## CHALLENGES AND OPPORTUNITIES IN NUCLEAR CARDIOLOGY FROM LATIN AMERICAN AND ASIAN PERSPECTIVES−REVIEW ARTICLE

# Challenges and Opportunities of Nuclear Cardiology from an Asian Perspective

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Abstract

**There are many challenges and opportunities for nuclear cardiology in the assessment and treatment of ischemic heart disease in Asia. A short recitation of the scope of the problem in Asia, the role of nuclear cardiology, and the various impediments to the widespread, appropriate and cost-effective use of nuclear cardiology is given, together with a list of possible solutions to these hindrances applicable to Asian countries.**
**Keywords: Asian, Nuclear cardiology, Utilisation rate**
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With the advent of aging societies, the global burden of non-communicable diseases has risen significantly. Cardiovascular disease (CVD) has become one of the most important health problems worldwide. CVD killed 17. 5 million people globally in 2012, representing 30% of total deaths. Of these deaths, 7.4 million were from ischaemic heart disease and 6.7 million from stroke.

Many risk factors, including hypertension, hyperlipidemia, obesity, smoking, and diabetes mellitus, are known to contribute substantially to age-related increase in coronary heart disease (CHD). However, the importance of each modifiable factor in influencing overall rates of CHD is not homogenous among Asian countries. Stroke is a major cause of morbidity and mortality in East Asian populations, with incidences higher than in Western populations, and the most significant risk factor has been found to be hypertension (1).

Furthermore, heart disease affects different races to varying degrees. In Asian Indians, the incidence of premature CHD is among the highest of all major ethnic groups. This has been attributed to a combination of genetic, dietary, and also environmental factors (2).

Many studies have also shown associations between socioeconomic status and mortality from all causes, with the lower economic classes more susceptible to CHD and stroke (3). Economic progress brings about problems of increased fat intake and a more sedentary lifestyle, leading to obesity and related diseases becoming more prevalent (4). A sustainable solution will require input from both the government and medical community.

### The role of nuclear cardiology

The role of nuclear cardiology (NC) in the management of CHD is undisputed, based on the large amount of literature available. The ability of the various indices available with myocardial perfusion imaging (MPI) to predict cardiac events and guide prognostically significant treatment of CHD is very well established (5). Newer data and techniques such as SPECT and PET absolute blood flow quantitation further refine diagnostic accuracy of NC techniques.

In many developed countries such as the United States (US) and those in Europe, NC is well entrenched, with procedures such as MPI being widely used in the diagnosis and risk assessment of patients with CHD. As of 2009, there were more than 1,000 MPIs done per 100,000 population in the US. In contrast, there were less than 50 MPIs done per 100, 000 population in most parts of Asia, including India and China (6). Fig. 1 shows this data for selected Asian countries. These are mostly developing countries in which the prevalence of

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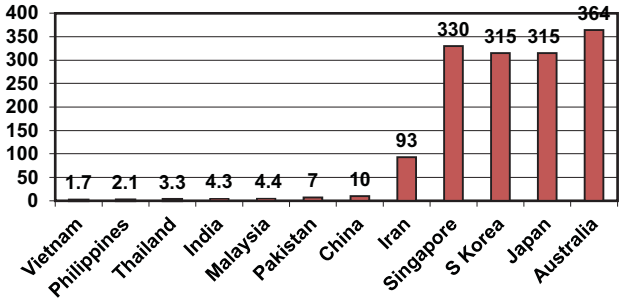


**Fig. 1** Estimated rate of utilisation of MPI for selected Asian countries (per 100,000 population per year) in 2009. The estimated rate in the US is 2,605 per 100,000 population.

CHD is high, but the growth of NC is slow.

NC techniques have the potential to be very useful in guiding cost-effective management when used appropriately, an advantage of particular significance in developing nations where financial resources may be severely limited. It is also necessary to note that while such imaging can confer great benefits, its use should still be based on established recommendations. Development of appropriate use criteria acts as a guide to the relevant use of NC, and will help rein in unrestricted and inappropriate use. This leads to NC techniques being used in a cost-effective manner. The cost-effectiveness of NC has already been established in both the US and Europe.

**Factors influencing the use of nuclear cardiology**

Many Asian countries such as India, China and Thailand are divided into urban and rural areas, with almost all of the nuclear medicine (NM) centres located in the major urban cities. As such, much of the population living in the rural areas are denied access to these facilities. For instance, 72% of the population in India live in rural areas where there are hardly any NM centres.

In these rural regions and smaller cities, hospitals not only lack sophisticated equipment but also trained personnel. In addition, MPI is generally not covered by health insurance, hence costs often prove prohibitive to the average patient, who may not even have health insurance. Import and availability of radioisotopes and cold kits can also prove to be an issue. Licensing restrictions further complicate this situation.

Even in urban centres and more developed nations, there are constraints preventing the effective use of NC. Many countries experience the problem of insufficient training and staffing of nuclear facilities. While Singapore has 0.25 NM physicians per 100,000 population, Indonesia and the Philippines have 0.015 and 0.06 NM physicians respectively per 100,000 population. Not only are nuclear physicians in short supply, nuclear technicians are also in great demand. Furthermore, clinical cardiologists or internists may have inadequate exposure to NM, making them more likely to order other cardiac imaging tests although MPI might confer greater benefit.

In addition, another difficulty faced is the high start-up and recurrent costs of NC equipment. The cost of newer generation cardiac specific gamma cameras is substantial. In many healthcare systems already facing the challenge of limited resources, with subsidies funnelled into other competing areas, such equipment might be seen as unaffordable.

The recent problem of a nuclear reactor accident in Fukushima, Japan has also highlighted the radiation safety aspects of NC (7). It re-emphasises the need for appropriate use of this technology.

**Possible solutions**

As Asian economies develop further and CHD incidence continues to increase in the region, there is great potential for growth in demand for NC services.

By encouraging the development of centres of excellence for training and exchange of experience, we mitigate the challenge of insufficient training. These accredited centres, manned by experienced physicians, provide opportunities for doctors and technical staff from neighbouring countries to train. These doctors can subsequently establish advanced cardiac imaging programmes with useful clinical impact in their home countries.

The distribution of information about the utility of NC techniques in terms of cost-effectiveness and appropriateness should be further encouraged, so that physicians will be able to adopt the best evidence-based approaches to treating CHD.

We can foster closer collaboration and mutual learning between cardiologists, NM physicians and radiologists, while also strengthening research efforts into the cost-effectiveness and appropriate use of cardiac nuclear imaging. In this way, we demonstrate the use of NC in the local setting.

Finally, support from internationally recognised groups such as the International Atomic Energy Agency and American Society of Nuclear Cardiology would undoubtedly bolster the development of NC in the region, both in knowledge and financial support. Various measures already instituted, such as regional training courses on all aspects of NC, have shown results around Asia. Furthermore, support in purchasing of NM equipment has resulted in the development of more NC capable centres and training centres of excellence.

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**Conflicts of interest**

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