# Editorial

# The Role of the Arquivos Brasileiros de Cardiologia in the New Era of Non-Invasive Cardiovascular Imaging

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We witness the "Renaissance" of cardiovascular imaging. Non-invasive cardiovascular imaging has concomitantly shown the solidification and maturation of more traditional imaging techniques and the exponential growth of the modalities most recently introduced in the armamentarium. The integration of imaging techniques has also allowed a more rational and effective use of specific imaging methods, favoring a more accurate diagnosis at a lower cost and with less overlap of exams. Smart algorithms for both the combined and non-combined selection of non-invasive exams in cardiology have allowed a much better cost-effectiveness ratio for establishing the final diagnosis, currently a crucial factor for all health care systems in both Brazil and the rest of the world. In Brazil, as in many other countries and following an international trend, the Department of Cardiovascular Imaging of the Brazilian Society of Cardiology has been created. It harmonically integrates professionals of the areas of echocardiography, nuclear medicine, magnetic resonance imaging, and cardiovascular computed tomography. This multimodality approach has helped the rapid progression of knowledge and the continuous development of the area. Integration has been proposed for a while with seminal publications describing models of integration that enable better efficiency[1]. Another development of this truly new subspecialty, cardiovascular imaging, is the launch in both Europe and the United States of scientific journals dedicated to cardiovascular imaging derived from the highest-impact scientific journals in the world, such as the *Circulation Cardiovascular Imaging*, *JACC Cardiovascular Imaging,* and *European Heart Journal Cardiovascular Imaging* (to be launched at the beginning of 2012). Of the Brazilian journals indexed in Pubmed, the *Arquivos Brasileiros de Cardiologia* has published a significant number of valuable national and international contributions in the area of cardiovascular imaging.

Of the most traditional modalities, echocardiography has undergone a significant development, with the appearance of new techniques, such as 3D echocardiography, tissue Doppler imaging, and, more recently, speckle tracking echocardiography. Experienced researchers in those areas have refined the use of such techniques allowing new and more accurate diagnoses, with significant impact on the patient's prognosis. Brazilian researchers, with their usual creativity, have surpassed expectations, conducting important research on relevant topics in the area. In an original way, epicardial fat accumulation has been assessed by use of echocardiography[2]. The prognostic value of dipyridamole stress echocardiography in women has also been demonstrated in publications of the *Arquivos Brasileiros de Cardiologia*[3]. Diastolic dysfunction, an area in which echocardiography indisputably predominates, has been carefully assessed in patients with chronic renal disease by Barberato et al[4]. For rejection after heart transplantation, tissue Doppler echocardiography has shown its value[5]. In reverse remodeling after resynchronization therapy, two-dimensional and three-dimensional echocardiography has proved useful[6]. That small sample of state-of-the-art articles published in the *Arquivos Brasileiros de Cardiologia* is also aligned with important journals of the world echocardiography[7,8].

Nuclear medicine has also been present in *Arquivos Brasileiros de Cardiologia*. Its diagnostic value in patients with multivessel coronary artery disease (CAD) has been confirmed in Brazil[9]. In an article using an innovative technique, mental-stress-induced myocardial ischemia has been assessed[10].

Cardiovascular magnetic resonance imaging has also been approached in the "how do I do it?" format[11]. Such educational approach, especially regarding its most recent modalities, is of paramount importance to clinical cardiologists, who need to understand the details of the new and sophisticated exams to better instruct imaging specialist physicians on the focus of the exam in a specific patient, and to better interpret the results of such tests. Continuing education leads to a more rational and accurate use of imaging methods and better cost-effectiveness of the diagnostic activity. In addition, sophisticated state-of-the-art techniques have been considered in the *Arquivos Brasileiros de Cardiologia*. An example is assessing the metabolism of high-energy phosphates in patients with Chagas' disease by use of phosphorus-31 nuclear magnetic resonance spectroscopy[12]. Another example is the unprecedented assessment of myocardial fibrosis in hypertrophic cardiomyopathy in Brazil by use of delayed enhancement magnetic resonance and its correlation with the risk of sudden death[13]. Articles providing an equivalent treatment of the application of that technique, published in the same year in *JACC,* have been considered landmark papers[14,15].

## Keywords

Periodicals, image processing, computer-assisted/trends, image interpretation, computer-assisted/methods.

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The modality of cardiovascular computed tomography, particularly the computed tomography of the coronary arteries, has shown vertiginous progress. Computed tomography calcium score and coronary angiography have taken over the risk stratification of asymptomatic patients at intermediate risk for CAD and the non-invasive assessment of the anatomy of coronary arteries, respectively. Coronary angiotomography has proved to be a useful instrument for both detecting coronary stenosis, and quantifying the calcification of the atherosclerotic plaque. Calcium score has been used for patients with pre-transplantation chronic renal failure and has proved its value in both risk stratification and prediction of obstructive CAD, which would be detected by subsequent catheterization[16]. A very original and creative study has shown that the drop in the number of publications about electron beam computed tomography (EBCT) and the increase in multiple-detector computed tomography (MDCT) have revealed the replacement of one technology by the other[17]. In addition, new cases have been described by use of those new technologies, such as MDCT[18]. In a pioneer way and pointing to the possible future of coronary tomography, cases of coronary artery bypass graft surgery performed based only on coronary angiotomography have been reported[19]. Such reports are aligned with a landmark publication in the *NEJM*, a multicenter study in which Brazil had an important participation. In addition to validating coronary angiotomography against invasive catheterization, that study has reported that the prediction of revascularization was similar by use of both non-invasive coronary angiotomography and invasive catheterization[20].

Hybrid techniques have been increasingly used in clinical practice and research. State-of-the-art technological innovation applied in Brazil has earned space in the *Arquivos Brasileiros de Cardiologia*, represented by the imaging fusion technique of F18-fluorodeoxyglucose positron emission tomography (FDG PET) and magnetic resonance imaging to characterize atherosclerotic plaques[21]. This preceded in two years the acquisition of the RM-PET equipment by the NIH of the United States for performing that type of hybrid image, which is currently simultaneously acquired. In that same year of 2009, the pioneer characterization of the atherosclerotic plaque was published by Motoyama et al[22] in the *JACC*. Invasive imaging has also contributed with important data in the characterization of the atherosclerotic plaque. A study reviewing optical coherence tomography, with impressive images, has been published in the *Arquivos Brasileiros de Cardiologia*[23].

Another relevant topic approached in the *Arquivos Brasileiros de Cardiologia* has been subclinical atherosclerosis, in which diastolic function[24] has been assessed in depth. Current topics, such as metabolic syndrome and visceral fat, have been approached in the *Arquivos Brasileiros de Cardiologia*[25,26].

Again, the *Arquivos Brasileiros de Cardiologia* have proved to be aligned with the major scientific journals worldwide regarding cardiovascular imaging developments.

The integration of images has allowed the comparison and validation of ventricular ejection fraction by use of three-dimensional echocardiography, having MDCT as reference[27].

The integration of image modalities has followed the quality in cardiovascular imaging criteria proposed by Pamela Douglas[28,29] and supported by the American College of Cardiology. Those documents have also established the strategy for better cost-effectiveness of imaging diagnostic methods.

In addition to the cardiovascular imaging subespecialty, other diagnostic areas of fundamental importance in Cardiology have been present in the *Arquivos Brasileiros de Cardiologia*, represented by high-quality and impact articles. An example is conventional ECG, which has been rediscovered for specific applications, such as Duchenne's muscular dystrophy[30], or used in new methodologies with T-wave alternans[31]. Ergometry has some representative examples as follows: detailed assessment of left bundle branch block[32]; autonomic dysfunction in type 1 diabetes[33]; new electrocardiographic score in ischemic preconditioning[34] and stable CAD[35]; exaggerated pressure response to exercise[36]; and heart rate predictive value for mortality[37].

Another method that has gained significant space in recent publications of the *Arquivos Brasileiros de Cardiologia* was ambulatory blood pressure monitoring (ABPM). Some examples of contribution were as follows: comparison of ABPM with self-measurement of blood pressure[38]; assessment of resistant arterial hypertension[39] in general and in women[40]; and subclinical hypothyroidism[40].

Briefly, scientific publications in the area of non-invasive cardiovascular imaging and cardiovascular diagnosis are abundant and of high quality in Brazil. The *Arquivos Brasileiros de Cardiologia* has a fundamental role in disclosing such information to the final player in health care, the assisting physician. It has also served its purposes regarding stimulus to publication with instructions and training to improve the scientific quality of its papers.

In addition to efforts in other areas of cardiological knowledge published in the *Arquivos Brasileiros de Cardiologia*, cardiovascular imaging has helped to increase the impact factor of that scientific journal, which represents the Brazilian cardiology in the international literature scenario.

In conclusion, we can certainly state that the *Arquivos Brasileiros de Cardiologia* are contributing to current topics of great clinical relevance in the area of cardiovascular imaging, in addition to being aligned with the major medical journals of high impact in the subspecialty.

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