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FELLOWS-IN-TRAINING & EARLY CAREER PAGE

Burgeoning Cardio-Oncology Programs

Challenges and Opportunities for Early Career Cardiologists/Faculty Directors

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From 1935 to 2013, cardiovascular diseases and cancer have been the 2 leading causes of death such that, in 2010, heart disease and cancer accounted for 46% of all deaths in the United States (1). Notwithstanding, owing to the success gained in finding treatments and cures for various cancers, overall cancer survival rate has skyrocketed, with about 14.5 million cancer survivors in the United States (1). Ironically, the clinical success of cancer therapy is attenuated by comorbid cardiovascular diseases as major complications (next to second malignancy) of intense oncology treatment.

To usher the patient safely through cancer therapy while tempering cardiovascular disease as a competing cause of morbidity and mortality, a clinical discipline—called cardio-oncology or onco-cardiology—has evolved. Practice in this discipline commonly involves a specialist in cardiovascular disease, often with additional expertise in heart failure and/or cardiovascular imaging, and also includes oncologists and the oncology care team, psychosocial providers, as well as primary care providers (**Figure 1**).

The exclusion of cancer patients from cardiovascular clinical trials and heart disease patients from oncology investigations has resulted in a paucity of data to direct clinical decision-making in many cardio-oncology patients. The oncologist may hesitate to give life-saving, potentially cardiotoxic therapy for fear of an adverse cardiac outcome, and the cardiologist may have difficulty in understanding appropriate measures on the basis of a patient's cancer-related comorbidities and prognosis. Consequently, the cardio-oncologist plays the pivotal role of intersecting the 2 specialties, seeking to establish a comprehensive plan to address the comorbidities, while achieving necessary life-saving therapies. With the growing patient need, a number of cardio-oncology clinical programs are emerging across the United States, adding to previously established cardio-oncology services localized in a few primary cancer institutions (2). Early career cardiologists actively participate and often serve as a driving force in many of these programs. In this paper, we summarize some of the challenges that junior faculty may face and discuss opportunities for learning and growth.

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ESTABLISHING A CARDIO-ONCOLOGY PROGRAM

In cardio-oncology—as with any other program—institutional support is paramount to achieving success, but is not always easy to achieve. The lack of academic and administrative mentorship presents a major challenge. Its reasons include: novelty of this field, a shortage of evidence-based clinical standards, a lack of opportunities for education and training, and a limited awareness among local oncology and cardiology specialists about the need for cardio-oncology services (2). Active participation in growing cardio-oncology networks may provide critical clues on potential solutions for these challenges and open horizons for growth.

INSTITUTIONAL SUPPORT AND COORDINATION OF CARE

Some approaches to facilitate institutional support for the junior (or any) faculty member attempting to build a cardio-oncology program are listed in **Table 1**. In general, an institutional administration (including cardiology) that appreciates cardio-oncology as a cardiovascular subspecialty is more inclined to disburse funds and resources to establish a cardiology service dedicated to oncology patients. Examples of needed support include:

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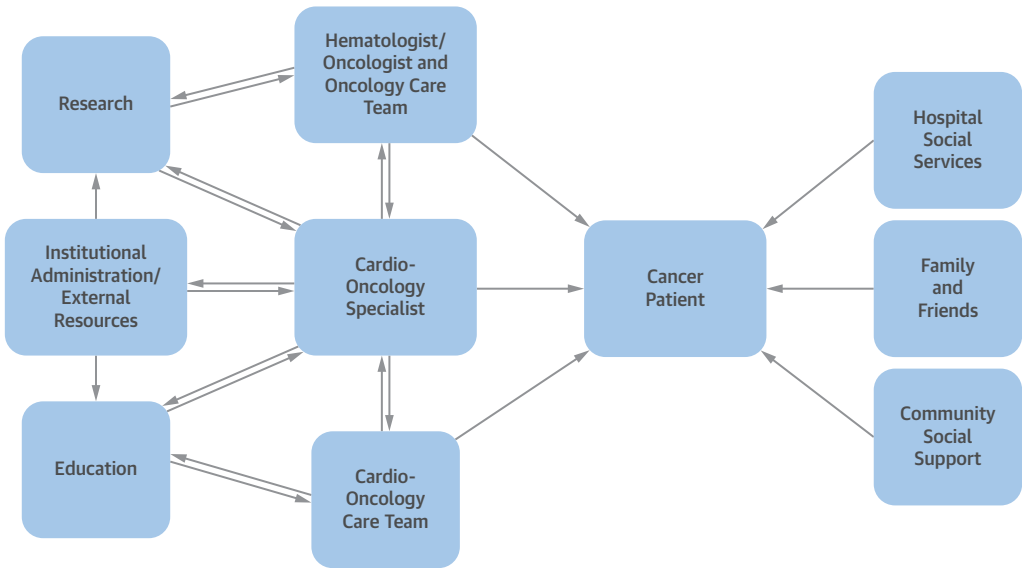
FIGURE 1 Cardio-Oncology Care Team Model



The various responsibilities of a cardio-oncologist are diagramed, showing the constant feedback and interactive process to effect integrated patient care. Modified with permission from Okwuosa TM, Akhter N, Williams KA, DeCara JM. Building a cardio-oncology program in a small to medium-sized, nonprimary cancer center, academic hospital in the USA: challenges and pitfalls. Future Cardiol 2015;11:1–8.

1. Clinical staff, such as a medical assistants, clinic nurses, and physician extenders (nurse practitioners/physician assistants), for:
   a. Coordination of cardio-oncology appointments and other cancer care, including chemotherapy, radiology studies, oncology and surgical appointments, and so on;
   b. Timely scheduling of (serial) cardiac imaging and/or laboratory studies with prompt care on the basis of results;
   c. Keeping abreast of changes in cancer treatment plans and/or changes in cardiovascular status including updates to all team members;
   d. Patient education and engagement;
   e. Coordinated documentation of medication adjustments and dose updates, including cancer treatments, for the purposes of cardio-oncology; and
   f. Enhancing clinical flow where physician extenders could see more stable or return patients, freeing up some time for the cardio-oncologist to incorporate more complex patients into their clinic schedule.
2. Time to engage hospital staff and the community to grow a comprehensive program, which includes:
   a. Participating in oncology tumor board conferences;
   b. Partnering with other cardiology and oncology team members to develop population-focused approaches for subgroups of patients, such as cancer survivorship clinics or patients undergoing treatment with vascular endothelial growth factor-pathway inhibitors;
   c. Training cardiology staff and technicians on newer diagnostic data and techniques, such as development of cardio-oncology-specific imaging pathways; and
   d. Providing awareness about the program within and around the local health care organization through presentations, workshops, and participation in existing programs.
3. Resources to establish a cardio-oncology database for informative and research purposes.
4. Time for professional education: includes educating hospital staff and trainees, as well as attending professional conferences with specific emphasis on development of the program.

LOCATION OF AMBULATORY CARDIO-ONCOLOGY CLINIC

Establishing the location of the clinic—in a cancer or cardiovascular center—is 1 of the key decisions to ensure the success of a cardio-oncology program and is dependent on a number of factors, including hospital administration and funding, proximity of the cardiovascular to the oncology clinics, interactions between both faculty members and staff, staffing

methods, available process measures, and location of the cardiovascular imaging center(s). The pros and cons of a cardio-oncology clinic location in either a cancer or cardiovascular center are shown in Table 2. Essential to making a decision on location is the knowledge that a cardio-oncology clinic must lend itself well to interdisciplinary communication and provider accessibility for patients.

Depending on its goals and objectives, some cardio-oncology programs have dedicated inpatient consultative services. These services are possible in institutions with 2 or more practicing cardio-oncologists, particularly with support staff. Conversely, an institution with only 1 practicing cardio-oncologist and not much support staff could adopt an approach where the general cardiology service sees and consults on the cancer inpatient, with/without some input from the cardio-oncologist, with subsequent cardio-oncology outpatient follow-up.

RESEARCH AND MENTORSHIP

Another key component of establishing a successful cardio-oncology program is conduction of meaningful research, which consequently enhances recognition and growth of the program. Finding a cardio-oncology research mentor is a major difficulty faced by the young faculty, but can be overcome by a motivated junior investigator. One could find a mentor in oncology and another in cardiology (e.g., in cardiovascular imaging or heart failure) and then generate project ideas with potential for growth through the collaboration. Another possibility is to identify a mentor in 1 of the few major cancer centers in the country with an already established cardio-oncology program (2), which raises the concern of a long-distance mentor-mentee relationship with less contact and therefore fewer accomplished work. However, this plan could offer an advantage with fostering interinstitutional collaborations and growth of this fascinating field.

Limited data in this nascent field leave a myriad of unanswered questions about the relationship among cancer, cancer therapies, and the heart, with a wide-open field of research. At the same time, funding in less-established fields such as this one can pose specific challenges. A recent publication summarizing the recommendations of the 2013 National Heart, Lung, and Blood Institute and National Cancer Institute workshop on cancer treatment-related cardiotoxicity provides valuable insight into current scientific priorities and an important resource for person(s) considering development of a cardio-oncology research project (3).

TABLE 1 Approaches to Facilitate Institutional Support for Cardio-Oncology

Process Measures	Methods
Creating awareness	• Educating and establishing cognizance of the necessity for cardio-oncology within the entire hospital, including other physicians,* physician extenders,† nurses, and administrative staff including the hospital leaders and decision makers • May involve multiple presentations on the necessity for and embodiment of cardio-oncology at different forums, including hospital grand rounds, various administrative committees, hospital symposia, and so on • The onco-cardiologist should be prepared to attend (and even seek) meetings with leadership and be prepared with relevant highlights on what necessitates this field
Patient education	• Seminars, community events, symposia, and so on • Informs patients to be attentive to the downstream effects of their cancer therapy • Patients are generally interested in learning how to care for their health, and may seek out the onco-cardiologist especially for this reason
Hospital staff education	• Includes teaching and providing educational materials on cardio-oncology; cardiovascular risks of cancer therapeutic agents; diagnoses, management, and treatment; when to refer to cardio-oncology; as well as updates in the published data • Lectures on various cardio-oncology topics should be provided to medical trainees and house staff‡
Organizing a comprehensive program	• That should involve exchange of patient information with discussions and updates on change in clinical status§
Input at oncology forums	• Includes tumor board conferences and oncology grand rounds • Makes for more comprehensive decision making on cancer therapies and overall patient care; oncologists value this sort of input‖
Providing evidence of growth	• Eventually necessary to convince administration of the need for cardio-oncology¶ • Alerts administration to the need for resources and/or the fact that already provided resources are being applied in a constructive manner
Providing outcome data	• Providing data on better patient outcomes as a result of the establishment of a cardio-oncology clinic would provide the ultimate driving force for establishment and growth of the program

*Oncologists, cardiologists, primary care physicians. †Nurse practitioners (NPs)/physician assistants (PAs). ‡Including medical students, residents, fellows, other cardiologists, oncologists, general practitioners, and medical support staff including oncology nurses, NPs, and PAs. §Should include the onco-cardiologist, the oncologist, and their support staff, particularly the nurses, NPs and PAs, pharmacist, social services (psychosocial oncology, case managers, and social workers), rehabilitation services (such as cardiac rehabilitation, physical therapy, and so on), nutritionist, and palliative care; creation of algorithms for patient education, management, and referrals with special cancer programs such as the cancer survivorship clinic, and so on. ‖In turn, attendance at these tumor board conferences and oncology grand rounds helps provide some perspective with respect to patient management from an oncology standpoint, while informing the onco-cardiologist on (previously unknown) characteristics of existing cancer therapies in addition to expectations for newer ones. ¶Demonstration of growth of cardiovascular services, such as echocardiography or cardiac magnetic resonance imaging referrals, linked to cardio-oncology is generally encouraging to any institution. Reprinted with permission from Okwuosa TM, Akhter N, Williams KA, DeCara JM. Building a cardio-oncology program in a small to medium-sized, nonprimary cancer center, academic hospital in the USA: challenges and pitfalls. Future Cardiol 2015;11:1–8.

FUTURE OPPORTUNITIES FOR CARDIO-ONCOLOGY PROGRAMS AND CAREER GROWTH

Many cardio-oncology programs are being developed across the United States by relatively young junior cardiologists who take on the task of engaging hospital/institutional administration for time and resources to facilitate program success. In response to the challenges, some of which are summarized in the

TABLE 2 Pros and Cons of a Cardio-Oncology Clinic Location in a Cardiovascular Versus Cancer Center

	Cardio-Oncology Clinic in Cardiovascular Center	Cardio-Oncology Clinic in Cancer Center
Pros	• Support staff that are familiar with the spectrum of cardiovascular disease • Patient and provider proximity to cardiovascular services such as ECG and echocardiography services	• Easy patient access to cardio-oncology • Capacity for more comprehensive patient care • Improved contact with the oncologists for immediate questions, consultations, and tumor board opinions, and a generally more inclusive care of the cancer patient
Cons	• Loss of exclusivity to the special needs of the cancer patient • Lack of awareness by the oncologists about a special cardiology service dedicated to serving their patients • Less spontaneous consultations and interactions between oncologists and serving cardiologist(s) which may hamper the evolution of a comprehensive service	• Limited access to cardiovascular studies such as ECG, echocardiography, and stress tests (depending on size and funding in institution) • Less availability of staff trained in performing ECGs/other cardiac studies, and can answer cardiac questions/educate patients on cardiac care
Circumvent the cons	• The cardiologist should be proactive in fostering relationships with the oncologist and the oncology team • Attendance—and contribution to—tumor board conferences and oncology grand rounds with the goal of integrating the cardio-oncologist into the day-to-day practices of the oncology team • Additional training of the cardiology clinic staff, including knowledge of common chemotherapies with relevance to cardiovascular health, need for more frequent monitoring, psychosocial needs of the cancer patient, and so on	• ECG, and possibly, echocardiography machine(s)/services in the cancer center to effect more efficient cardiovascular diagnosis and care of these patients • Institute effective transportation between the cardiac imaging center and oncology clinic • Train oncology staff in cardiovascular care and assistance (including performing ECGs)

ECG = electrocardiogram.

previous text, there has been a call for platforms that allow for knowledge exchange and interdisciplinary education within the field of cardio-oncology. The American College of Cardiology's Cardio-Oncology Working Group organized the first Cardio-Oncology Intensive at the 64th Annual Scientific Sessions (ACC.15), which brought specialists and subspecialists from across a number of disciplines to discuss advances in diverse aspects of clinical care, research, and cardio-oncology program development. A survey noted in a recent publication by this group demonstrated a widespread appreciation of cardiovascular concerns in cancer patients and survivors, identifying at the same time a number of critical barriers for the development of specialized services (2). The newly formed ACC Cardio-Oncology Member Section aims to serve as a professional home for the growing number of specialists in this field. Its success and the ability to advance the future of cardio-oncology programs will critically depend on the contribution of all, and in particular, of early career members focused on advancing this field within their institutions and nationally.

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RESPONSE: Cancer and the Heart: A Fortuitous Union Between Oncology and Cardiology

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When I was asked to build a department of cardiology in a major cancer center 15 years ago, I was often asked whether my department specialized in caring for "cancer of the heart," and why there is a need for a cardiologist in a cancer center. For decades, cardiologists and oncologists have worked in different spheres, attending to their favorite maladies. However, it has become increasingly apparent that cancer patients would benefit from the expert care of both cardiologists and oncologists, because heart disease and cancer often coexist in the same patient. Furthermore, cancer therapy frequently causes either short- or long-term cardiovascular complications. Many chemotherapy drugs are known to cause cardiomyopathy, thromboembolic disease, ischemic heart disease, blood pressure alterations, and rhythm disorders (1). Radiation therapy accelerates atherosclerosis and causes valvular and pericardial heart diseases (2). Thus, cardiovascular consultations are often needed during active cancer therapy or in cancer survivors. In MD Anderson Cancer Center, the department of cardiology employs 12 full-time cardiologists to provide comprehensive cardiac care to our cancer patients. However, in the majority of noncancer hospitals, cardiac consultation for cancer patients is often given by a single provider or by referral to outside institutions. Given the success of modern cancer therapy and the sheer increase in the number of cancer survivors, there is a tremendous opportunity for cardiologist to enter this burgeoning field called "onco-cardiology" or "cardio-oncology."

Drs. Okwuosa and Barac have written a thoughtful piece on the challenges and opportunities for early career cardiologists to enter into this new subspecialty. They carefully outline the need to obtain institutional support and the strategy for growing a comprehensive program. Many of these recommendations are excellent, but need to be individualized. Clearly, the most important ingredient for success is persistence and the willingness to provide prompt and high-quality advice to our oncologic colleagues. Another hurdle for the young cardiologists is the lack of knowledge base in this new field, because cancer has been an exclusion criterion for most of the cardiology trials. We have organized 3 international conferences in cancer and the heart with the mission to educate our next-generation onco-cardiologists. In addition, we have developed algorithms based on the practice patterns of cardiologists in our department, called the MD Anderson Practice, from which 11 video modules are available (3). These resources should serve as a good starting point for the burgeoning onco-cardiologist.

Finally, the interface between cardiology and oncology also provides an excellent opportunity for basic and clinical research. A good example is the discovery of a new paradigm for anthracycline-induced cardiomyopathy that may lead to new strategy for prevention (4). Multiple clinical trials are currently in progress to determine whether chemotherapy-induced cardiotoxicity can be predicted by biomarkers and ameliorated with cardiac medications. Furthermore, with the increasing number of targeted therapies that interfere with prosurvival signaling in the heart, we also can learn valuable lessons from our patients about cardiovascular biology. In summary, the future success of onco-cardiology is only limited by our imagination.

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