Is more imaging better than less?

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The growth of Nuclear Cardiology imaging studies in North America, Western and Northern Europe as well as in Australia and Japan over the past two to three decades has been impressive. In comparison to many developing countries, the national utilization rates are much higher in these more developed areas, but there is also a global increase in diabetes, obesity, and cardiac disease. It is certainly important to consider whether Nuclear Cardiology can play a role in helping to stem this potential epidemic of coronary artery disease (CAD). Although it is difficult to demonstrate a statistically significant relationship between the growth of myocardial perfusion imaging (MPI) studies in the USA and the steady decrease in cardiovascular mortality, there is a perception that risk assessment and detection of disease can be helpful in bringing appropriate treatment to patients with CAD. Over these last two decades, the improved cardiac survival has come at a staggering price tag that is clearly not sustainable.¹ The utility and cost effectiveness of cardiac imaging and specifically MPI seems especially critical at a time of global economic stress and the USA finally appears poised to make some dramatic healthcare reforms.

In this issue of the *Journal of Nuclear Cardiology*, Vitola et al.² have reported on a global survey of Nuclear Cardiology studies that are dominated by MPI. These authors postulated that high utilization rates would be greater than 1,000/100,000 population (>1%) and low utilization would be less than 50/100,000 population (<0.05%) with cut points at moderately high (0.25–0.99%), moderate (0.01–0.24%), and low-moderate (0.05–0.09%). In viewing their world map, the vast majority of the global population is either low, none or

only limited utilization of MPI. The USA has the highest utilization rates based on total numbers of studies, but the increase in utilization among Medicare patients is most impressive. Studies have reported a large rate increase for cardiac nuclear studies between 1993 and 1999 as well as for 1993–2001.^{3,4} The increase in MPI utilization rates in the Medicare population over this time period was approximately 130% and continues to be far greater than any other national rate. Is it possible, given this high penetration of MPI in the USA that the incidence of CAD can account for this increase? Actually, an analysis of CAD events and invasive procedures suggests that MPI imaging increases cannot be attributed to increasing rate of disease.⁴ It also appears difficult to attribute any healthcare benefits directly to this large increase in MPI utilization rates. As Vitola and colleagues² suggest, there appears to be a relationship between the utilization of MPI and economics. When national healthcare reimbursement plans restrict and severely budget physician compensation for MPI studies, then utilization rates remain relatively small. It is not surprising that utilization rates correlate with how the system pays for healthcare which may account for the relatively low number of MPI studies in countries that effectively restrict nuclear cardiology certification to cardiologists.

Given the current strains on the uncontrolled growth of healthcare expenses in the USA with little or no data to document higher quality of care or outcomes compared to the countries included in Vitola's article,² the observation that the American medical system produces the highest utilization rates for MPI and for most other imaging modalities is a problem that must be addressed. The focus and goal for medical imaging were more or less objectively defined by Fryback and Thornbury⁵ to include six critical factors for the evaluation of cardiac imaging: technical quality, diagnostic accuracy and impact, therapeutic impact, patient outcomes as well as societal outcomes. This standard for diagnostic imaging is challenging to accomplish and much of documentation for medical imaging cannot achieve all six factors. It is clear that a relatively high utilization rate for imaging in the absence of significant outcomes and society impact related to this diagnostic modality should be more difficult to be promoted or financially supported by the healthcare system.

This current *Journal* article² is a good model for how to approach global evaluation of cardiac imaging as

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it spreads and penetrates into developing countries. While it is important to get an accurate estimate of the utilization rate, the imaging modality must also develop high quality standards and demonstrate efficacy and prognostic utility in centers or geographic areas that have the most experience with the technique. There will always be a bias from the centers or excellence that were heavily involved in the initial development of any new imaging modality, but as it becomes more widespread and reaches community medical practices, its routine clinical efficacy and impact will then be possible to measure. As noted by these authors, the economic impact of healthcare and physician reimbursement will often be a dominant factor in any medical technique's ability to penetration new markets. These authors are certainly correct in noting that the development of advanced cardiac imaging in developing countries can best occur if it follows the rigorous patterns of formal training, research, education, and physician certification.

The development of a global certification examination in nuclear cardiology (Certification Board of Nuclear Cardiology⁶ is an excellent example of how to promote this concept for other imaging modalities. The growth of accreditation of all types of imaging laboratories (Intersocietal Accreditation Commission)⁷ is another excellent example of how to establish and maintain excellence in quality imaging. Vitola and colleagues² make an important point of noting the establishment of training criteria in nuclear and advanced cardiac imaging that have been developed both in the USA and European medical societies.^{8,9} If cardiac imaging expands into developing regions on the basis of well-trained operators and certified interpreters performing in accredited centers, then there is an excellent opportunity that these diagnostic modalities could provide a very useful clinical impact. As these authors note, the promotion of regional imaging centers that could provide a local basis of high quality standards would greatly enhance this effort. Of course the continued development, maintenance, and fine tuning of appropriate use criteria will also be critical to this entire process. Appropriateness is a relatively recent addition¹⁰ to the cardiac imaging arena is likely to become an ever more important factor in determining how to use the standard and emerging modalities for optimal clinical impact and outcome.

The clear message for cardiac imaging appears to be that more is not necessarily better as the American model is demonstrating. Nuclear Cardiology and MPI have achieved high standards that could guide the continued development and spread of global cardiac imaging. In the real world, there are very powerful economic and political forces that will be demanding appropriate use of our imaging techniques and expertise. It is only through well-guided scientific efforts that we will be able to provide best clinical practice. The quality and consistency of the product will always be more important than the quantity.

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