

## EDITORIAL POINT OF VIEW

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### Nuclear cardiology: A European perspective

Angelika Bischof Delaloye, MD

From the European point of view, the term "nuclear cardiology" is inappropriate because there is no specific certification in nuclear cardiology; however, this term has entered common medical language and therefore will be used here as a synonym of nuclear medicine in cardiology and cardiovascular nuclear medicine.

It is difficult to give an overall impression on the European situation because equipment, regulations and, last but not least, medical practice patterns differ from one country to the other even within the European Union. On the European level, nuclear medicine has been recognized as a full medical specialty since 1989. In many European countries it is not possible to practice medicine in more than one specialty even if fully trained in more than one. In some countries these regulations are changing, and physicians are or will be allowed to have more than one specialist title provided they fulfill the requirements of continuing education in all specialties. According to a survey published in a 1996 position paper by the Nuclear Medicine Section of the Union of European Medical Specialists (UEMS),<sup>1</sup> nuclear medicine studies in cardiology are mostly performed by certified nuclear medicine specialists. For legal reasons, only these specialists are allowed to administer radioactive tracers to patients. In the Scandinavian countries, clinical physiology deals with all kinds of functional studies, including those performed with radioactive tracers. In the other countries, a few nonnuclear medicine physicians (cardiologists, radiologists) perform such studies. In many centers, cardiologists perform or at least are present during stress tests, but only in a small number of countries is their presence mandatory.

Training in nuclear medicine varies from country to country as well. A 1996 syllabus prepared by The European Board of Nuclear Medicine (EBNM) listed the minimal requirements for training as at least 3 years in nuclear medicine and 1 or 2 years in one or more other

specialties. This training period is to include clinical activity with bedside training and performance of a minimum of 500 nuclear cardiology studies. The revised form of this syllabus has been published in the *European Journal of Nuclear Medicine*.<sup>2</sup> All of these requirements, of course, must be considered only as directives that can, but need not, be accepted as the foundation of laws and rules that are set up at the national level.

Since 1993 the proportion of presentations in the cardiovascular domain during the European Annual Meetings of the European Association of Nuclear Medicine (EANM) tends to diminish slightly. There are probably several reasons for this apparent decrease (Table 1), which should not be interpreted as a decrease of scientific activity in this field. Other topics that have gained interest (in particular oncology) fill time slots previously available for cardiology papers. The absolute number of presented abstracts remained rather stable except for the number presented at the last meeting, which clashed with the annual meeting of the European Society of Cardiology (ESC). Considering that 90 nuclear medicine papers were selected for presentation there and 110 at the EANM meeting, the scientific interest in this field seems well preserved. Not only quantity but also quality seems to be at good levels: the rejection rate of nuclear medicine and radiology abstracts at the ESC meeting was 26% compared with an overall rejection rate of 48%.

In addition to these two large European meetings, the International Conference of Nuclear Cardiology (ICNC) in early 1997 also drained an important number of presentations that otherwise would have been submitted to the annual meeting.

As for bone scans, which are widely performed but are the subject of only a very limited number of abstracts submitted to the EANM Annual Congress, myocardial perfusion studies are today considered routine and are no longer the subject of widespread methodologic debate even if the final standard of performing such studies still needs to be defined. Due to the importance of myocardial perfusion imaging, nuclear cardiology occupies the second or third position of the number of nuclear medicine studies in most countries despite the contraction of the volume of radionuclide ventriculography, which tends to be replaced by echocardiography.<sup>3</sup>

From the Service of Nuclear Medicine, University Hospital - CHUV, Lausanne, Switzerland.

Reprint requests: Angelika Bischof Delaloye, MD, Service of Nuclear Medicine, University Hospital - CHUV, CH - 1011 Lausanne, Switzerland; [angelika.bischofdelaloye@chuv.hospvd.ch](mailto:angelika.bischofdelaloye@chuv.hospvd.ch).

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The scientific interest in myocardial perfusion and viability imaging has shifted from methodology to questions such as standardization, quality control, clinical impact, decision-making, cost-efficacy, and cost-benefit. A recent European cost-benefit study has shown that diagnostic management strategies that include myocardial perfusion imaging in the evaluation of patients with possible coronary artery disease generate significantly fewer costs than strategies that do not include the nuclear medicine test. This difference in cost is not only observed at diagnosis but persists after 2 years of follow-up.<sup>4</sup>

In addition to lower costs, strategies including myocardial perfusion imaging have higher diagnostic power at diagnosis and a lower negative coronary angiography rate. These results, which were collected in four western European countries, are an important signal to health authorities, hospital managers, and insurance companies. The discussion on the cost-effectiveness of assessing hibernating myocardium is ongoing.<sup>5</sup>

Medical practice and availability of medical resources differ within the European Union already, but the differences are even more important when we also take into consideration the situation in eastern and central Europe. Many of our colleagues in those countries who have had access to modern technology only recently and in a very limited fashion have made a tremendous effort to make these newer techniques available to their colleagues and patients and to promote training of medical and technical staff.

The penetration of myocardial perfusion imaging still shows great variations from one country to the other. The following comments are based on a survey by Iskandrian and Giubbini<sup>6</sup> that compared nuclear cardiology in the United States and Europe. They showed that the number of myocardial perfusion studies per million inhabitants varied greatly even within the European Union, with the high being 8400 in Belgium and the low 264 in Ireland. As expected, the number of myocardial perfusion studies is still much lower (173/million inhabitants) in eastern and central European countries. At first glance, the density of gamma cameras appears to play a role in this difference because Belgium has the highest density in Europe (24/million inhabitants), but Ireland is not at the other extreme for the camera density. There are more cameras in Ireland than in Portugal after normalization for the population, but the number of myocardial perfusion studies per gamma camera is only 58 in Ireland and 285 in Portugal, which is well beyond the European annual average of 183.

Table 2 compares the distribution in percentage of scientific presentations in the field of cardiology at the 1997 EANM Congress in Glasgow<sup>7</sup> and of the myocardial perfusion studies performed in Europe.<sup>6</sup> In most countries there is a balance between the scientific and

**Table 1.** Presentations in the field of cardiology in percentage of all (oral and poster) presentations during the annual meetings of the European Association of Nuclear Medicine since 1990

Year	Presentations (%)
1990	14.0
1991	14.4
1992	16.2
1993	20.7
1994	18.0
1995	16.4
1996	15.8
1997	13.0

clinical activity in cardiology, with myocardial perfusion imaging representing by far the most important part. It is worth noting that in Greece, Turkey, and eastern and central European countries, scientific participation exceeds the clinical activity by a factor of 2, 4, and 3, respectively. The situation in Belgium is special. In this country we find not only the highest gamma-camera density, but also the greatest imbalance in favor of the clinical activity. This finding does not mean that the scientific activity in this country is poor; in fact, the percentage of presentations is 1.7 times higher than the percentage of the Belgian population in Europe, which indicates a scientific productivity with respect to the number of inhabitants comparable to that of Germany.

There are probably several other reasons for this imbalance which might have socioeconomic and cultural roots. The greater availability of camera time, and thus the absence of waiting lists, is certainly not a major argument because the number of studies performed per camera is much higher (350) than in all of the other European countries except France (395). I dare to speculate that the popularity of nuclear cardiology in Belgium results from its development by a certain number of nuclear physicians trained in cardiology whose academic and clinical activity was either preferentially or exclusively devoted to nuclear medicine in cardiology, which favored the clinical impact of the technique.

In my opinion, this shows the importance of cooperation between the two specialties to promote nuclear medicine in cardiology. First, we need to speak a common language.<sup>8</sup> The nuclear physician needs to understand what information the cardiologist needs to manage cases efficiently, and this information must be given in clinical terms. According to the EBNM syllabus interpreted for the field of cardiovascular nuclear medicine, trainees in nuclear medicine should follow a program

**Table 2.** Distribution (%) for the various European countries of population, myocardial perfusion studies (MPS) and scientific presentations in the field of cardiology during the 1997 EANM Congress

Country	Population	MPS	Presentations
Austria	1.5	2.9	1.1
Belgium	1.9	11.7	3.3
Denmark	1.9	0.5	0
France	11.0	14.3	10.9
Finland	1.0	14.3	10.9
Germany	15.6	30.0	27.2
Greece	0.7	2.7	5.4
Ireland	10.8	0.1	0
Luxembourg	0.1	NA	NA
Portugal	1.9	0.8	0
Spain	7.5	.7	5.4
Sweden	1.6	2.5	1.1
The Netherlands	2.9	5.2	6.5
United Kingdom	11.0	7.2	6.5
Norway	0.8	0.5	0
Switzerland	1.3	1.9	2.2
Turkey	9.7	1.6	6.5
Eastern/Central Europe	17.9	2.3	7.6

that includes, if not bedside training in a cardiology ward, at least regular participation in clinical conferences with cardiologists and cardiovascular surgeons in addition to sufficient training in theory and practice of nuclear medicine techniques in cardiology. To give competent advice about the potential contribution of nuclear medicine techniques, trainees must learn to appreciate the value of the available investigations in cardiology and not just those of nuclear medicine.

In my opinion, however, aside from the questions of laws and regulations, it does not seem reasonable in the present European situation to create a specialty of nuclear cardiology. In the European community, an average of 183 myocardial perfusion studies are performed per gamma camera, which amounts to less than 1 study per working day. This relatively small volume does not justify the exclusive use of gamma cameras for cardiology. We need to consider that many, if not a majority of, nuclear medicine facilities work with a single gamma camera.<sup>9</sup>

The absence of a sufficient volume of cardiac studies to ensure the profitability of a dedicated camera is not the only obstacle to setting up special facilities for nuclear cardiology. Overall, high-quality nuclear cardiology not only requires knowledge in cardiology, but it also includes thorough understanding of tracer kinetics, physics of radionuclide imaging including tomography, attenuation and scatter correction, reconstruction algorithms, as well as preparation and administration of

radioactive tracers, quality control of gamma cameras and radiopharmaceuticals, dosimetry, and radioprotection. These are the foundations of nuclear medicine applied to any of the clinical sciences, be it endocrinology, gastroenterology, neurology, nephrourology, oncology, pediatrics, or rheumatology, not just cardiology. In a period of cost-awareness, it is difficult to conceive that costly gamma-camera computer systems are dedicated to one single organ, but neither is it acceptable to use such systems without ensuring the highest clinical impact of the studies.

To find a common platform while respecting the European socioeconomic and cultural diversity, we have chosen to favor cooperation between cardiologists and nuclear medicine specialists rather than the development of a new medical specialty and, by this pragmatic approach, to close at least momentarily, the debate on nuclear cardiology.<sup>10,11</sup> We have recently formalized the unofficial partnership that already existed between certain members of the Working Group on Nuclear Cardiology and Magnetic Resonance of the ESC and the Cardiovascular Committee of the EANM. This informal collaboration was already very successful in participating in the ICNCs and in setting up protocols for cardiac radionuclide studies,<sup>12</sup> but it is time to formalize this relation between the two European societies. The primary goals of this formal partnership are the "clinical promotion of nuclear cardiology and related areas, the training and continuing education of medical and technical

specialists, and the establishment and maintenance of clinical standards in the field." It is not intended to create a special society of nuclear cardiology. Both groups recognize the independent specialties of cardiology and nuclear medicine and intend to improve collaboration to the advantage of the cardiac patient. We think that this is an important step forward to promote nuclear medicine in the field of cardiology in a structured way instead of relying on the good will of people who are, by chance, members of both the EANM and ESC.

This joint group will also be the European partner of the American Society of Nuclear Cardiology in the organization and support of the next ICNC and possibly in other actions to promote the use of radioactive tracers in research and clinical applications in cardiology.

By joining our knowledge, our understanding, our competence, and our ideas we will be stronger than if each specialty works alone. Through the ESC and EANM working group and committee dealing with nuclear medicine and cardiology, we have created the forum where such an exchange and collaboration can take place to promote nuclear medicine and cardiology by interactive research and training, setting of standards and mechanisms of controlling them, and favoring the development of both specialties for the sake of cardiac patients in Europe.

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