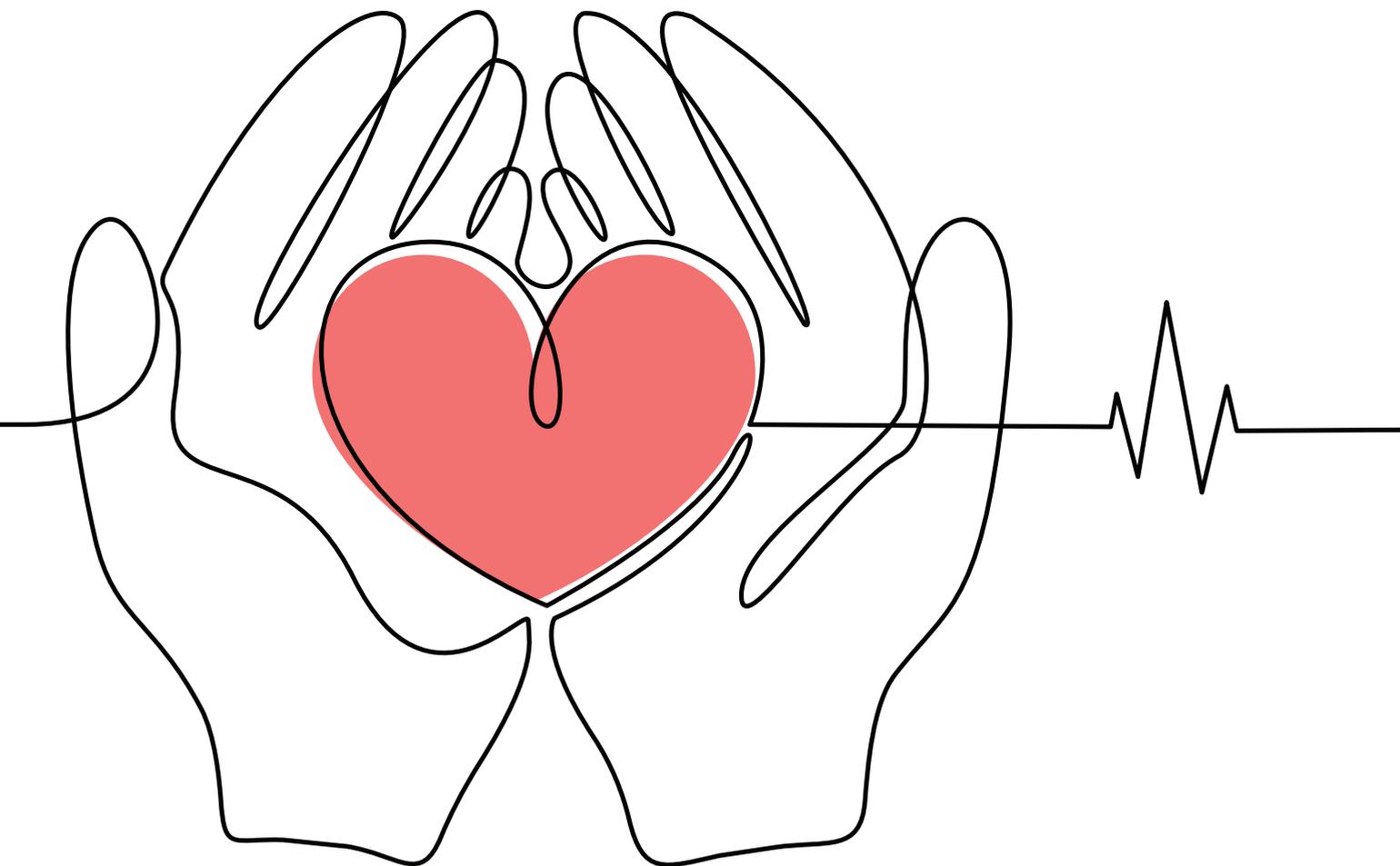


Best Processes for Development of a Successful Cardio-Oncology Program in a Community Hospital



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In Brief

Cardio-oncology is a multidisciplinary field that aims to address the effects of anti-cancer treatment on the cardiovascular system. However, access to cardio-oncology programs is often limited to large academic cancer centers. In 2015, Lehigh Valley Hospital, a community hospital in Allentown, Pa., started a cardio-oncology program to implement best practices and guideline-based care with minimal resource utilization.¹ The program started with a multidisciplinary team comprised of two cardiologists, a nurse practitioner, medical oncologist, and clinical pharmacist. With support from administrative leadership, this cardio-oncology team established an internal workflow for consults that resulted in an average growth in patient volume of 50 percent per year.

Many novel cancer therapies have potentially cardiotoxic side effects. With the growing number of cancer survivors, it has become increasingly important to optimize cardiovascular outcomes for these patients.^{2,3} Cardio-oncology specialists can help prevent and manage acute cardiotoxicity related to anti-cancer therapy, as well as follow survivors of cancer to prevent long-term cardiovascular complications.

Specialized cancer research centers and large academic medical centers are at the forefront of cardio-oncology program development.^{4,7} However, these cancer programs are not accessible to all patients. As of 2017 only 400 of the 6,210 hospitals in the United States were academic or major teaching hospitals.⁸ Therefore, patients with cancer who develop or have pre-existing cardiovascular disease will likely seek care at community-based programs or practices.

Lehigh Valley Health Network is a community hospital network in Pennsylvania that operates the Lehigh Valley Cancer

Institute, which conducted 55,000 visits and evaluated 5,000 new patients with cancer in 2019. In 2015, Lehigh Valley Health Network opened a cardio-oncology program at Muhlenberg Hospital in Bethlehem, Pa., to offer specialized cardio-oncology care in a local community hospital. (Prior to this, the closest cardio-oncology program was 66 miles away.)

Approach and Methodology

The Lehigh Valley Health Network team used the Model for Improvement to implement its multidisciplinary cardio-oncology program.⁹ The first step was to identify physician champions within cardiology and oncology. These physician champions attended national and local cardio-oncology meetings to learn the latest recommendations in this new and evolving field. The next step was to put together the core team, which included three physician champions (two cardiologists and an oncologist), a nurse practitioner, and a clinical pharmacist.

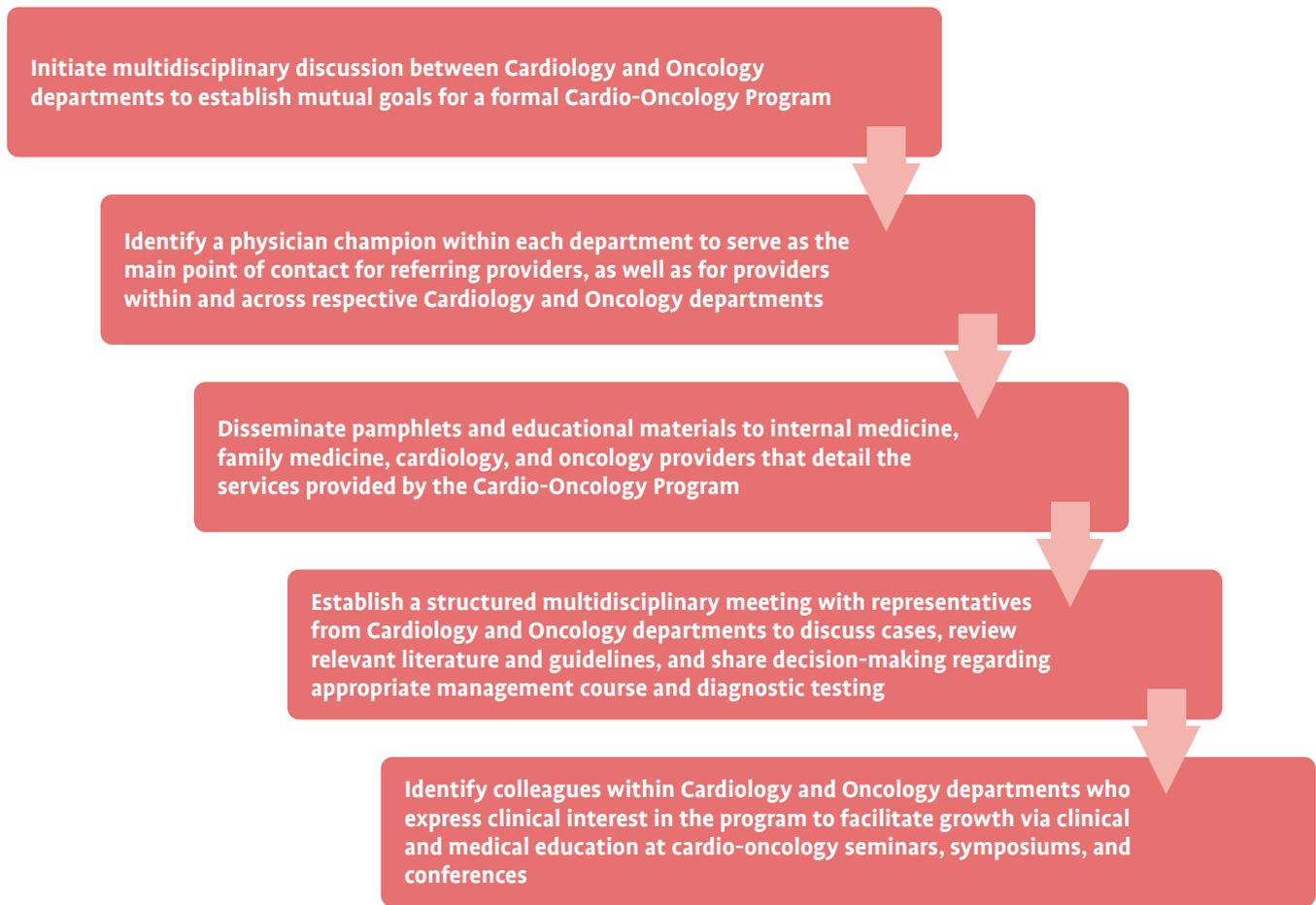
Next, this multidisciplinary team turned its focus on increasing referrals to the newly developed cardio-oncology program. The team's goal: to achieve an annual growth rate of 25 percent. (Initially, cardio-oncology referrals averaged approximately two per month.) To raise awareness of the new service, the team developed educational material and shared this information with internal medicine, family medicine, cardiology, and oncology providers. Expert-led, consensus-driven guidelines were used to establish criteria for inpatient and outpatient consults to the cardio-oncology program.^{10,11} Team members spoke regularly at educational symposia and continuing medical education events to further promote the cardio-oncology program. To raise awareness in the community, patient and physician testimonials about the program's multidisciplinary care were shared in the community newsletter *Healthy You*. Other means to increase public awareness included team members speaking at the American Heart Association's "Go Red Luncheon," cancer survivorship summits, and breast health community events (Figure 1, below and Figure 2, right).

Pamphlets and educational materials with information about appropriate patient referrals served as valuable reminders about the cardio-oncology program. Referrals primarily came from cardiology and oncology colleagues.

Upon request for a consult, a cardio-oncology team member evaluates patients in either the outpatient or inpatient setting, depending on the urgency of the evaluation. Patients are then informed that their case will be discussed with the full cardio-oncology team and clinical consensus recommendations would be shared with the referring provider. Documentation of the cardio-oncology consult and treatment recommendations are standardized using note templates in the electronic health record (EHR). These templates ensure consistency across the cardio-oncology program and embed appropriate references guidelines that support decision-making.

The cardio-oncology team reviews patient cases monthly. Referring providers and colleagues with interest in the field are invited to attend the meeting. When there is an urgent case that requires collaborative decision-making, the cardio-oncology team uses the EHR to facilitate communication among providers.

Figure 1. Process for Developing and Growing a Cardio-Oncology Program



Outcomes

Lehigh Valley Health Network’s institutional review board approved the use of the patient registry to track referral volume. Patients referred to the cardio-oncology program were enrolled in this registry using REDCap software. Data showed that the cardio-oncology program surpassed expectations by growing an average of 50 percent annually. In the four years since inception, the cardio-oncology program referral rate grew from two patients per month to approximately seven patients per month. In total, the program saw 354 patients over 4 years.

Patient Characteristics

Table 1, right, summarizes the characteristics of the 354 individuals. Approximately two-thirds of referred patients were initially seen in the outpatient setting, and the remainder were inpatient consults. Breast cancer and lymphoma were the first and second most common cancers referred. From a cardiology perspective, 16 percent of patients were referred for either decreased left ventricular function or clinical heart failure, 17 percent were referred for arrhythmia, and 15 percent were established cardiology patients who required collaborative decision-making. Common management scenarios included instituting and titrating heart failure medications, determining when to appropriately interrupt and subsequently resume anti-cancer therapy, and managing late-onset heart failure or coronary artery disease in survivors of childhood cancer. The diversity and complexity of the patients referred to the cardio-oncology program (Table 2, page 40) supports the need for these services in a community hospital like Lehigh Valley Hospital.

Shared Insights

The Lehigh Valley Health Network experience has shown that building a multidisciplinary cardio-oncology program is feasible in the community setting. Successful development and implementation requires committed cardiology and oncology specialists, as well as support from hospital leadership.

To guide the decision-making process for cardio-oncology referrals, create a best practice algorithm within the EHR. This algorithm should incorporate treatment- and chemotherapy-related risks and patient-related risk factors into a cardiotoxicity risk score that will help providers identify patients at high risk for cardiotoxicity and guide decision making for cardio-oncology referrals.

Early success of this cardio-oncology program demonstrates that access to high-quality, collaborative care can be done in smaller and/or less resourced facilities. Moving forward, Lehigh Valley Health Network hopes to grow and expand its cardio-oncology program in its satellite locations in East Stroudsburg and Hazelton, Pa. The REDCap registry will allow providers to measure and monitor their performance in adherence to best practices and patient outcomes. The biggest benefit to this multidisciplinary cardio-oncology program is that it allows patients with cancer who are already struggling with the high burden of care to receive high-quality cancer and cardiology care close to home. 

Figure 2. Actions Taken to Increase Referrals to the Cardio-Oncology Program

- Obtain support from hospital administration
- Educate outpatient and inpatient staff
- Develop protocols and guidelines for referrals
- Attend regular staff meetings
- Participate in tumor boards
- Attend regional and international meetings
- Produce scholarly articles
- Educate residents and fellows
- Increase public awareness and education
- Conduct community outreach

Table 1. Baseline Characteristics of Patients Evaluated in Cardio-Oncology Consultation

Baseline Characteristics	Number of Patients	% of Patients
Female	240	68
Male	114	32
Mean age (years)	59.9	
Mean body mass index	29.3	
Hypertension	202	57
Dyslipidemia	188	53
Active smoker	181	51
Diabetes mellitus	62	18
Coronary artery disease	56	16
Arterial fibrillation	52	15
Heart failure with preserved ejection fraction	27	8
Heart failure with reduced ejection fraction	21	6

Table 2. Location of Evaluation, Primary Diagnosis, and Therapeutic Agents for Cardio-Oncology Consultations

Location of Cardio-Oncology Referrals	N (total 354)	% of Total Patients
Outpatient referral	235	66
Inpatient consult	119	34
Reason for Referral*	N*	% of Total Patients
Arrhythmia	61	17
Decreased ejection fraction	57	16
Decompensated heart failure	44	12
Chest pain	42	11
Cardiovascular risk factor management	36	10
Hypertension	29	8
Edema	23	6
Pre-chemotherapy assessment	21	5
Immune-related adverse events	14	4
Acute myocardial infarction	12	3
Unstable angina	9	2
Myocarditis	5	1
Therapeutic Agent	N**	% of Total Patients
Taxanes	120	34
Anthracycline	104	29
Platinum compounds	88	25
Cyclophosphamide	87	24
Other	80	23
Vinca alkaloids	46	13
Other antibodies	44	12
Pyrimidine analogs	40	11
Anti-HER2 antibodies	40	11
Anti-VEGF antibodies	24	7
Other tyrosine kinase inhibitors	24	7
Checkpoint inhibitors	20	6
Folate analogs	10	3
BCR-ABL kinase inhibitors	10	3
Topoisomerase Inhibitors	8	2
IMiDS	8	2
mTOR inhibitors	6	2
Purine analogs	2	1
EGFR inhibitor	1	<1

*Patients may have had more than one diagnosis; **Many patients received more than one chemotherapy agent. ABL = abelson murine leukemia; BCR = breakpoint cluster region; EGFR = epidermal growth factor receptor; HER2 = human epidermal growth factor receptor 2; IMiDS = immunomodulatory drugs; mTOR = mechanistic target of rapamycin; VEGF = vascular endothelial growth factor.

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Disclosures

Ranju Gupta, MD, is a speaker for Eli Lilly and Company.

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