



# Current functioning of cardio-oncology units in Spain

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## Abstract

**Purpose** The aim of the current survey was to describe the functioning of cardio-oncology (C-O) units in Spain.

**Methods** All members of the Spanish Society of Cardiology pertaining to scientific communities related to C-O received questionnaires on the existence of specific programs at their institutions. A second, more extensive questionnaire was sent to the centers which reported C-O organization.

**Results** We identified 56 centers with C-O programs of which 32 (62.5%) replied to the extended questionnaire. 28% of all centers reported having a multidisciplinary unit involving specialists in several areas. More than 80% of the centers developed surveillance protocols locally adapted which included advanced echocardiographic techniques (68%) or troponin (82%).

**Conclusions** The number of institutions with C-O programs is still limited but higher than reported in a survey in 2017. Development of multidisciplinary units of C-O should be promoted to improve the cardiovascular health of cancer patients.

**Keywords** Cardio-oncology · Cardiotoxicity · Multidisciplinary units

## Introduction

The field of cardio-oncology (C-O) in Spain is constantly expanding since the publication of several consensus documents on the management of cardiovascular complications in cancer patients [1, 2] as well as a national multidisciplinary survey [3], all of which were developed jointly by Cardiology, Medical and Radiation Oncology and Hematology

National Scientific Societies. From the working group on C-O of the Spanish Society of Cardiology (SSC) we conducted a survey focused on the current functioning and organization of these units in Spain.

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## Methods

In January 2019 all members of SSC registered to the subspecialty communities dedicated to Clinical Cardiology, Prevention, Imaging and Heart Failure received questionnaires on whether C-O structures were developed in their centers. If the answer was affirmative, a second questionnaire was sent requiring more information in May 2019.

## Results

We received a total of 532 replies of which we identified 56 centers that declared the existence of some form of C-O organization. From the 56 centers with C-O programs we subsequently received 32 (62.5%) replies to the second, more extended questionnaire. Geographically, out of the 56 centers, 25% (14) are located in Madrid Community, 16% (9) in Catalonia, 10.7% (6) in Andalucia, 8.9% (5) in Valencian Community, 7% (4) in Galicia while in the rest of the Autonomous Regions there are 1–3 centers, respectively. Most of the programs were initiated after the year of 2015 which is probably related to the publication of the expert consensus document on multimodality imaging in cancer patients [4].

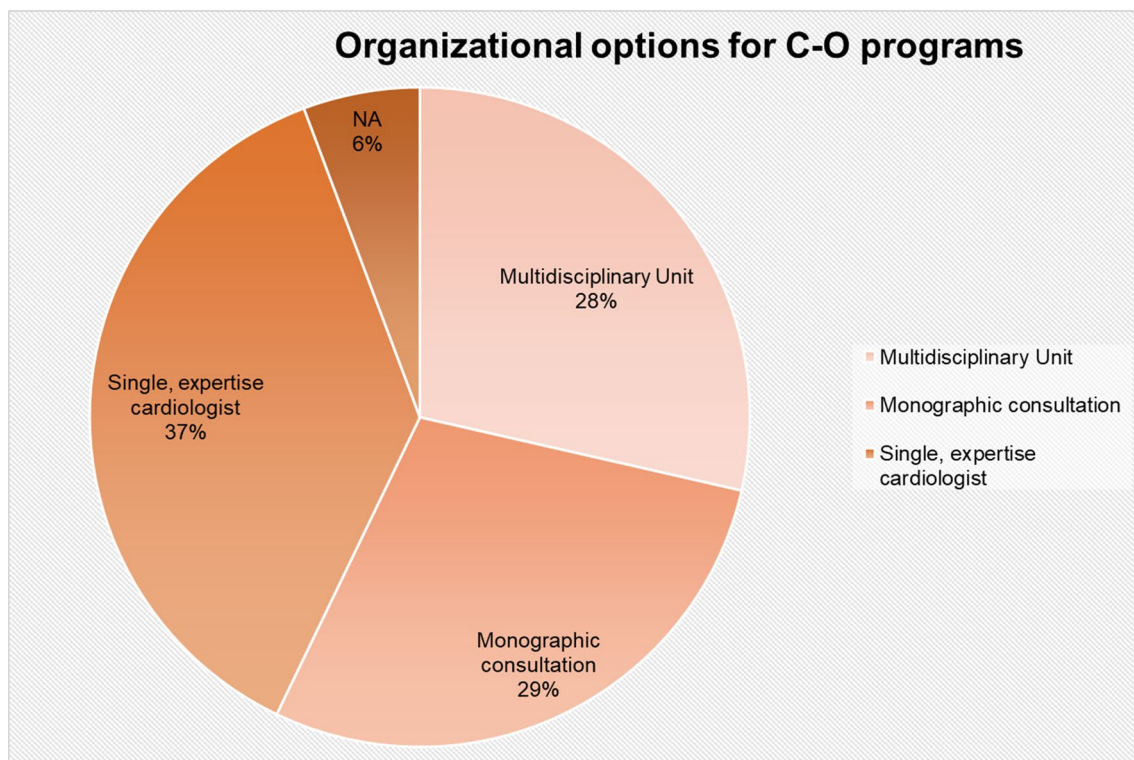
A total of 88% of all replies proceeded from public-funded centers and 91% from tertiary or university hospitals. C-O programs may take several forms of organization ranging from a single cardiologist with expertise in the area, a monographic consultation or a more extended C-O unit involving multiple Cardiology, Oncology and Hematology specialists. The distribution of the different forms of C-O organization are depicted in the Fig. 1.

More than 80% of the centers developed surveillance protocols adapted to local needs and resources. Figure 2 depicts the percentage of centers employing specific surveillance protocols for different types of cancer or specific treatments.

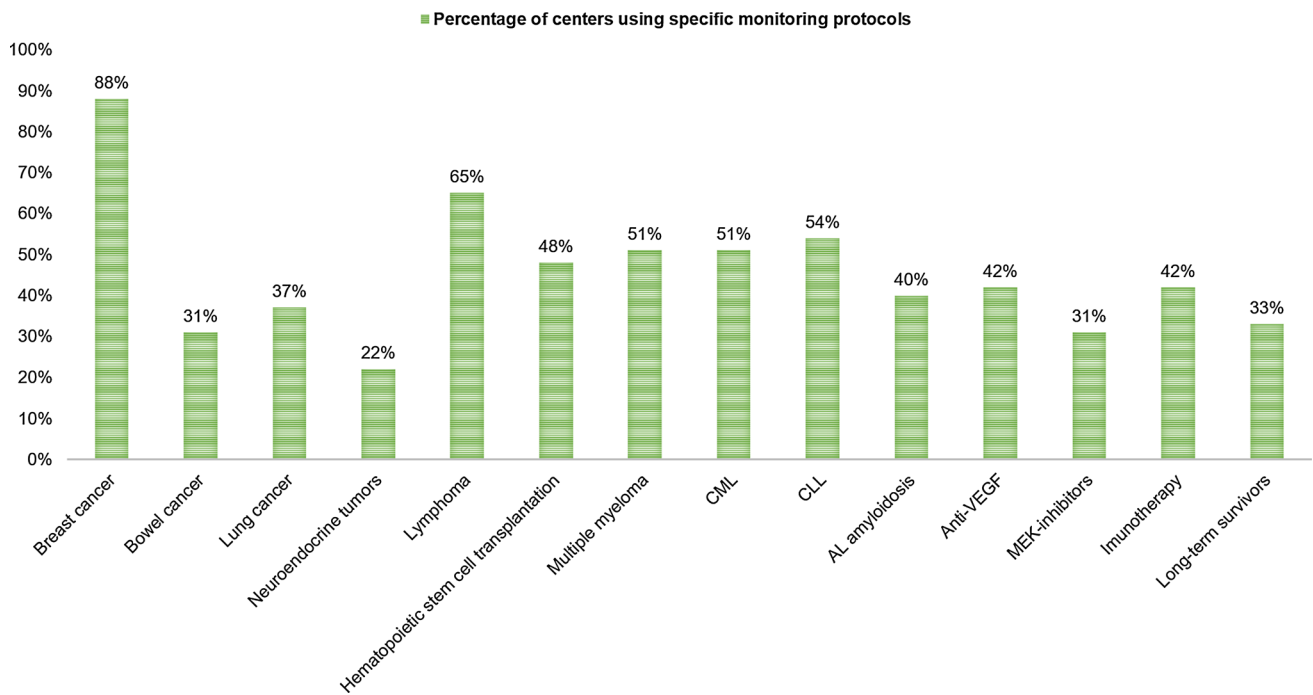
C-O programs were designed to treat patients based on several indications: cardiotoxicity (97%), atrial fibrillation management (71%), previously diagnosed heart condition (68%) and cardiac function monitoring during cancer therapy (65%). In a minority of 17% of all centers patients were to be referred only if symptoms or abnormal results in cardiovascular tests developed.

Figure 3 illustrates actual percentages of patients treated in C-O programs by indication.

As far as cardiovascular testing is concerned, 68% of the centers reported availability for echocardiography during the C-O consultation. The same percentage of centers reported using advanced techniques for cardiac function

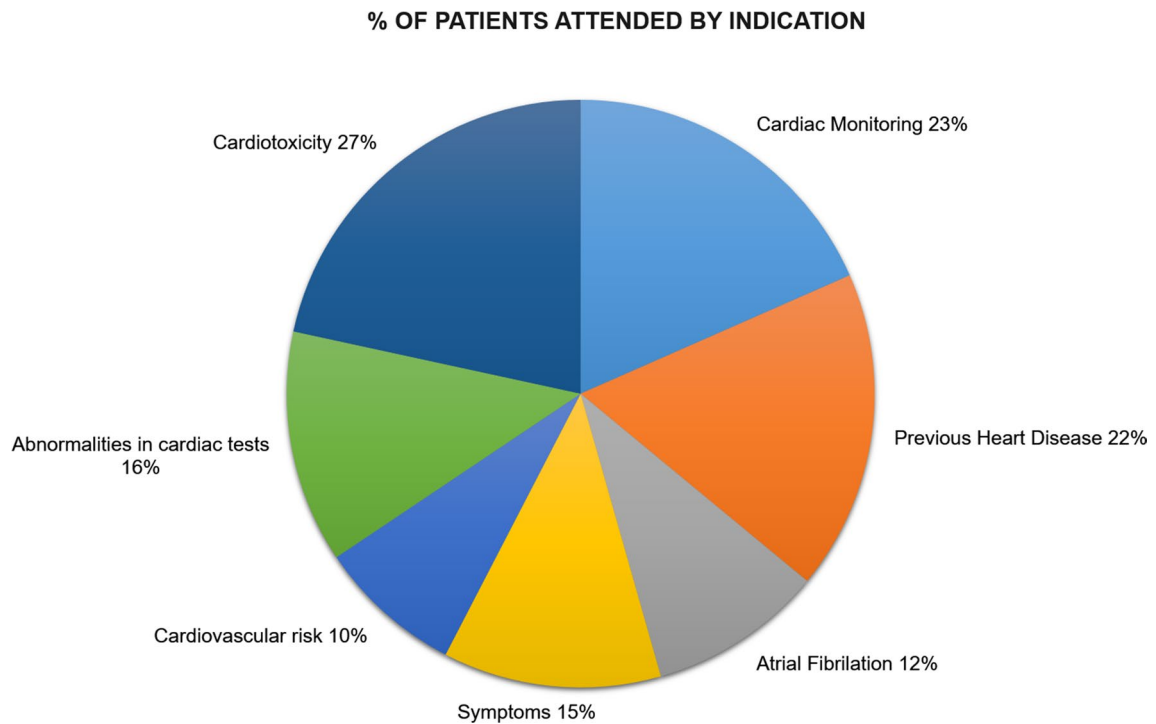


**Fig. 1** Depicts percentages for the main organizational options for C-O programs. *NA* no answer



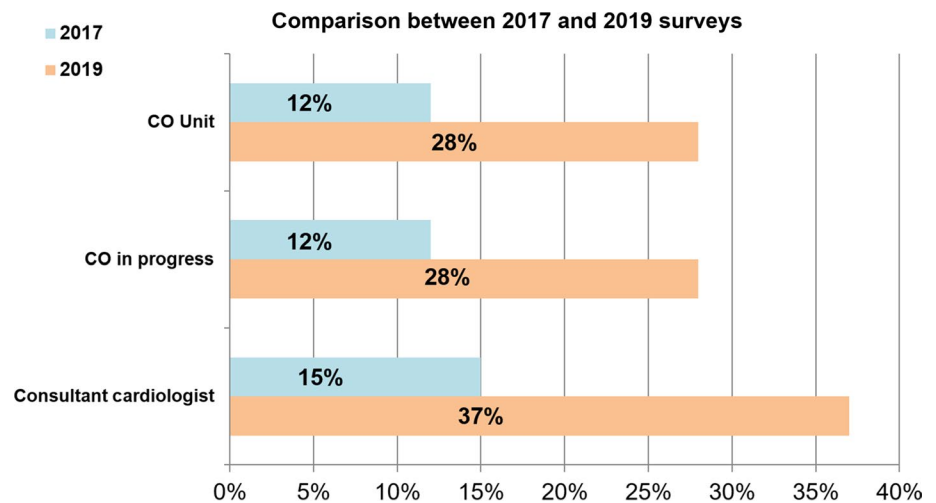
**Fig. 2** Illustrates percentage of centers that developed specific protocol for different types of cancer. *CML* chronic myeloid leukemia, *CLL* chronic lymphocytic leukemia, *AL* amyloidosis Amyloid light-

chain amyloidosis, *Anti-VEGF* anti-vascular endothelial growth factor, *MEK-Inhibitors* mitogen-activated extracellular kinase enzyme inhibitors



**Fig. 3** Depicts percentages of patients treated in the C-O program by referral indication. *Note* Percentages sum more than 100% since one patient may have more than one indication

**Fig. 4** Illustrates results obtained in the 2019 survey as compared with the 2017 survey [3]



characterization such as speckle tracking or 3D imaging. Echocardiographic surveillance is performed in 61% of the centers in the imaging laboratory, in 12% during the C-O consultation and in 27% in both. The median for the number of echocardiographic studies performed annually per center was 525 (interquartile range 225–887). Troponin is used for cardiac monitoring during oncologic treatments in 82% of all centers, with 74% of them employing ultrasensitive troponin and equal distribution between I and T isoforms. Use of troponin is protocolized in 62% of centers but only 22% of them report that oncology/hematology specialists employ it systematically. Natriuretic peptides are used by 67% of the responders, mainly NT pro-BNP (88%), but only 40% of centers developed protocols and only 20% use it systematically. 97% of all centers report cardiac magnetic resonance availability with an average of 6.5% of all studies dedicated to C-O patients. Cardiac computed tomography is available in 64% of all centers and an average of 4.2% of all studies are performed for C-O patients. Although 73% of the centers report nuclear ventriculography availability, only 24% use it to monitor cardiac function.

Close coordination between all specialists is crucial to provide quality cardiac care for cancer patients [5]. Nevertheless, only 39% of all centers organize multidisciplinary sessions, 15% have specialized nurses and only 9% developed continuity protocols for cardiac surveillance with primary care.

## Discussion

The current survey illustrates the actual development of the C-O field in Spain. When compared with the previous 2017 questionnaire there is a significant increase in the number of centers which developed C-O programs [3], 24 centers in 2017 versus 56 in 2019. In addition, the percentage

of centers with multidisciplinary units has increased as depicted in Fig. 4. The multidisciplinary unit is considered nowadays the ideal form of organization in C-O [6] since it provides stable, bidirectional relationship between cardiologists and oncology/hematology specialists and may include other healthcare providers such as surgeons, pharmacists, specialized nurses, psychologists or primary care physicians. This integrated approach offers improved and individualized plans of care for cancer patients based on close communication between unit members.

Although there is scarce information on how C-O programs function, recently, the European Society of Cardiology has published a survey dedicated to this subject in several European countries [7]. Results are highly similar to our survey, most of the patients do not receive specific cardiac care while most of the specialists implicated claim more resources and dedicated training to improve patient care.

The main limitation to this work is the small number of centers with C-O programs, emphasizing the need for growth in this field. When comparing our results with the general recommendations for cardiac monitoring in cancer patient there is an obvious need not only for physician training but also for supplying cardiology and oncology services with the necessary resources (personal and material) to develop multidisciplinary programs for cardiotoxicity prevention. Involving primary care physicians in multidisciplinary C-O programs is a priority. SSC is currently developing a new structure aimed to promote continuity of cardiac care for oncologic patients [8].

## Conclusions

Only a minority of medical institutions in Spain developed C-O programs, most of which include a single cardiologist or a monographic consultation. Most of the centers have

developed locally adapted surveillance protocols, especially for breast cancer and lymphoma patients, with a high percentage of biomarker and advanced echocardiographic techniques usage. The current survey emphasizes the need for a more multidisciplinary approach by involving multiples specialists and primary care physicians to achieve high-quality cardiac care for cancer patients.

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### Compliance with ethical standards

**Conflict of interest** None of the authors have any conflict of interest to declare.

**Ethical approval** The current paper does not include any research involving Human Participant or Animals.

**Informed consent** All the authors have given informed consent on publishing this paper.

### References

1. Lopez-Fernandez T, Garcia AM, Beltran AS, et al. Cardio-oncology in clinical practice. Position paper and recommendations. *Rev Esp Cardiol (Engl Ed)*. 2017;70(6):474–86. <https://doi.org/10.1016/j.rec.2016.12.041>.
2. Lopez-Fernandez T, Martin-Garcia A, Rabadan IR, et al. Atrial fibrillation in active cancer patients: expert position paper and recommendations. *Rev Esp Cardiol (Engl Ed)*. 2019;72(9):749–59. <https://doi.org/10.1016/j.rec.2019.03.019>.
3. Martin-Garcia A, Mitroi C, Sanz RG, Bertran AS, Arenas M, Lopez-Fernandez T. Current status of cardio-oncology in Spain: a National Multidisciplinary Survey. *Rev Esp Cardiol (Engl Ed)*. 2019;72(1):84–6. <https://doi.org/10.1016/j.rec.2017.11.002>.
4. Plana JC, Galderisi M, Barac A, Ewer MS, Ky B, Scherrer-Crosbie M. 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. *J Am Soc Echocardiogr*. 2014;27:911–39. <https://doi.org/10.1016/j.echo.2014.07.012>.
5. Lancellotti P, Suter TM, López-Fernández T, et al. Cardio-oncology services: rationale, organization, and implementation: a report from the ESC Cardio-Oncology council. *Eur Heart J*. 2018;40(22):1756–63. <https://doi.org/10.1093/eurheartj/ehy453>.
6. Hayek SS, Ganatra S, Lenneman C, et al. Preparing the cardiovascular workforce to care for oncology patients: JACC review topic of the week. *J Am Coll Cardiol*. 2019;73(17):2226–35. <https://doi.org/10.1016/j.jacc.2019.02.041>.
7. [https://www.escardio.org/Councils/Council-for-Cardiology-Practice-\(CCP\)/Survey-results](https://www.escardio.org/Councils/Council-for-Cardiology-Practice-(CCP)/Survey-results). Accessed 2 Nov 2019.
8. <https://secardiologia.es/institucional/reuniones-institucionales/sec-calidad/sec-primaria/procesos/10256-proceso-cardio-oncologia>. Accessed 2 Nov 2019.

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