving institute which provides an important cultural immersion. This reciprocal training experience benefits students from both institutes by providing direct experience of the complex issues surrounding health disparities research, establishes strong interactive networks to facilitate career development and advance research, and further links the two institutes into one supportive infrastructure.

The third activity was the creation of two unique clerkships within the PHSU curriculum. The first is an Oncology Clerkship for fourth year students. The goal of this clerkship is to provide knowledge critical to the understanding of total cancer care tailored to the Medical Oncology practice setting in southern Puerto Rico. There is no consolidated facility in this area to accommodate all elements of cancer care, thus services must be coordinated between different medical facilities to ensure the rapid diagnosis and treatment of cancer patients and their successful navigation through the oncology care process. The clerkship consists of

three primary components 1) clinical rotations with PHSU oncology physicians, 2) lectures on pathology, epidemiology, diagnosis, treatment, and specific malignancies, and 3) mandatory experiences in radiation oncology, surgical oncology and clinical cancer research. In the clinical cancer research experience the students gain knowledge on developing, initiating and managing clinical trials. They attain an essential understanding of the process of presenting clinical trials as a good option for treatment in a population that has traditionally been reluctant to participate in clinical trials. The second clerkship is Biobanking. The availability of a biobank and participation in biobanking is a critical component of clinical and translational research. Deficiencies in biobanking with respect to Puerto Rican patient derived specimens impair the advancement of therapeutic approaches relevant to the PR population. The Biobanking clerkship provides fourth year medical students with 1) a clinical research rotation at the clinical sites where tissues are collected for the PHSU-MCC Partnership run Puerto Rico Biobank, with an emphasis in Surgery (assistance in the process of tissue accrual and timely transport to Pathology) and Pathology (observation of tissue processing, annotation, and preservation), 2) training (webinars, power point presentations, observational) on the basis of pathological analysis, biobanking principles, and the ethical issues of human subjects research, and 3) experiences in patient recruitment, completion of questionnaires, tissue accrual, specimen transport, processing and storage, inventory keeping, and demographic/clinical/pathology data entry for tumor specimens. The establishment of the Puerto Rico Biobank through support of the PHSU-MCC Partnership is reported in Flores *et al.*, [17] and elsewhere in this journal [18].

The fourth activity is specifically targeted to medical hematology and oncology fellows on the island with the goal of exposing minority fellows to state-of-the-art cancer care delivery and clinical cancer research to ultimately enhance retention of these physicians in oncology on the island. Fellows are enrolled into a unified three year Accreditation Council for Graduate Medical Education (ACGME) accredited program with training at PHSU, MCC, SJCH and SJVAMC. Mentored by the partnership faculty, fellows leverage the strengths of each participating institute. The SJCH and SJVAMC, which carry out late phase clinical trials and Cancer Community Oncology Program (CCOP) prevention trials, provide the primary clinical training capacity. Fellows then relocate to the Moffitt Cancer Center to receive three months training in Bone Marrow Transplantation and early phase cancer clinical trials. Thirdly the fellows complete three 1-month blocks of training at the Ponce School of Medicine participating in early phase clinical trials and translational research with an emphasis on laboratory research. The MCC and PHSU rotations occur during the first and second year of the three-year fellowship with the remainder of their training at SJCH and SJVAMC. Some of the fellows are recommended by the fellowship director to participate in enhanced clinical cancer research training. These selected fellows with a high degree of interest for continued clinical cancer research on the island may undertake extended translational research training of up to one year in the PHSU laboratories. The faculty mentors facilitate the development of a hypothesis-driven translational research project. This practical exposure helps the fellow understand how research can be translated to individual clinics and promote them to incorporate clinical research as a standard in each practice once graduated. It also improves exposure of these trials to patients that are affected by transportation logistics, or are not willing to be cared for at distant comprehensive cancer

care facilities. Ultimately this will develop investigator-initiated clinical trials in numerous different facilities and increase patient participation in clinical trials on the island.

The fifth activity is to provide extensive and continual career development training events and mentoring. Importantly, the events and mentoring are unified across both institutes and across all levels of trainees. This arrangement fosters increased engagement from both institutes and builds a strong peer network for the future. Each trainee is matched with a mentoring team of one faculty member from each institute. The mentoring team is responsible for creating a career development plan and evaluating progress of the trainee. Professional skills and career development workshops are held throughout the year at both institutes. A key feature is that the workshops are video-streamed live between institutes as well as recorded and archived for future viewing. These workshops focus on diverse topics such as grant writing, interview skills, addressing health disparities in your research, or practical aspects of directing a clinical trial. In addition, junior faculty participating in the Partnership are provided a mentoring team consisting of a faculty member from each institute and receive extensive grant writing training through the Training Core. Grant writing skills are built through participation in mock NIH-style grant review panels, submitting their own grants to be pre-reviewed by faculty from both institutes, and attending grant writing workshops. All junior faculty are required to prepare an individual development plan and undergo review every 6 months to promote success in their career development.

Outcomes of the Training Program

Having completed the five year planning phase and embarked on the first two years of the implementation phase of our partnership, the partnership has established a strong inter-networked foundation at both institutes and is beginning to realize some of the early goals. We have observed that creating a clear leadership structure supported by the administration is vital to the long term engagement by all parties involved. This partnership faced two unusual challenges. First is the very large distance between institutes and the second is the participation of trainees from three distinct organizations (PHSU, MCC, and SJCH/SJVAMC) all located in different cities. Overcoming these challenges has been accomplished through multiple mechanisms. In-person meeting are necessary every 6 months and funds to support the travel must be provided. These in-person meeting must be supported by no less than monthly teleconference or videoconference meetings. The Partnership must mandate and enforce the meeting schedule to ensure that it continues. Shared cloud storage of partnership data, reports and tracking also play an important role in creating the concept and practicality that each institute has equal ownership in the Partnership goals and accomplishments.

A major outcome of the partnership has been the successful engagement and advancement of clinical fellows on the island to pursue oncology. The integration of the Hematology Oncology fellowship program based at the San Juan VA Medical Center and the San Juan City Hospital with the PHSU-MCC Partnership has provided key research and bone marrow transplant experiences to the fellows. The outcomes show that approximately 50% of the fellows trained in the program pursue an oncology related academic career in Puerto Rico or

the United States. There are 3 fellows per year for a total of 9 fellows in the program at any one time. Every fellow from the program has taken or will take the Medical Oncology and Hematology boards within 5 years of completing their training. There has been an excellent success rate with greater than 80% of the fellows acquiring board certification. This was not common practice in the past since both boards are not required for practice on the island. Of the nine graduates since 2010, eight now have their clinical practice on the island while one practices on the US mainland. In support of the fellows' career development, a 26 lecture series has been developed on clinical cancer research (Table 1). The series provides important knowledge on conducting and managing clinical trials and is required for all fellows participating in our program. The lectures are held at the Moffitt Cancer Center, so to facilitate participation by the fellows regardless of their geographic location, an online video library of the lectures was created. This library is password protected and reports both on the person viewing the video as well as the percentage of the video watched in each session.

The Partnership has also been successful in developing programs to encourage medical students to consider oncology as their specialty. While it is still too early to have data on the actual change in numbers of students pursuing oncology, we have observed significant and increasing participation in oncology-related training activities. The Oncology Interest Group has grown to more than 20 active participants. The group meets on a regular basis led by a faculty member to increase interest in pursuing oncology as their specialty. Activities include orientation lectures on oncology practices, available training programs, admission requirements, and community outreach. Medical students electing to take the optional Biobanking and Oncology clerkships also continues to grow with a total of 10 participants in just the first year of it being offered. The students are also provided access to the same online video library of clinical research lectures presented to the medical fellows. Furthermore we established a Cancer Biology Seminar series that brings established cancer researchers to PHSU for a presentation and interaction with faculty and trainees at all levels. Integration of some of these seminars with Journal Clubs beforehand has been important to enhance the trainee engagement. The seminars occur throughout the year and thereby continue to reinforce oncology research and clinical careers. Didactic course work in the cellular and molecular basis of cancer has been developed for students pursuing a PhD in the form of a 3-credit lecture course which provides in-depth discussion of the cellular and molecular changes associated with oncogenic transformation. The course at PHSU is supported with lectures from faculty at both institutes and other guest speakers, further complemented by journal clubs to cover the more technical aspects of cancer research. This course has educated 19 trainees since 2007, several of whom are now graduated and pursuing cancer-related post-doctoral fellowships. Further, two of these trainees, who are still completing their PhD, helped organize the first Puerto Rico Cancer Research Meeting which took place October 2014, with over 130 attendees from across the island.

The medical students along with graduate students from both institutes have benefited from a robust research exchange program. Over a seven year period from 2007 through 2014, 62 students have participated in the research internship exchange (36 students from PHSU and 26 students from MCC and USF). Of these students, 22 were in graduate school, and 40 were medical students. The PHSU graduate students were all from basic cancer biology

laboratories. MCC/USF graduate students came from basic cancer biology laboratories (50%), as well as clinical psychology research laboratories (25%) and public health laboratories (12.5%) focused on outreach to the cancer patient population. Nearly half of the MCC/USF students participated in community outreach research rotations and activities during the rotation in PR. All of the students from PR were Hispanic while 57% of the MCC/USF participants were Hispanic and the remainder white, non-Hispanic. Twenty one percent of the graduate student internships were successful in promoting continued collaborations between the primary laboratory of the student and the internship host laboratory. Involving the student's primary mentor in the selection of a host mentor and participation in related Partnership activities is critical to promote long lasting interactions. This extends the potential impact of the training and education experience long after the internship itself has concluded. In addition, 16% of the PHSU graduate students added a MCC/USF faculty member to their dissertation committee facilitating continued support. The students from PR have reported 16 scientific publications occurring since the conclusion of their internship or fellowship rotation. The impact of the Partnership Training program is also revealed by 11 new publications addressing health disparities led by MCC investigators with participation of students involved in the research exchange. In addition, collaborative research has been encouraged by the Partnership Training program as evidenced by 18 publications with authors from both PHSU and MCC and involving students from the Training program.

One of the strengths of the program has been to include students from MCC/USF with research interests in community outreach. These students come from the Clinical Psychology and Public Health programs at USF and are mentored by PHSU faculty from the Psychology and Public Health departments. The internships (Table 2) in PR have involved the students interacting directly with both physicians and patients throughout the island. Further, important synergy with the Outreach Core of the PHSU-MCC Partnership occurs through participation in outreach to the PR population (eg community/researcher forums 'El Puente'/'The Bridge') as an integral component of the health disparities training, and training workshops to address the importance of minority recruitment in clinical trials.

In support of the trainee career development the partnership regularly presents workshops and training at both institutes with most being video-streamed live between the two locations. These training events engage all levels of trainees within the pipeline and incorporate expertise from the other components of the overall Partnership. These workshops (Table 3) have included Health Disparities Workshops held at both PHSU and MCC. To highlight a few specific examples, in 2013 the "Basic Science Research Targeting Health Disparities" all-day workshop at MCC featured four external speakers followed by a presentation and panel discussion with senior representatives from the Center to Reduce Health Disparities at the NCI. The conference was video cast live to PHSU and the NCI participated via a three-way video stream. Importantly, the event was attended by a broad spectrum of investigators from both institutions with 38% classifying themselves as "basic scientists" and reached a broad spectrum of levels from faculty through undergraduates. The evaluations from over 50 attendees were outstanding. A second health disparities workshop was held in 2014 which included poster presentations on health disparities research by trainees and an external keynote presentation by a leading researcher in health disparities.

The event received favorable evaluations from over 40 attendees. More ‘hands-on’ type workshops have also taken place, examples include a 2-day workshop for Statistical Analysis of Tissue Microarray Data held at PHSU by Dr. Ji-Hyun Lee (MCC) and Dr. Idhaliz Flores (PHSU) which leveraged the collaboration between our U54 partnership and the NCI funded U54 Tampa Bay Community Cancer Network. Thirty one investigators attended and evaluations were excellent. A full day workshop on career enhancement was held at MCC and video cast live to PHSU. This workshop entitled “On Being a Scientist: Essential skills of a Biomedical Investigator” given by Dr. Tung-Tien Sun of New York University Medical School impacted 200 investigators (including 30 from PR). The evaluations were outstanding with many providing comments that they will incorporate his recommendations into their research. Finally, workshops and seminars geared towards specific levels of training are offered on a regular basis, addressing topics such as grant writing, mentoring, and career advice.

Conclusions and Lessons Learned

The success of the Training Core experience depends in large part upon constant communication, active participation and evaluation of all those involved. Providing unique but integrated training at both the cancer center and the minority serving institute is essential to enable continuous involvement by the trainees in the program. It is also vital that the Training Core has equal leadership at both the cancer center and minority serving institute to fully engage all participants and encourage continued support from both institutes. Monthly teleconferences (and video conferences) are needed to ensure that all involved parties continue to work towards combined milestones and goals but cannot replace in-person meetings. Semi-annual meetings and retreats provide the necessary environment to maintain integration between the two institutes, and allow for more informal brainstorming and discussion.

Intensive in-person orientation prior to and at the initiation of each training experience is essential to the success of the experience. Clear expectations and goals must be established and provided in writing at the beginning of the participation by each trainee, and their involvement and progress must be evaluated both on a continual basis, as well as formally every six months, and followed by immediate actions to address any perceived weaknesses. In our experience it is important to have the student and mentor communicate well in advance of the start of the internship. This allows a clear understanding of expectations for both mentor and mentee. Early communication also allows the student to become familiar with the mentors work and the mentor to ensure that the laboratory and supplies are ready when the student arrives. Without early preparation the internship will not be as productive and both mentor and mentee will find the overall experience less satisfying. Two of the initial exchange students to PR at the start of the partnership dropped out due to a lack of preparation for the differences in environment and lack of good communication channels with the home institute program leader. A designated bilingual contact person at each institute to facilitate the logistics of travel and acclimatization to the new environment and being available to help with adaptation to cultural and language differences has greatly enhanced the rotation experiences.

Long term tracking of the participants is necessary to evaluate the success of the efforts of the program. This is highly challenging and must be initiated at the onset of participation with an annual follow-up to re-establish contact and verify details with each former trainee. Effective longitudinal follow-up in training programs is a recognized challenge since participants by their nature are at an extremely transitional period of their life. Use of social media, search engines and personal contacts has been suggested as a means of tracking former participants [19]. Establishing an online professional network has the potential to enhance tracking efforts, although compliance by the participants can be an issue. Barriers appear to include the initial effort required to form a personal account, concerns about revealing personal information to their professional associates, and maintaining their account information up-to-date. We recommend these issues be addressed by: 1) requiring the trainee to establish the network account at the beginning of their participation in the program and as a requirement of their acceptance into the program, and 2) utilizing a professional network distinct from the social networks typically used for sharing information between friends and family. LinkedIn (www.linkedin.com, Mountain View, CA) is a good example with which we have experience and has several potential advantages which can increase participation. The professional nature of the LinkedIn network lowers participant concerns of revealing personal information. A group specific for the internship program can be formed within LinkedIn without cost and can be an effective way to disseminate information and request updates. Members may also be more likely to maintain their account up to date as a professional resource long after leaving the internship program.

Overall, PHSU-MCC Partnership program addresses the major unmet need of a lack of sufficient clinical cancer research involving Puerto Ricans. There are only approximately eighty oncologists in Puerto Rico with 68 in adult hematology-oncology, thus the Partnership Training Core has the potential to significantly impact building oncology practice and research on the island. Furthermore, the unmet need of clinical cancer research is even greater in the rest of Latin America. Once this training model is proven, it is very exportable to these other Latin American countries.

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Figure 1.
Cancer Training Pipeline

Table 1

Clinical Cancer Research Lecture Series

** Introduction to Intervention Research at MCC
** Regulatory Requirements
Introduction to Survey Methods Core Resources
Cell Therapy Production Lab at Moffitt
** The Informed Consent Process
** Monitoring and Auditing of Clinical Trials
** Adverse Events and Serious Adverse Events
** How to Work with Sponsors
Role of M2Gen in Clinical Research at Moffitt
** Introduction to Biostatistics Resources
** Introduction to Bioinformatics Resources
Introduction to Immunotherapy Research at MCC
Clinical Research in Heme Malignancies
Language Barriers in Clinical Research
** How Oncore works and Data Collection
** Image Response Assessment and Investigational Imaging
** Grant Writing for Physicians
** Conflict of Interest
Introduction to Pharmacokinetics
Cultural Competency
TCC Data and Bio-Repository as a Resource for Investigator-initiated Research
Tissue Acquisition and Molecular Analyses
** How to Apply for an IND or IDE at Moffitt
Companion Diagnostics & Personalized Drug Delivery at Moffitt
Strategies for Effective Clinical Trials Designs and Proposals
Translational Research and Biomarker-driven Trials

** indicates required lecture for medical fellows

Table 2

Internship Outreach Projects in P.R.

Smoking Relapse Prevention for Pregnant Women in Puerto Rico
Social Marketing and Cancer Genetics among Puerto Rican Women
Developing a Patient Navigation System for Cancer Patients in PR
Evaluation of Smoking Cessation Booklets for Hispanics
Cancer Survivorship and infertility in Puerto Rican women

Table 3

Training Workshops

Location	Topic/Event
MCC	Mock Grant Study Section
MCC (PHSU video)	Career Development Grants: <i>Grant Planning and Preparation of the Candidate, Career Development, Mentor, and Institution Sections</i>
PHSU	“Frontiers in Stem Cells in Cancer” Training Course (1 week in duration)
MCC	“Careers in Medical Education”
MCC (PHSU video)	Scientific Communications Seminar “Enhancing your success as a published author”
MCC (PHSU video)	Course: Biostatistics for Cancer Researchers
PHSU	Grant writing workshop
PHSU	U54 summer research rotation presentations
PHSU	Online workshop- Maximize your chances for NIH awards
MCC (PHSU video)	Basic Science Research Targeting Health Disparities Workshop (4 speakers, and NIH)
PHSU	Statistical Analysis of TMA data - 2-day workshop
PHSU	Workshop: Your CV/Resume 2.0 - Tips for upgrading your CV/Resume
MCC (PHSU video)	Full-day workshop: “On being a Scientist”
MCC (PHSU video)	Health Disparities Research Colloquium and poster session “The Use of Genetic Ancestry in Cancer Disparities Studies”
PHSU	U54 summer research rotation presentations
San Juan	Full-day workshop on Biobanking
MCC (PHSU video)	Course: Biostatistics 101 for Cancer Researchers
PHSU MCC	Workshops: “Mentoring faculty to become independent scientists”