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## A new model for postdoctoral training: The Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities

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### Abstract

The University of Massachusetts Boston and Dana-Farber/Harvard Cancer Center joined forces in 2009 to create a Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities. In combining the resources of a large university and a research-intensive service institution, the postdoctoral program provides a new model for preparing nurse scientists to conduct independent research that advances nursing knowledge and interdisciplinary understanding of complex health issues. The multi-faceted program consists of educational programming, research training, and career planning components. Additionally, each fellow is assigned a nurse scientist mentor and interdisciplinary co-mentor. The mentors support the fellows with scholarly activities and research training and help the fellows craft individualized career plans, including proposals for post-fellowship career development research. In this article, the postdoctoral program leaders describe the program structure, strategies used to recruit minority and non-minority candidates, and data describing program outcomes, and share lessons learned and recommendations for organizations that may be interested in establishing similar postdoctoral fellowships at their institutions.

### Keywords

nursing research; postdoctoral research fellowships; research development; cancer health disparities; oncology nursing

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Nursing research is critical to advancing nursing knowledge and practice and enhancing multidisciplinary understanding of health, wellness, and care across the continuum of disease (American Association of Colleges of Nursing [AACN], 2006; Sigmon and Grady, 2001). For nursing to remain at the forefront of new knowledge development, the ranks of nurse scientists capable of conducting independent research must be continually developed and expanded. One key to this expansion is the postdoctoral fellowship. Effective postdoctoral programs build on foundational skills and knowledge acquired through doctoral studies, and provide new nurse scientists with concentrated time, resources, and support required to advance research skills and launch and sustain independent research careers (Conn, 2005; Wood, 2002; Wysocki, 1998). Evidence of the effectiveness of postdoctoral training is provided by the National Institutes of Health (NIH) and the National Institute for Nursing Research (NINR). In 2001, NINR, the major funder of nursing postdoctoral training in the U.S., reported that nurses who complete an NINR-supported postdoctoral program are

more successful in obtaining future research grant funding than peers who apply but do not complete such training (Sigmon & Grady, 2001). Similarly, researchers examining successful and unsuccessful applications for NIH postdoctoral training grants determined that receiving an NIH postdoctoral fellowship leads to approximately one additional publication over the next five years, and noted that this reflected a 20 percent increase in research productivity (Jacob & Lefgren, 2013).

Recognizing the importance of postdoctoral programs, the College of Nursing and Health Sciences at the University of Massachusetts Boston (UMB) and the Dana-Farber/Harvard Cancer Center (DF/HCC) joined forces in 2009 to develop a postdoctoral nursing fellowship to prepare nurses to conduct independent research in cancer and health disparities. Supported in part by a U54 grant from the National Cancer Institute (grant number 1 U54CA156732), the postdoctoral program provides nurse fellows with a comprehensive training experience that includes educational, research training, and career planning components, and individualized mentoring by nurse scientist and interdisciplinary research mentors. To accommodate junior nursing faculty and other recent graduates who may have competing obligations, the program offers two options for completion: a traditional option, in which fellows participate in the fellowship full time and complete all requirements in one to two years, and a non-traditional option that allows completion over three consecutive summers.

The Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities was designed to address several critical gaps in nursing research and research training. These include the shortfall in available nursing postdoctoral fellowships (Sigmon & Grady, 2001; IOM, 2011), minority underrepresentation among nurse researchers (AACN, 2010), and the need for more nursing research and knowledge development in cancer and health disparities (Underwood, Powe, Canales, Meade, & Im, 2004). Over the years, nurse leaders, faculty, and scientists have repeatedly cited the need for increasing nursing postdoctoral opportunities (Sigmon & Grady, 2001; Wood, 2002; Conn, 2005; IOM, 2011) and the number of nurse researchers from minority backgrounds (Johnson Rowsey, Kneipp, & Woods-Giscombe, 2013; AACN, 2010; Wallen, Rivera-Goba, Hastings, Peragallo, & DeLeon, 2005). In 2008, when UMB and DF/HCC proposed developing the program, there were only 60 NINR-funded postdoctoral training positions available to nurses, 17 fewer than in 2003 (National Research Council, 2011). Additionally, in 2010, African Americans accounted for only 3.0% of postdoctoral fellows in health, science, and engineering fields, and Latinos accounted for only 3.9% (Einaudi, Heuer, & Green, 2013). The Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities sought to improve the statistics in both of these areas by supporting up to four postdoctoral fellows in the program's first three years and filling at least half the available positions with nurses from underrepresented racial and ethnic groups.

Understanding and eliminating disparities related to health care access, cancer, and other diseases is a primary goal of the Department of Health and Human Services (2011), the National Cancer Institute (NCI, n.d.), and NINR (2011). The opportunity for nurse researchers to play a larger role in identifying and understanding factors associated with cancer disparities was highlighted by a review of nursing research published in 2004, in

which the authors acknowledged the contributions of nurse researchers but concluded that nurses needed to “further expand and strengthen the knowledge base” in this area (Underwood, et al., 2004, p. 217). By harnessing the resources available at UMB and DF/HCC, the Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities offers nurses with a research doctorate a unique opportunity to obtain the skills, knowledge, and experiences necessary to help lead research efforts in this important area.

## Background

The Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities builds on a number of distinctive assets and strengths offered by the founding institutions. UMB is the only public university in New England that is recognized by the NIH as a minority-serving institution. The diversity of its student body is evident in the College of Nursing and Health Sciences (CNHS), where 30 percent of the approximately 1,600 students enrolled in the college’s nursing programs are from racial or ethnic minority groups. Among the college’s strengths is the PhD Program in Nursing, which offers concentrations in population health and health policy that prepare graduates to play leadership roles in addressing population health concerns as policy analysts, researchers, and educators.

DF/HCC is an NCI-designated Comprehensive Cancer Center that includes Dana-Farber Cancer Institute (DFCI) and four other hospitals affiliated with Harvard Medical School and the Harvard School of Public Health. Representing more than 1,000 researchers and \$600 million in annual cancer-related grants, the institutions that make up DF/HCC offer an unparalleled breadth and depth of cancer research and training opportunities for developing nurse scientists. Of particular note is the Phyllis F. Cantor Center for Research in Nursing and Patient Care Services (Cantor Center), located at DFCI. The Cantor Center is home to nurse scientists who conduct independent research examining and testing interventions that impact the patient/family experience of being at risk for, or having, a cancer diagnosis.

DF/HCC and CNHS have long enjoyed a collaborative relationship. Many nursing students complete clinical placements in acute care in DF/HCC institutions. Additionally, the institutions have developed several programs focused on oncology nursing. In 2004, CNHS and DFCI developed a community option for undergraduate nursing students, in which students participate in community outreach activities at DFCI while also gaining exposure to adult ambulatory oncology nursing practice. Subsequently, in 2007, CNHS and DF/HCC developed and launched an accelerated BSN-to-PhD program that prepares students for careers in research, teaching, and/or health policy in cancer and health disparities (Glazer, Ponte, Stuart-Shor, & Cooley, 2009). The accelerated program includes an 81-credit curriculum with content specific to cancer and health disparities, research mentoring by UMB faculty and DF/HCC nurse scientists, and a community outreach component. Since the program was launched, four nurses (including two from minority backgrounds) have completed doctoral degrees with a concentration in cancer and health disparities. An additional three nurses (including one from a minority background) are currently matriculated students. The accelerated BSN-to-PhD program provided a foundation for the development of the Nursing Postdoctoral Program in Cancer and Health Disparities by providing a curriculum and courses in cancer health disparities and research for postdoctoral

fellows, and a model for research mentoring that drew on the expertise available within UMB and DF/HCC.

## Program Structure

The Postdoctoral Nursing Fellowship in Cancer and Health Disparities consists of three components: (1) an educational training component, in which fellows complete an individualized curriculum plan that addresses gaps in their doctoral training and supports them in acquiring skills and knowledge required to conduct independent research in nursing and cancer health disparities; (2) a research training component, in which fellows conduct a research project under the guidance of a nurse scientist mentor and an interdisciplinary scientist co-mentor; and (3) a professional development and career planning component that provides fellows with the support and resources required to develop a research career plan and identify potential junior research positions and funding sources. This individual development plan, as encouraged by NIH policy NOT-OD-13-093, is implemented and monitored not only by each fellow's primary (i.e., nurse scientist) mentor, but also by the principal investigator and program directors of the post-doctoral nursing fellowship every six months.

As noted previously, two options for program completion are available to the nurse fellows. The first is a traditional path, in which fellows complete the postdoctoral program in one to two years. The second option is a summer-intensive, non-traditional program, completed in three years. Development of the non-traditional model was based on concerns that professional and family obligations held by nurses pursuing postdoctoral studies, who on average are older than their counterparts in other disciplines (Robert Wood Johnson Foundation [RWJF], 2013), would prevent some candidates from participating in the traditional option. The non-traditional program's development was also informed by the success, as gauged by favorable student ratings, of summer-intensive postdoctoral educational programs in nursing (Gennaro, Deatrick, Dobal, Jemmott, & Ball, 2007), and doctoral programs that blend on-site summer experiences with distance-accessible learning and mentoring opportunities (Broome, Halstead, Pesut, Rawl, & Boland, 2011). Postdoctoral fellows enrolled in the traditional path complete all of the program requirements at UMB and DF/HCC. Fellows in the non-traditional option are required to be on-site for three months in the summer and to continue scholarly work throughout the year in their home institutions while maintaining ongoing contact with nurse scientist and interdisciplinary mentors.

Consistent with the partnership model, UMB and DF/HCC share responsibility for program oversight and operations. Overall direction is provided by the senior vice president and chief nursing officer at DFCI, and the associate vice provost for research and professor of nursing at UMB, who serve as co-principal investigators (PIs); and by the director of the Cantor Center, and a nurse scientist/associate professor from DFCI and UMB, who serve as the program directors. The co-PIs and program directors work together to oversee and coordinate the continued development of each program component, develop recruitment plans, select the postdoctoral fellows, and monitor and evaluate program performance. The group also reviews and monitors the progress of each fellow's educational, research training,

and professional development plan, offering recommendations for additions and changes as needed. One of the co-PIs and one of the program directors are members of the U54 Executive Committee, composed of PIs of U54-funded projects at DF/HCC and UMB and leaders from both institutions. The Executive Committee meets monthly, and also meets on an annual basis with an external Program Steering Committee that includes the NCI program officer and leaders in cancer and health disparities, including a nurse scientist. During the day-long site visit, the Program Steering Committee offers critique and suggestions for future directions and program improvement specific to the postdoctoral nursing research fellowship.

### **Educational Training Component**

The educational training component includes courses and seminars addressing substantive, conceptual, and methodological areas relevant to the fellow's goals for post-doctoral education, including knowledge and skills for conducting research associated with cancer disparities. The post-doctoral fellows may participate in courses in any of UMB's 14 doctoral, 42 masters, and 20 graduate certificate programs, including the accelerated BSN-to-PhD Program in Cancer Health Disparities. Fellows also may audit courses at the Harvard School of Public Health and Harvard Medical School and attend clinical and research seminars at DF/HCC and UMB. Additionally, in accordance with NIH guidelines, each fellow receives instruction in the responsible conduct of research. Fellows in the non-traditional track, who are on site for three months during the summer, may take advantage of online courses and any courses and seminars offered during the summer months. They also may take courses at their home institutions with mentor approval.

All of the fellows meet with assigned nurse scientist mentors at the start of their fellowships to develop a written plan identifying learning needs and goals, as well as courses and practicum experiences to address them. Additional input into the educational plan is provided by the fellows' interdisciplinary mentors, who meet with the fellows regularly throughout the post-doctoral program.

### **Research Training Component**

Through the research training component, fellows gain knowledge and skills in research methods by contributing to ongoing projects in the clinical research settings, and by developing and implementing a collaborative research project with guidance and mentoring provided by an expert nurse scientist from DF/HCC or UMB and an interdisciplinary co-mentor. Areas of focus for research purposes include cancer care, cancer prevention, bio-behavioral research, and health disparities research focused on the patient/family experience of living with cancer or the risk of cancer. As part of the research component, fellows also travel to and present findings at scientific meetings and workshops related to their research interests.

Mentoring is central to the research training component. Fellows are assigned mentors by the co-PIs and program directors at the start of the fellowship on the basis of shared professional interests. The nurse scientist mentor serves as the fellow's primary mentor and is drawn from the pool of nurse scientists in the Cantor Center and UMB. The

interdisciplinary scientist co-mentor is drawn from a pool of medical and behavioral scientists who have expressed interest in working with nursing postdoctoral fellows, and who add breadth and an interdisciplinary perspective to the fellow's research experiences. As the primary mentor, the nurse scientist is responsible for supervising the fellow's participation in all projects; identifying courses, seminars, and other learning opportunities related to the research process and the fellow's area of interest; supporting the fellow in developing a proposal for independent or career development research at the end of the fellowship; assisting with problem solving related to career issues; and assisting the fellow in networking and career planning. The primary mentor is expected to meet with the fellow on a regular basis (every one to two weeks), using Skype, email, and telecommunication to maintain contact with non-traditional fellows as needed.

### **Professional Development Training**

Through this component, fellows are supported in developing a career plan that positions them to launch a career as an independent investigator with an established program of research. Support for professional development is provided by the fellow's mentors, the co-PIs, and the program directors, who support fellows in developing contacts within the research community and skill in grant writing, manuscript development, and other areas. Each fellow is required to complete a grant application for a career development award or small grant for submission to an external funding agency before the end of the program. The grant development process is a key element of career planning as it establishes a template for future grant applications and ideally yields funding for the fellow's first project as an independent nurse researcher. The timing of grant development varies, as some fellows enter the program with a clear vision for their research, while others develop and refine their research focus during the course of the fellowship. In addition to the support provided by the mentors and co-PIs, fellows are also encouraged to use services offered by the Postdoctoral and Graduate Student Affairs Office (PGSAO) at DFCI, and UMB's Offices of Faculty Development and Research Development. These DFCI and UMB offices offer an array of services supporting career planning, such as seminars and symposia on grant and manuscript writing, networking, resume preparation, and interviewing and negotiating skills.

With the other program components, the professional development component promotes socialization to the research role. By attending classes and seminars with other researchers, consulting with their mentors and the co-PIs, engaging in an immersive research experience, and participating in conferences and other networking opportunities, fellows interact with a broad range of nursing and interdisciplinary research colleagues and become conversant in research issues, questions, and concerns.

### **Recruitment and Eligibility Criteria**

Multiple strategies are used to promote the program among doctorally-prepared nurses from minority and non-minority backgrounds. These include reaching out to nurses in the accelerated BSN-to-PhD program at UMB, posting information about the program on the UMB and DFCI websites, sending brochures to all BSN and higher degree programs in the US, contacting deans and directors of nursing PhD programs, networking at peer institutions and historically black colleges, and actively recruiting qualified applicants at local and



national nursing/oncology meetings. Efforts to recruit minority nurses also include actively working with minority applicants to negotiate the application process.

To be considered for the program, applicants must demonstrate a track record of scholarship in oncology and health disparities and have strong recommendations from faculty in their PhD programs. All fellows accepted to the program are provided an annual stipend to help cover living expenses.

## Program Outcomes

The co-PIs and program directors monitor the following parameters on an ongoing basis to assess program performance: applications received from minority and non-minority nurses; program enrollment and completion statistics; postdoctoral fellows' areas of research; individual and collaborative (e.g., mentor-fellow) publications and presentations; and the results of the fellows' grant submissions. In addition, the U54 Survey and Statistical Methods Core, a central methodological infrastructure designed to provide consultation and operational support to all U54 projects, conducted an evaluation survey and interviews in 2013, obtaining feedback on the program from the first four fellows accepted to the program and associated nurse and interdisciplinary mentors.

## Program Recruitment, Enrollment, and Completion

The first recruitment period extended from November 2010 through February 2011. Thirteen nurses inquired about the program, including two nurses who self-identified themselves as minorities. Of the 13 inquiries, eight nurses began the application process, and five submitted completed applications.

Data on program enrollment and completion are summarized in Table 1. Four fellows from the initial applicant pool, including one from a minority background, were accepted into the program and began their postdoctoral studies in the last half of 2011. Two of the fellows elected to pursue the traditional path, planning to complete the program in two years. Of these, one completed the fellowship in June 2013, the other left the fellowship in 2012 after being offered a tenure-track position as an assistant professor of nursing. The other two fellows in the initial cohort elected to pursue the non-traditional path; one completed the program in August 2013, the other left after one year to accept a position with a state department of public health. With two fellows leaving the program prematurely, the program leadership invited another applicant to join the program, and the nurse began a two-year fellowship in January 2013.

Early in 2013, the U54 funding for the fellowship was extended for one two-year fellow and one one-year fellow, and a second group of applicants was recruited for the program. Recruitment strategies were enhanced with ads placed in minority nursing professional publications and more aggressive recruiting at national conferences that drew faculty and minority and non-minority PhD students. Additionally, program leaders expanded the program eligibility criteria related to productivity to include both basic science and community leadership experience and other scholarly activities. In this round, six nurses completed applications, and two nurses (one from a minority background) were accepted

into the program. Both nurses elected to pursue the traditional path. The fellow from a minority background concluded her fellowship in 2014 with plans to pursue other (non-research) interests that were cultivated during the fellowship. The remaining two fellows are on track to complete their fellowships in 2015.

Each fellow was assigned a nurse scientist mentor and an interdisciplinary co-mentor upon enrollment into the program (see Table 2). All of the mentors were experienced researchers, with interests that matched or complemented the fellow's area of focus. For example, Fellow 1, a nurse practitioner with experience in oncology nursing and genetics, expressed interest in studying symptom management, the experience of living with cancer risk, and patient decision making. This fellow was paired with a nurse scientist mentor who studied symptom assessment/management and patient decision making, and an interdisciplinary co-mentor with experience in gastrointestinal cancer, and cancer genetics and prevention.

### Research, Publications, and Presentations

As part of their postdoctoral studies, each fellow assumed responsibility for one or more discrete components of an ongoing research project led by one of their mentors, and/or conducted their own studies among patients and populations served by DF/HCC. As noted in Table 3, the projects reflected the fellows' interest in a range of areas, including cancer health disparities. One project addressing health disparities was titled *LaCruza, a community-based participatory research project designed to provide capacity enhancement in selected churches with large Latino populations*. Fellow 3 contributed to this project that examined the role of faith-based organizations in health research and promotion among Latino communities. Other projects addressing health disparities include, *Culturally and linguistically appropriate symptom and quality of life screening in Spanish-speaking patients with cancer* (Fellow 2), *Patterns of communication about cancer pain by ethnic minority patients* (Fellow 6), and *Survivorship after a cancer diagnosis in a community health center* (Fellow 7).

Each fellow also submitted one or more research or career development grant applications while enrolled in the program. As noted in Table 3, these also reflected a diverse range of interests, with several directly addressing an aspect of cancer health disparities. Among 22 applications submitted by the fellows, nine were awarded funding. The funded applications included a proposal titled, *The psychosocial experience of living with pancreatic cancer risk*. Submitted by Fellow 1, the proposal was awarded an NIH Harvard Catalyst Medical Research Training Award.

Research dissemination was another area of focus. Collectively, the fellows authored or co-authored 45 articles that were accepted for publication between 2011 and 2014.

Additionally, the fellows gave 30 podium presentations (including 16 invited presentations), and presented 27 posters to academic and professional groups.

### Evaluation Survey

The evaluation by the U54 Survey and Statistical Methods Core involved interviews with the four fellows initially admitted to the postdoctoral program, three nurse mentors, and four interdisciplinary mentors. The postdoctoral fellows were asked to rate and comment on each



program component and identify what helped and/or impeded goal achievement, aspects of the program that would benefit from change, and whether they would recommend the program to a colleague. The interviews with mentors were less structured and focused on aspects of the mentoring experience, including whether the mentors understood their role, whether their mentees made good use of the mentor's expertise, and whether expectations on both sides were appropriate.

**Postdoctoral fellows**—Fellows were asked to rate program elements in terms of their importance in their decision to apply and satisfaction with each element at program's end. The fellows rated the elements on a 1–5 scale, with higher values corresponding to a more favorable rating.

**Decision to apply and satisfaction at program's end:** As indicated in Table 4, the nurse and interdisciplinary scientists who served as mentors were a major draw for all of the fellows. Two fellows had contact with the nurse scientist mentor prior to applying to the program. Another major draw for two of the nurses was the option of following the non-traditional pathway, as this allowed them to participate in the program as fellows and also remain in 9-month academic appointments elsewhere. Being able to carry out interesting research and learning to do rigorous and well-designed research was a main attraction for three fellows; the fourth noted she was already engaged in research at her home institution and thus the other learning opportunities were more important. While most of the fellows found the resources provided by the university (e.g., library and statistical consultation) a draw, and one fellow expressed interest in the diversity of the faculty and UMB's urban mission, the fellows rated the clinical and research environment and opportunities offered at DF/HCC as slightly more important than these other factors. The DF/HCC environment was especially important for two fellows whose research interests were in clinical cancer care and who were pleased with the opportunity to work with top cancer researchers. Rated lowest in terms of importance was the stipend, though two fellows assigned it a rating of 5, with one fellow indicating she wouldn't have been able to manage without it.

As indicated in Table 4, the fellows indicated a high level of satisfaction with all program elements at the end of the program, with mean ratings for the various elements ranging between 4.00 and 5.00. The satisfaction ratings, and comments and ratings pertaining to specific aspects of the various elements, are discussed in more detail below.

**Nurse scientist and interdisciplinary mentors:** As noted in Table 4, overall satisfaction with the nurse scientist and interdisciplinary mentors was quite high, with a mean rating of 4.00 for nurse mentors (range 1,5) and 4.50 for interdisciplinary mentors (range 4,5). The high ratings were mirrored in fellows' assessments of specific aspects of the mentor experience. As indicated in Table 5, mean ratings for access to nurse and interdisciplinary mentors, interest in the mentor's research, and assistance the mentor provided in writing papers and preparing posters ranged between 4.00 and 5.00. In commenting on experiences with their nurse mentors, the fellows indicated that the nurse mentors maintained open-door policies or scheduled weekly, biweekly, or monthly conferences with their mentees, supplemented the meetings with frequent email contact, and were generally very responsive to requests for input. An exception was noted by one fellow, who rated her overall

satisfaction with her nurse mentor and access to her nurse mentor low, explaining that the mentor was rarely on site and she often needed to work through the project manager.

Three fellows described their relationships with their interdisciplinary mentors as quite good, though they felt that mutual expectations about the role were somewhat unclear. One fellow in this first cohort noted she met with her interdisciplinary mentor only once, as she believed the mentor was only marginally relevant to her research interests and both she and the interdisciplinary mentor were uncertain about what the relationship ought to be.

**Research projects:** The fellows were generally very satisfied (mean 4.50, range 3,5) with their participation in research projects during the post-doctoral experience. One fellow reported being the lead researcher for one study aim, another noted having a mix of project involvement. The majority of the fellows were very satisfied with how well the fellowship prepared them to develop a grant proposal (assigning a rating of 5), with only one fellow noting she experienced a lack of support for this work from her mentor.

**Courses and learning opportunities:** The number of courses taken by the fellows ranged between 0 and 5. Those who took courses generally found them very useful; however, the fellows indicated some dissatisfaction with the amount of information they were given about available educational resources at UMB and DF/HCC (mean rating 2.25, range 2,3). Additionally, fellows noted that resources available over the summer for nurses in the non-traditional program were particularly sparse.

**Non-traditional program:** Both of the non-traditional fellows were highly satisfied with their ability to participate in the non-traditional path. The fellows also gave high ratings (mean 4.50) to the strategies for staying connected with mentors, though one of the fellows noted the experience isn't the same as being onsite day to day. The fellows also noted that many of the courses and other events benefiting fellows occur during the academic year and thus are not accessible to fellows in the non-traditional program.

The fellows recommended several changes to benefit the program. These included developing more structured opportunities to allow the fellows to interact as a group, and improving communication about available courses and seminars. Three of the four fellows said without hesitation that they would recommend the program to a colleague or friend; the fourth fellow was ambivalent due to her unsatisfactory experience with her mentor.

**Evaluation by nurse and interdisciplinary mentors—**Three nurse scientist mentors (one mentored two fellows) and four interdisciplinary mentors provided feedback on the program and mentoring experience. Whether the mentors had a favorable experience largely depended on how the mentee(s) fared and how often they had contact with their mentee(s). Mentors described a positive experience when a good working relationship was established and the mentee was productive. Mentors described a less positive relationship when a mentee was unhappy or not very productive or asking for frequent interaction. None of the mentors described the time requirement as burdensome.

The mentors identified a number of areas where changes would be beneficial. These included clarifying the role of mentors and mentees, formalizing the structure for providing feedback to mentees, increasing the pool of interdisciplinary scientists serving as mentors and improving the experience of interdisciplinary collaboration, doing a better job communicating about available courses and workshops for fellows, and providing a structure for resolving mentor/mentee conflicts or problems.

## Discussion

Outcomes achieved by the Postdoctoral Nursing Research Fellowship — including the depth and diversity of topics researched by trainees, the number of accepted manuscripts and presentations, the success experienced by some fellows in securing grant funding, and favorable ratings of the fellowship experience — suggest the program was both well received by the majority of participants and effective in helping them acquire the skills needed for an independent research career. A number of factors contributed to the program's success. Perhaps most important is the longstanding partnership between UMB and DF/HCC, and the commitment of the institutions' nurse leaders to advancing and expanding educational opportunities for minority and non-minority nurses. The resources made available by the two institutions assure that nurse fellows have ample support for developing new skills and knowledge, as well as opportunities for interacting and collaborating with experienced nurse and interdisciplinary scientists with complementary research interests.

Also key to the program's success is the availability of experienced and highly skilled nurse scientists and interdisciplinary researchers willing to serve as mentors. As indicated by the evaluation survey, the mentors and mentoring component were key factors influencing nurses to apply to the program, as well as a major source of satisfaction. Recognizing the mentoring component's importance, program leaders have taken steps to further strengthen mentoring relationships by assuring junior mentors receive individual support and guidance in identifying and meeting mentee needs. In other changes, administrative staff in the Cantor Center have organized a list of resources, list-serves, and training opportunities available to fellows at DF/HCC, and have supported the fellows with travel and poster production.

One factor that may contribute to the program's long-term success is the availability of the non-traditional option. With nurses pursuing doctoral studies relatively late in their careers (the age at which nurses get a PhD is 46 on average, compared to 33 in other fields [RWJF, 2013]), and many postdoctoral candidates also taking on faculty positions, there is a need for post-doctoral programs that offer both flexibility and rigor. Communication technologies such as Skype, email, and videoconferencing assure that fellows in non-traditional programs can stay in close touch with their research mentors. And while limitations in summertime educational opportunities were a source of frustration for non-traditional fellows, this concern will likely decrease as more courses become available online.

While the Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities has experienced success on a number of fronts, several areas have presented significant challenges and yielded important lessons that might benefit other organizations that are interested in developing postdoctoral programs in nursing. A top challenge involves

recruiting and retaining qualified minority candidates. The scope of this problem is evidenced by enrollment statistics for the Postdoctoral Nursing Research Fellowship that indicate only one of four nurses accepted to the first cohort, and one of three accepted to the second cohort, were from minority backgrounds. Additionally, of the two minority fellows accepted into the program, one left before completing the program, and the other completed her one-year program before moving on to pursue non-research interests. Recruiting minority candidates is a pressing issue for nursing education at all levels, though recent data suggest that efforts to enhance student diversity are beginning to pay off: in 2013, 26% of baccalaureate nursing students, 27% of master's students, and 25% of PhD students were from minority groups (AACN, 2014). While the pipeline of minority PhD students is expanding, postdoctoral programs continue to face some unique challenges in attracting minority candidates. These include competition from schools of nursing that are trying to attract minority faculty, salary disparities that favor assistant professor positions over postdoctoral fellowships (IOM, 2011), and the need for mentors who are able to meet the unique socialization and professional development needs of new minority researchers (Beech et al, 2013). Data indicating a low percentage of African Americans and Latinos participating in science, engineering, and health postdoctorates in 2010 (Einaudi et al., 2013), signify that the challenge of recruiting minority post-doctoral candidates extends beyond nursing.

The leaders of the Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities have sought to improve minority representation by implementing AACN (2010) recommendations for increasing the diversity of nurses seeking a career in research. These include regularly evaluating admission, progression, and graduation data for diverse students; partnering with minority organizations to identify strategies to recruit and support minority students; identifying and providing support to promising researchers from diverse backgrounds; seeking nursing and interdisciplinary mentors from diverse backgrounds to minimize the isolation that minority nurses may experience; and emphasizing the importance of health disparities research. When recruiting nurses for the second cohort, the program leaders also expanded program eligibility criteria related to productivity to include basic science, community leadership experience, and other scholarly activities. While this broadened the candidate pool, the program leaders caution that such an approach must be accompanied by an interview process aimed at ensuring that a candidate's interests are consistent with a research career, and by an individual development plan that assures the candidate acquires foundational research skills as part of the fellowship experience.

Another lesson learned involves the assignment of mentors. Matching fellows with mentors who share their goals and research interests not only assures a more satisfying experience for fellows and mentors, but also results in more joint/collaborative publications and presentations in peer reviewed nursing and interdisciplinary forums, and enhances the likelihood of successful outcomes with grant submissions. Conducting a comprehensive assessment of prospective fellows' research interests and goals during the application and recruitment phases allows program leaders to ascertain the availability of appropriate nursing and interdisciplinary mentors. In-person interviews between applicants and prospective mentors can further ensure a good fit.

In this era of team science, it is helpful to supplement the fellow-mentor relationship with an interprofessional mentoring team composed of active investigators from disciplines and professional fields that are relevant to the fellow's short- and long-term research goals. Such a team might consist of individuals who work with the nurse scientist mentor or interdisciplinary co-mentor. Fellows in the Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities have reported that a mentoring team expands the range of knowledge and perspectives available to the fellow, supports the fellow's socialization to the researcher role, and can often provide insight and assistance that benefits the fellow in his/her post-fellowship research career trajectory.

The make-up of the leadership team that is charged with overseeing program development and operations is yet another area that merits close attention by organizations seeking to establish a postdoctoral program in nursing research. Ideally, the leadership team should include individuals with the skills and influence needed to secure initial organizational support and funding, as well as nurse scientists who have experience working with post-doctoral fellows and understand what is needed to provide a robust research and mentoring experience. Support for day-to-day operations and reporting requirements from a program administrator is also essential, as are monthly meetings and other forms of communication that facilitate collaboration on troubleshooting, responding to fellows' concerns, and continued planning by program leaders. Human resource support may also be needed, particularly if the program involves two or more organizations with different human resource policies.

As the Postdoctoral Nursing Fellowship in Cancer and Health Disparities completes its fifth year, program leaders are focused on identifying sources of stable and sustained funding; strengthening how the program achieves the U54 grant objective "to support interdisciplinary approaches to solving significant and complex biomedical problems" (NIH, 2006); and exposing fellows to content and methods relevant to translational science as emphasized in the mission and goals of the National Center for Advancing Translational Sciences (NCAT)-Clinical and Translational Science Awards (CTSAs). Current funding plans include submitting F32 applications for individual fellows, as well as administrative supplements to support minority post-doctoral trainees who work with nurse scientists with R01 grants. Additionally, UMB and DFCI have committed to supplement grant funding by providing partial funding support for one postdoctoral stipend each, as they have done in the past. More significantly, DF/HCC and UMB plan to submit an application for renewal of the U54 grant, in which they will propose expanding the postdoctoral program by opening it to nurse scientists, as well as scientists in the basic sciences, population sciences, and other disciplines that conduct biobehavioral research. The postdoctoral program's leaders believe this will enhance the fellowship program by strengthening its interdisciplinary focus, creating new opportunities for interprofessional translational research, and expanding the pool of minority scientists seeking a fellowship position. In addition to supporting U54 program objectives, the changes will also secure the program's role in advancing nurse scientist capabilities and nursing contributions to cancer and health disparities research.

## Conclusion

The Postdoctoral Nursing Research Fellowship in Cancer and Health Disparities offers a new model for nursing postdoctoral training, one in which a college/school of nursing and clinical partner blend their resources to create a comprehensive program that provides trainees with opportunities to develop their research skills and knowledge base, participate in interdisciplinary research, and develop a robust career plan focused on launching a career as an independent nurse researcher. In addition to expanding the number of postdoctoral training opportunities available to nurses in the U.S., the program also positions the nursing profession to play a greater role in understanding and addressing cancer and health disparities by preparing nurse researchers with expertise in this area.

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**Table 1**

Nursing Post-Doctoral Program: Program Admission and Completion

<b>Cohort</b>	<b>Traditional</b>	<b>Non-Traditional</b>
Initial cohort, admitted 2011		
• Completed the program in 2013	1	1
• Did not complete the program	1 <sup>a</sup>	1
Second cohort, admitted 2013		
• Completed the program in 2014	1 <sup>a</sup>	
• Scheduled to complete program in 2015	2	

<sup>a</sup>Under-represented minority

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**Table 2**

**Fellowship Experience and Mentors**

<b>Fellows &amp; Status</b>	<b>Months in Fellowship</b>	<b>Nurse Scientist Mentor (Title, Areas of Focus)</b>	<b>Interdisciplinary Mentor (Credentials, Title, Areas of Focus)</b>
<b>Initial Cohort</b>			
<ul style="list-style-type: none"> <li>• Fellow 1, complete</li> </ul>	24 7/11–7/13	Director, The Phyllis F. Cantor Center, DFCI, and Associate Professor of Medicine, Harvard Medical School (HMS) <i>Research focus:</i> Cancer symptom management, patient-centered decision making	MD, MPH; Director, Gastrointestinal Cancer Genetics and Prevention Clinics, DFCI, & Professor of Medicine, HMS <i>Research focus:</i> GI cancer, cancer genetics and prevention
<ul style="list-style-type: none"> <li>• Fellow 2, complete</li> </ul>	3 consecutive summers 2011–2013	Director, The Phyllis F. Cantor Center, DFCI, & Associate Professor of Medicine, HMS <i>Research focus:</i> See above	MD, MPH; Clinical Director, GI Cancer Center, DFCI, & Associate Professor, Harvard School of Medicine <i>Research focus:</i> GI cancer
<ul style="list-style-type: none"> <li>• Fellow 3, did not complete</li> </ul>	8 months 2011–2012	Assistant Professor of Medicine, DFCI & HMS <i>Research focus:</i> Cancer prevention & early detection	PhD; Associate Professor of Anthropology, UMB <i>Research focus:</i> Minority health disparities
<ul style="list-style-type: none"> <li>• Fellow 4, did not complete</li> </ul>	2 consecutive summers 2010–2012	Professor, UMB <i>Research focus:</i> Child and adolescent health, childhood obesity, health promotion interventions, prevention of cardiovascular disease	PhD; Associate Professor, UMB <i>Research focus:</i> Clinical health psychology, health promotion interventions
<b>Second Cohort</b>			
<ul style="list-style-type: none"> <li>• Fellow 5, complete</li> </ul>	12 7/13–7/14	Director, The Phyllis F. Cantor Center, DFCI, & Associate Professor of Medicine, HMS <i>Research focus:</i> See above	MD; Director, Leonard P. Zakim Center for Integrative Therapies, DFCI, Assistant Professor of Medicine, HMS <i>Research focus:</i> Breast Oncology
<ul style="list-style-type: none"> <li>• Fellow 6, current</li> </ul>	15 7/13–10/14	Director, The Phyllis F. Cantor Center, DFCI, & Associate Professor of Medicine, HMS <i>Research focus:</i> See above	PhD; Director, Harvard Global Equity Initiative, Associate Professor, HMS <i>Research focus:</i> Health Policy
<ul style="list-style-type: none"> <li>• Fellow 7, current</li> </ul>	21 1/13–10/14	Nurse Scientist, The Phyllis F. Cantor Center, DFCI, & Associate Professor of Nursing, UMB <i>Research focus:</i> Cancer nursing research, palliative care, lung cancer, health promotion interventions for cancer survivors	MD, MPH; Faculty Director for Cancer Care Equity, Dana-Farber/ Harvard Cancer Center, Assistant Professor of Medicine, HMS <i>Research focus:</i> Thoracic Medicine

Table 3

Fellowship Outcomes

Fellow	Research Projects Conducted while Enrolled in the Program (Title, Role)	Publications <sup>a</sup>	Presentations (Invited & competitive)	Research Grant Applications (Title, Role, Funding agency/award type)	Position after Fellowship
Fellow 1	<p>Support needs of women with BRCA1/2 gene mutation; PI</p> <p>A nurse-led evidence based practice project to monitor and improve the management of chemotherapy induced nausea or vomiting; PI</p> <p>Living with inherited pancreatic cancer risk; PI</p> <p>Clinician's perceptions of communication about symptom and quality of life issues with patients with cancer; PI</p> <p>Describing institutional process differences within the Personal Profile Prostate clinical trial and evaluating their association with decisional conflict; PI</p> <p>Breast and ovarian cancer risk related decision making; PI</p> <p>EBP nursing: Evaluation and Needs Assessment; PI</p>	14	<p>Invited: 0</p> <p>Competitive: 9 (4 podium, 5 poster)</p>	<p><b>Funded (n=2)</b></p> <p><i>Living with inherited pancreatic cancer risk and undergoing pancreatic screening</i>; PI; <i>Daisy Foundation</i> IPB 65-A (1/2012–11/2013)</p> <p><i>The psychosocial experience of living with pancreatic cancer risk</i>; PI; National Institute of Health/Harvard Catalyst KL2/Catalyst Medical Research investigator Training Award (10/2014–09/2016)</p> <p><b>Funded and declined by Investigator (n=1)</b></p> <p><i>The experience of living with inherited or familial pancreatic cancer</i>; PI; American Cancer Society Mentored Scholar Award (9/1/2014–8/31/2019)</p> <p><b>Submitted, Not Funded (n=4)</b></p> <p><i>The experience of living with inherited or familial pancreatic cancer</i>; PI; National Cancer Institute K07 Mentored Career Development Award</p> <p><i>The psychosocial experience of living with familial pancreatic cancer risk</i>; PI; American Association for Cancer Research/Pancreatic Cancer Action Network Career Development Award</p> <p><i>Evaluating the impact of a nurse-led program to promote genetic testing in vulnerable populations</i>; PI; American Association of Colleges of Nursing; Academic/Public Health Partnership, Impact Evaluation Projects</p> <p><i>The psychosocial experience of living with pancreatic cancer risk</i>; PI; Friends of Dana-Farber Cancer Institute</p>	Instructor of Medicine, Harvard Medical School; Nurse Scientist, DFCI
Fellow 2	<p>Culturally and linguistically appropriate symptom and quality of life screening in Spanish-speaking patients with cancer; Co-Inv</p> <p>A pilot study of a strength and balance training program for chemotherapy-induced peripheral neuropathy; PI</p> <p>Usability and acceptability of an electronic self-management system for chemotherapy-induced peripheral neuropathy; PI</p>	17	<p>Invited: 11 (podium)</p> <p>Competitive: 9 (6 podium, 2 poster)</p>	<p><b>Funded (n=4)</b></p> <p><i>Patient outcomes of a self-care management approach to cancer symptoms: A clinical trial</i>; Co-Inv; Patient Centered Outcomes Research Institute (PCORI) (2013–2016)</p> <p><i>Usability and acceptability of an electronic self-management system for chemotherapy-induced peripheral neuropathy</i>; PI; American Cancer Society-Institutional Review Grant (2012–2013)</p> <p><i>ESRA-C Spanish: Linguistic appropriateness &amp; cultural sensitivity</i>; Co-Inv; Oncology Nursing Society Foundation (2012–2014)</p> <p><i>A pilot study of a strength and balance training program for chemotherapy-induced peripheral neuropathy</i>; PI; Oncology Nursing Society Foundation (2010–2011)</p> <p><b>Submitted, Not Funded (n=2)</b></p> <p><i>Evaluating a Web-based program for chemotherapy-induced peripheral neuropathy</i>; PI, R01</p> <p><i>An OCN delivered intervention to improve adherence to podium chemotherapy</i>; PI; ONS Adherence to Podium Chemotherapy Research Grants</p>	<p>Assistant Professor, Director, Graduate Concentration in Oncology, University of South Florida College of Nursing, Tampa, FL</p> <p>Assistant Collaborating Member, Health Outcomes and Behaviors Research Group, H. Lee Moffitt Comprehensive Cancer Center, Tampa, FL</p>

Fellow	Research Projects Conducted while Enrolled in the Program (Title, Role)	Publications <sup>a</sup>	Presentations (Invited & competitive)	Research Grant Applications (Title, Role, Funding agency/award type)	Position after Fellowship
Fellow 3	<i>La Cruzia, a community-based participatory research project designed to provide capacity enhancement in selected churches with large Latino populations</i> ; Collaborator	Not Available	Not Available	<b>Submitted, Not Funded</b> Health Resources and Services Administration (HRSA) Grant for Nursing Workforce Diversity, HRSA	Assistant Professor, Clemson University, School of Nursing
Fellow 4	<i>The Readiness Engagement Approach to Children's Health (R.E.A.C.H.)</i> ; PI	9	Invited: 1 (Podium) Competitive: 4 (Posters)	<b>Funded (n=2)</b> <i>The NP Attending and NP Education Unit: Two models to increase faculty and preceptor capacity</i> ; PI; Massachusetts Department of Higher Education Research Protocol (2014) <i>The Readiness Engagement Approach to Children's Health (R.E.A.C.H.)</i> ; PI; University of Massachusetts Center for Clinical and Translational Science (CTSA) NIH Grant No. UL1RR031982. (2011)	State Executive Director of Nursing, Rhode Island Department of Health, Providence, RI (9/12–6/13) Assistant Professor, University of Massachusetts-Lowell (9/13-present)
Fellow 5	<i>Shared journeys case study</i> ; PI <i>Healthy Living Trial</i> ; Collaborator <i>Survivorship after a cancer diagnosis in a community health center</i> ; Collaborator <i>Bladder cancer treatment decision-making</i> ; collaborator	1	Invited: 4 (Podium) Competitive: 4 (Posters)	<b>Submitted and Withdrawn</b> <i>Understanding the healthy behavioral change needs of African American breast cancer survivors</i> ; PI; Oncology Nurses' Society (ONS) 2015 Research Grant (RE01)	Self-employed
Fellow 6	<i>Patterns of communication about cancer pain by ethnic minority patients</i> ; PI <i>Pilot testing of an e-learning pain management curriculum in Uganda-Mexico</i> ; Collaborator <i>African Pain Policy Fellowship: Evaluation of a novel policy training program</i> ; Collaborator <i>Exploring effectiveness of screening for pain in cancer patients</i> ; PI <i>Palliative care issues encountered by radiation oncology patients</i> ; Co-Inv	2	Invited: 0 Competitive: 11 (3 podium, 8 poster)	<b>Submitted, Not Funded (n=2)</b> <i>Improving communication between oncology nurses and prescribers to improve pain management for cancer patients</i> ; Dana-Farber Friends; PI <i>Improving communication between oncology nurses and prescribers to improve pain management for cancer patients</i> ; Arnold P. Gold Foundation; PI <b>Submitted, Pending 1</b> <i>A nurse-led cancer symptom management training program for inpatient family caregivers and auxiliary staff in India</i> ; PI; Oncology Nursing Society	Current fellow
Fellow 7	<i>Healthy Directions after lung surgery</i> ; Collaborator <i>Survivorship after a cancer diagnosis in a community health center</i> ; PI	2	Invited: 0 Competitive: 5 (1 podium, 4 poster)	<b>Submitted, Not Funded (n=2)</b> <i>Low socioeconomic status, lifestyle behaviors and longitudinal changes in DNA methylation after surgery for lung cancer</i> ; Co-Inv; U54 Competitive Pilot Grant Program <i>Exploring cancer survivorship needs in an urban community health care center</i> ; PI; American Nurses Foundation	Current fellow

<sup>a</sup>In peer reviewed journals since beginning fellowship

**Table 4**

Importance of/Satisfaction with Major Program Elements in Four Fellows On a 1 (low) to 5 (high) Scale

Program Element	Importance in Decision to Apply		Satisfaction at Program End <sup>a</sup>	
	Mean	Range	Mean	Range
Mentors	5.00	5,5		
Nurse scientist			4.00	1,5
Interdisciplinary scientist			4.50	4,5
Ability to carry out interesting research	4.25	2,5	4.50	2,5
Environment at DF/HCC	4.25	2,5	4.20	3,5
Environment at UMB	3.50	2,5	4.00	3,5
Ability to participate in non-traditional program	5.00	5,5	5.00	5,5
Stipend	3.00	2,5	4.00	2,5

<sup>a</sup>The two fellows who did not complete the fellowship based their ratings on time spent with the program

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**Table 5**

Satisfaction with mentor, N=4

	Nurse Mentor		Interdisciplinary Mentor <sup>a</sup>	
	Mean	Range	Mean	Range
Access	4.00	1,5	4.33	4,5
Interest in mentor's research	4.75	4,5	4.50	3,5
Assistance mentor provided in writing papers	4.50	3,5	4.66	4,5
Assistance mentor provided in preparing poster	4.00	3,5	5.00	5,5

<sup>a</sup>Ratings supplied by only 3 of the 4 fellows

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