

Cardio-Oncology: The Need of the Hour Subspecialty

Agyanta Dhal

SCB Medical College and Hospital, Cuttack, India

Email: agyantadhal20@gmail.com

How to cite this paper: Dhal, A. (2024) Cardio-Oncology: The Need of the Hour Subspecialty. *World Journal of Cardiovascular Diseases*, 14, 187-194.
<https://doi.org/10.4236/wjcd.2024.144015>

Received: February 23, 2024

Accepted: April 12, 2024

Published: April 15, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

There have been considerable advancements in cancer therapy in recent years. However, adverse effects often defeat the benefits, especially on the cardiovascular system. The effects of chemotherapeutic agents on the cardiovascular system can be directly on the heart by altering the coagulability state or by altering the hemodynamic system. Some drugs like Sunitinib and Bevacizumab show Heart Failure which is chemotherapy-induced. Other agents are notorious for showing QT prolongation like Vandetanib. Similarly, other agents with demonstrated cardiotoxicity would be molecular-targeted drugs (Trastuzumab and Pertuzumab) and cytostatic agents (Anthracycline antibiotics, Cyclophosphamide and 5-FU). These effects may present early or late, during or after the treatment. Most of the research has focused on the management and monitoring of patients for cancer who are under treatment, for example new biomarkers in the field of proteomics have been discovered for the diagnosis, treatment, and monitoring of patients. While the upgrades have been successful in reducing mortalities, with the advent of better treatment outcomes, the several adverse effects on the cardiac system cannot be dismissed. For instance, damage to the cardiomyocytes is most frequently associated with the treatment. The damage can further expedite LV failure, valvular dysfunction, conduction abnormalities, etc. Hence, a better management plan for patients with cancer would be one that not only caters to primary cancer treatment but also incorporates ventricular systolic function evaluation using echocardiography, electrocardiography, and cardiac biomarkers for the well-being of patients. Our article focuses on introducing an ideal cardio-oncology team along with the components required for setting up the team. This needs a multidisciplinary approach to reduce patients' cardiovascular morbidity, during and after the interventions. With the growing population of patients undergoing cancer therapy, the risk of developing cardiovascular problems has further escalated. Hence, development of a cardio-oncology multidisciplinary team would be of utmost importance to not only improve patient care but also to improve quality of life.

Keywords

Cancer, Cardio-Oncology, Services, Multidisciplinary Team, Cardiovascular Disease

1. Introduction

Over the past ten years, there has been a significant advancement in cancer treatment, resulting in a population of over 15.5 million cancer survivors in the United States alone. This increase in survivorship, although positive, has led to a rise in cardiovascular issues among patients. Drugs like Anthracyclines have been linked to congestive heart failure and left ventricular dysfunction, while 5-fluorouracil, another commonly used chemotherapy drug can cause myocardial ischemia and changes in the repolarization phase of the electrocardiogram [1]. Globally, cardiovascular disease (CVD) is responsible for about 32% of all deaths, with a notable portion occurring in individuals who have undergone cancer treatment [2]. Various studies have highlighted the cardiotoxic effects of certain anti-cancer medications; for example, VEGF inhibitors have been associated with myocardial dysfunction, though the exact timing of symptom development remains unclear. Furthermore, 33% of patients receiving VEGF inhibitors for renal cell carcinoma were found to have myocardial toxicity. These effects extend beyond adults to children undergoing cancer treatment as well. Also, eight out of fifty children treated with Adriamycin and two out of sixty children treated with daunomycin developed severe cardiomyopathy accompanied by congestive heart failure [1].

2. Necessity for Cardio-Oncology Subspecialty

It's well known that anticancer drugs can negatively impact the cardiovascular system. The aim of establishing the cardio-oncology subspecialty isn't focused on cardiac tumors but rather on early detection of cardiac conditions to potentially mitigate the anticipated adverse effects of anticancer treatment [3]. A study conducted using a modified Dillman's Total Design method found a discrepancy between cardiologists and oncologists regarding Cancer Therapy Related Cardiac Dysfunction (CTRCD). While cardiologists believe that monitoring cardiotoxicity in both symptomatic and asymptomatic patients, along with establishing a cardio-oncology clinic, would significantly improve cancer patients' prognosis, oncologists are somewhat less inclined, likely due to a limited understanding of options for mitigating cardiotoxicity [4]. Therefore, it's crucial to develop the cardio-oncology subspecialty. This not only aids in risk assessment and early detection of high-risk patients to prevent premature cardiac toxicity but also facilitates the creation of personalized management guidelines based on risk factors and the specific baseline of cancer treatment. A specialized cardio-oncology program facilitates direct collaboration between oncologists and cardiologists

concerning mutual patients and facilitates advanced care for these individuals within the cardiology subfields. This may involve procedures like coronary stenting for chemotherapy patients with low platelet counts. Recent findings indicate that integrating a dedicated cardio-oncology service into cancer centers improves screening rates for heart-related complications in cancer patients, potentially leading to better future outcomes.

Figure 1 illustrates the components at various levels which are necessary for setting up an ideal cardio-oncology team. This includes research, local and institutional support, educational and clinical components, multi-disciplinary team along with the cardiologist and oncologist. The key element is the presence of a cardiologist and an oncologist with support from cardiac and cancer centers on-site. Also, various levels of research such as registries, centers, and institutions, teamwork with local communities, lawyers, acute care centers, and inter-societal coordination play a role. Various educational components and the existing resources like medical students and trainees, grand rounds conferences at various levels, nursing staff, surgical specialists, and advanced interventions are important for an ideal cardio-oncology team.

3. Requirements of Cardio-Oncology Subspeciality

Cardiac imaging plays a crucial role in initially assessing the risk and promptly diagnosing cardiovascular disease (CVD) before, during, and after treatment. It

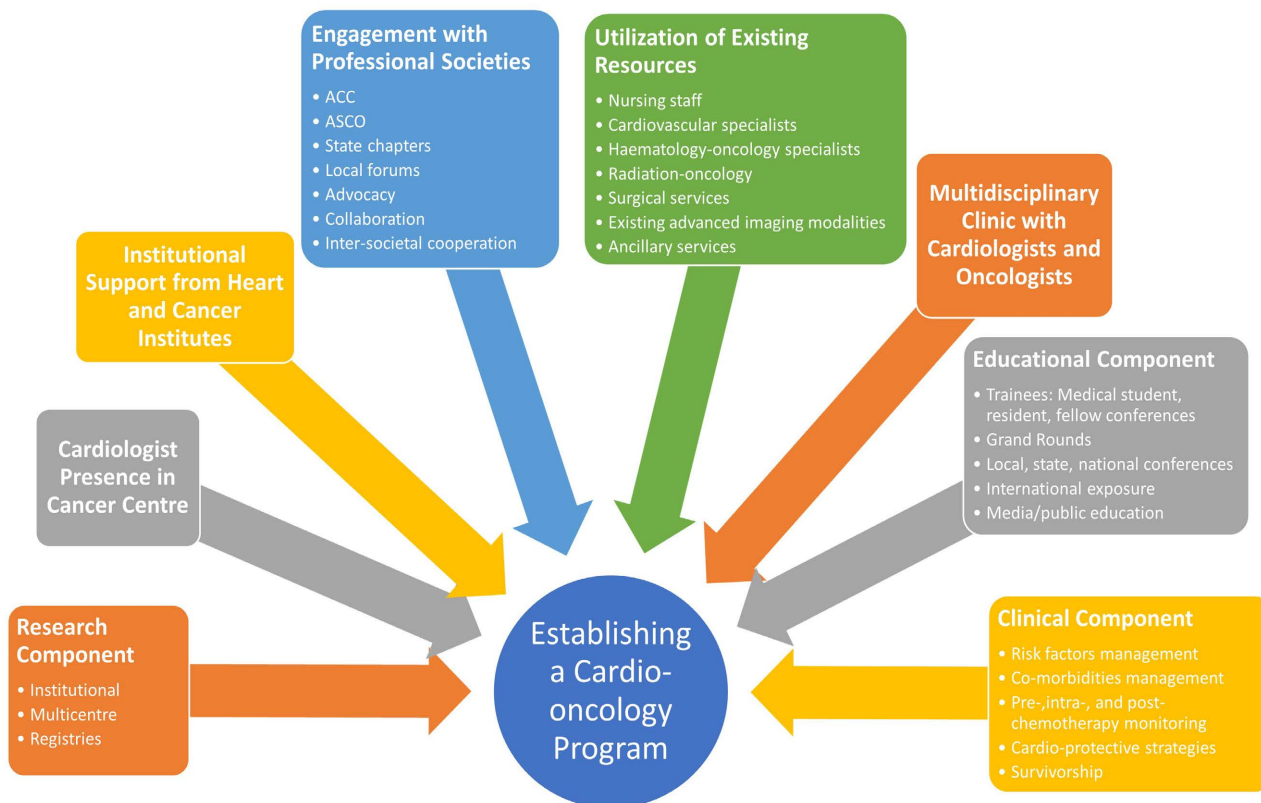


Figure 1. An ideal cardio-oncology team.

is instrumental in identifying cancer patients who could benefit from cardioprotective measures while undergoing anti-cancer therapy [5]. Strain imaging allows for early detection of changes in left ventricular ejection fraction (LVEF) after just three cycles of chemotherapy, while LV torsion analysis through 2D speckle tracking echocardiography can reveal changes as early as one month into treatment [6]. Cardiac MRI is acknowledged to be more discerning than echocardiography for ongoing monitoring. The Imaging and Cardio-Oncology Study Groups of the Heart Failure Association (HFA) within the European Society of Cardiology (ESC), in partnership with the European Association of Cardiovascular Imaging (EACVI) and the Cardio-Oncology Council of the ESC, have issued guidance regarding the utilization of cardiovascular imaging techniques, including echocardiography, cardiac magnetic resonance (CMR), computed tomography (CT), and nuclear testing, before, during, and following cancer treatment. This joint statement highlights their consensus on the significance of contemporary cardiovascular imaging methods in cancer patient care. It stresses the importance of identifying and assessing myocardial dysfunction and heart failure (HF), determining the optimal timing for monitoring various cardiotoxic cancer therapies, considering specific patient groups, and anticipating advancements in this field [7]. In addition to imaging, simultaneous blood pressure measurements can prevent misdiagnoses, especially in cases where blood pressure and volume fluctuate due to intravenous chemotherapy or adverse reactions [8].

Guidelines for the Cardio-Oncology Setup

Currently, there are a limited number of cardio-oncology guidelines available [9] [10], although additional ones are under development. Therefore, it proves beneficial to establish departmental strategies to direct local cardio-oncology practices. Such protocols may encompass the following areas:

- Conducting basic cardiovascular risk evaluations to identify patients requiring cardio-oncology assessments.
- Implementing cardiovascular monitoring for cardio-oncology patients undergoing treatment with: 1) Anthracyclines, 2) Trastuzumab, 3) Tyrosine kinase inhibitors, 4) Vascular endothelial growth factor (VEGF) inhibitors.
- Addressing coronary intervention in cancer patients.
- Managing arrhythmias and pacing issues in cancer patients.
- Utilizing echocardiography for observing patients undergoing cardiotoxic cancer therapies.
- Evaluating the use of new oral anticoagulants in cancer patients.

4. Gaining Popularity within the Population

When establishing a cardio-oncology service, it is essential to emphasize collaboration among the management committee and publishing workers. A comprehensive team comprising patients, their families, cardio-oncologists, cardio-

oncology specialist nurses, sub-specialty cardiologists, medical oncologists, radiotherapy oncologists, and cancer surgeons is required for the setup of such services [10]. Moreover, it is crucial to garner support from the management team, including the medical director, medical superintendent, and chief executive officer, to actively engage in this area. Promoting the benefits of primary-care centers linked with the hospital is also valuable. The cardio-oncology service should communicate with patients' oncologists and primary care physicians, facilitating referrals for cancer survivors experiencing cardiac issues such as pericardial effusions and heart failure. To ensure prompt patient reviews, a significant number of doctors and supporting staff need to be appointed within the service, capable of conducting assessments either on the same day or the following day.

5. A Classic Cardio-Oncology Setup in LMIC

Certainly, there has been a significant increase in cancer mortality in low-income and middle-income countries. A study conducted in Iran projected a twofold rise in cancer incidence among Iranians by the year 2035 compared to 2012 [11]. Similarly, population-based cancer registries from the early 1980s suggest a potential increase in incident cases among males and females by 2021 [12]. This co-occurrence of cardiovascular disease (CVD) and cancer is driven by improved survival rates and shared risk factors such as smoking, hyperlipidemia, and obesity, leading to similar mortality patterns among patients [13]. In developing countries, diagnostic and therapeutic processes differ substantially from those in developed nations due to limited budgets and infrastructure. Changes to health policies and infrastructure are implemented based on available resources, with cancer screening programs playing a crucial role in early detection and improving patient survival. For example, the cost-effectiveness of various screening methods, such as visual inspection or HPV DNA testing, varies widely across different regions, with India demonstrating particularly low costs per year of life saved [14].

Adapting cardio-oncology services to existing follow-up protocols and modifying monitoring and follow-up procedures according to available resources is essential. The escalating costs of drugs often render them inaccessible to many low and middle-income countries, necessitating policies promoting the use of generic drugs, increased participation in global clinical trials, and expanded insurance coverage [15]. Less expensive monitoring methods, such as serial comparison of cardiac biomarkers and Doppler evaluation of peak systolic mitral excursion, can be utilized to monitor high-risk patients and refer them for further evaluation only when abnormalities arise [10]. In low- and middle-income countries, primary care physicians are considered pivotal members of the cardio-oncology team due to their role in modifying risk factors and providing long-term surveillance [13].

Research indicates that multidisciplinary teams improve patient health outcomes and adherence to guidelines [16]. These advancements, along with evol-

ing modalities in cardio-oncology, contribute to improving survival rates among cancer patients, with the specialty primarily aimed at facilitating successful cancer treatments and reducing the burden of cardiovascular diseases [17]. This approach aims to ultimately decrease cardiovascular morbidity and mortality among the increasing population of cancer patients and survivors [18].

6. Conclusion

Ensuring the optimization of cardiovascular risk factors and managing pre-existing cardiac conditions promptly is crucial without causing delays in oncological treatments. The shift towards personalized medicine will play a pivotal role in future evidence-based approaches, focusing on tailored interventions for specific risks in cardio-oncology. Another crucial aspect is conducting audits to continually improve patient care. Future research could cover a range of topics related to service enhancement. Furthermore, empowering doctors within the service, particularly through training junior staff and raising awareness in other departments, as well as organizing conferences and fellowship programs, can significantly enhance patient outcomes.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Albini, A., Pennesi, G., Donatelli, F., Cammarota, R., Flora, S.D. and Noonan, D.M. (2010) Cardiotoxicity of Anticancer Drugs: The Need for Cardio-Oncology and Cardio-Oncological Prevention. *National Library of Medicine*, **102**, 14-25. <https://doi.org/10.1093/jnci/djp440>
- [2] Florescu, M., Cinteza, M. and Vinereanu, D. (2013) Chemotherapy-Induced Cardiotoxicity. *Medica: A Journal of Clinical Medicine*, **8**, 59-67.
- [3] Herrman, J. and Lerman, A. (2014) An Update on Cardio-Oncology. *Trends in Cardiovascular Medicine*, **7**, 285-295. <https://doi.org/10.1016/j.tcm.2014.07.003>
- [4] Peng, J., Rushton, M., Brezden-Masley, C., Chiu, M.G., Graham, I. and Dent, S. (2019) An International Survey of Healthcare Providers' Knowledge of Cardiac Complications of Cancer Treatments. *Cardio-Oncology*, **5**, No. 12. <https://doi.org/10.1186/s40959-019-0049-2>
- [5] Lyon, A.R., Dent, S., Stanway, S., Earl, H., Brenden-Masley, C., Cohen-Solal, A., Tocchetti, C.G., Moslehi, J.D., Bergler-Klein, J., Khoo, V., Tan, L.L., Anker, M.S., Haehling, S.V., Maack, C., Pudil, R., Barac, A., Thavendiranathan, P., Ky, B., Neilan, T.G., Belenkov, Y., Rosen, S.D., Lakobishvili, Z., Sverdlov, A.L., Hajjar, L.A., Macedo, A.V.S., Manisty, C., Ciardiello, F., Farmakis, D., Boer, R.A., Suter, T.M., Skouri, H., Cardinale, D., Witteles, R.M., Fradley, M.G., Herrmann, J., Cornell, R.F., Wechelaker, A., Mauro, M.J., Milojkovic, D., Lavallade, H., Ruschitzka, F., Coats, A.J.S., Seferovic, P.M., Chioncel, O., Thum, T., Bauersachs, J., Andres, M.S., Wright, D.J., Lopez-Fernandez, T., Plummer, C. and Lenihan, D. (2020) Baseline Cardiovascular Risk Assessment in Cancer Patients Scheduled to Receive Cardiotoxic Cancer Therapies: A Position Statement and New Risk Assessment Tools from the

- Cardio-Oncology Study Group of the Heart Failure Association of the European Society. *European Journal of Heart Failure*, **11**, 1945-1960. <https://doi.org/10.1002/ejhf.1920>
- [6] McGowan, J.V., Chung, R., Maulik, A., Piotrowska, I., Walker, J.M. and Yellon, D.M. (2017) Anthracycline Chemotherapy and Cardiotoxicity. *Cardiovascular Drugs and Therapy*, **31**, 63-75. <https://doi.org/10.1007/s10557-016-6711-0>
- [7] Celutkine, J., Pudil, R., Lopez-Fernandez, T., Grapsa, J., Nihoyannopoulos, P., Bergler-Klein, J., Cohen-Solal, A., Farmakis, D., Tocchetti, C.G., Haehling, S.V., Barberis, V., Flachskampf, F.A., Ceponiene, I., Haegler-Laube, E., Suter, T., Lapinskas, T., Prasad, S., Boer, R.A., Wechalekar, K., Anker, M.S., Lakobishvili, Z., Bucciarelli-Ducci, C., Schulz-Menger, J., Cosyns, B., Gaemperli, O., Belenkov, Y., Hulot, J.-S., Galderisi, M., Lancellotti, P., Bax, J., Marwick, T.H., Chioncel, O., Jaarsma, T., Mullens, W., Piepoli, M., Thum, T., Heymans, S., Mueller, C., Moura, B., Ruschitzka, F., Zamorano, J.L., Rosano, G., Coats, A.J.S., Asteggiano, R., Seferovic, P., Edvardsen, T. and Lyon, A.R. (2020) Role of Cardiovascular Imaging in Cancer Patients Receiving Cardiotoxic Therapies: A Position Statement on Behalf of the Heart Failure Association (HFA), the European Association of Cardiovascular Imaging (EACVI) and the Cardio-Oncology Council of the European. *European Journal of Heart Failure*, **22**, 1504-1524. <https://doi.org/10.1002/ejhf.1957>
- [8] Narayan, H.K., Finkelman, B., French, B., Plappert, T., Hyman, D., Smith, A.M., Margulies, K.B. and Ky, B. (2017) Detailed Echocardiographic Phenotyping in Breast Cancer Patients: Associations with Ejection Fraction Decline, Recovery, and Heart Failure Symptoms over 3 Years of Follow-Up. *Circulation*, **135**, 1397-1412. <https://doi.org/10.1161/CIRCULATIONAHA.116.023463>
- [9] Zamorano, J.L., Lancellotti, P., Munoz, D.R., Aboyans, V., Asteggiano, R., Galderisi, M., Habib, G., Lenihan, D.J., Lip, G.Y.H., Lyon, A.R., Lopez Fernandez, T., Mohty, D., Piepoli, M.F., Tamargo, J., Torbicki, A. and Suter, T.M. (2016) 2016 ESC Position Paper on Cancer Treatments and Cardiovascular Toxicity Developed under the Auspices of the ESC Committee for Practice Guidelines: The Task Force for Cancer Treatments and Cardiovascular Toxicity of the European Society of Cardiology (ESC). *European Heart Journal*, **37**, 2768-2801. <https://doi.org/10.1093/eurheartj/ehw211>
- [10] Plana, J.C., Galderisi, M., Barac, A., Ewer, M.S., Ky, B., Scherrer-Crosbie, M., Ganne, J., Sebag, I.A., Agler, D.A., Badano, L.P., Banchs, J., Cardinale, D., Carver, J., Cerqueira, M., DeCara, J.M., Edvardsen, T., Flamm, S.D., Force, T., Griffin, B.P., Jerusalem, G., Liu, J.E., Magalhaes, A., Marwick, T., Sanchez, L.Y., Sicari, R., Villarraga, H.R. and Lancellotti, P. (2014) Expert Consensus for Multimodality Imaging Evaluation of Adult Patients during and after Cancer Therapy: A Report from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *Journal of the American Society of Echocardiography*, **27**, 911-939. <https://doi.org/10.1016/j.echo.2014.07.012>
- [11] Mohebbi, E., Nahvijou, A., Hadji, M., Rashidian, H., Seyyedsalehi, M.S., Nemati, S., Rouhollahi, M.R. and Zendehtdel, K. (2018) Iran Cancer Statistics in 2012 and Projection of Cancer Incidence by 2035. *Basic & Clinical Cancer Research*, **9**, 3-22.
- [12] Murthy, N.S., Juneja, A., Sehgal, A., Prabhakar, A.K. and Luthra, U.K. (1990) Cancer Projection by the Turn of Century-Indian Science. *Indian J Cancer*, **27**, 74-82.
- [13] Alizadehasl, A., Amin, A., Maleki, M., Noohi, F., Ghavamzadeh, A. and Farrashi, M. (2020) Cardio-Oncology Discipline: Focus on the Necessities in Developing Countries. *ESC Heart Failure*, **7**, 2175-2183. <https://doi.org/10.1002/ehf2.12838>
- [14] Goldie, S.J., Gaffikin, L., Goldhaber-Fiebert, J.D., Gordilli-Tobar, A., Levin, C.,

- Mahe, C. and Wright, T.C. (2005) Cost-Effectiveness of Cervical-Cancer Screening in Five Developing Countries. *The New England Journal of Medicine*, **53**, 2158-2168. <https://doi.org/10.1056/NEJMs044278>
- [15] Lima Lopes Jr, G., Souza, J.A. and Barrios, C. (2013) Access to Cancer Medications in Low- and Middle-Income Countries. *Nature Reviews Clinical Oncology*, **10**, 314-322. <https://doi.org/10.1038/nrclinonc.2013.55>
- [16] Brar, S.S., Hong, N.L. and Wright, F.C. (2014) Multidisciplinary Cancer Care: Does it Improve Outcomes? *Journal of Surgical Oncology*, **110**, 494-499. <https://doi.org/10.1002/jso.23700>
- [17] Lehmann, L.H. and Totzeck, M. (2020) Establishing an Oncocardiology Service. *Herz*, **45**, 626-631. <https://doi.org/10.1007/s00059-020-04952-w>
- [18] Dreyfuss, A.D., Bravo, P.E., Koumenis, C. and Ky, B. (2019) Precision Cardio-Oncology. *The Journal of Nuclear Medicine*, **60**, 443-450. <https://doi.org/10.2967/jnumed.118.220137>