

The World Health Organization (WHO) estimates that more than half of the world's population lacks adequate access to diagnostic imaging. Yet, it is without doubt that diagnostic imaging is essential in the health care system, having an essential role in identifying pathology, monitoring disease and preventing disease onset by early detection and screening. Advanced imaging technologies, including MRI, is now commonplace in developed countries but as it is a relatively resource demanding modality, access to this imaging modality highlights the disparity in radiology services across the world. Many countries do not have MRI units, whilst some 'developing countries' including China and Brazil have 6-7 MRI units per million population compared to some 'developed countries' like USA and Japan, which have 35-45 MRI units per million population. Regardless, there is a rising demand in the utilization of MRI with insufficient expertise to meet the workload, reflecting the increasing role of MRI in disease management and patient care. Thus, despite the fact that acquiring MRI technology requires substantial resources, MRI scanners are increasingly deployed in many resource limited countries. China, with its rapid economic development, is estimated to have more than doubled its MRI resources in the past 5 years. Moreover, in many developing countries, the spectrum of diseases is shifting to a higher prevalence of non-communicable diseases, including cardiovascular diseases and cancer, and this may impact on the need for advanced imaging technology including MRI in patient care.

The challenges faced in the provision of MRI services in resource limited, underserved populations are manifold. Access to resources depends on several key components; availability, affordability, appropriateness (acceptance by referring clinicians and patients) and quality. A countries' wealth and health expenditure has a strong influence on availability of hardware, and many developing countries continue to expand MRI services in public hospitals, national referral hospitals and teaching hospitals backed by governmental support. Developing countries with a large gap in socio-economic development across the country often find inequity in access, e.g. it is reported that there are more than double the MRI scanners/unit population in Shanghai, a province with a low rural population percentage in Eastern China compared to Hunan, a large rural province in Central China. There is a notable trend in many developing countries of growth in private sector services for which access is limited by patient affordability, and this contributes to disparate distribution and accessibility within a country. For example, in Brazil more than 90% of MRI scanners are in the private sector. Availability of infrastructure and expertise in equipment maintenance are crucial in sustainability, and this may not be locally available. In resource limited countries, low-cost MRI scanners, which are usually low-field or locally manufactured, are more frequently utilized. Apart from hardware, the availability of human resources that includes trained radiologists and MRI technologists is often lacking in developing countries. Some do not provide structured formal training for radiologists or MRI technologists, and even with available training, there is often a shortage of manpower to meet demand. Many international organizations, including the ISMRM, ACR, WHO etc, offer outreach programs in training and education to developing countries. A global non-profit network organization, RAD-AID International was set up to increase and optimize radiology services in the developing world, including evaluate the need for imaging technology. Some countries with sufficient infrastructure have implemented teleradiology to enhance knowledge exchange and seek consultation in image interpretation.

Due to the high demand of MRI services, resource-limited countries are especially challenged in providing cost-effective services and to maximize utilization. This may be facilitated by highly tailored examinations with the shortest possible scan times, keeping consumables to a minimum, maintaining an efficient streamlined workflow, and with low manpower costs, scanners can be operated with extended hours. It is not uncommon in China that 40-50 MRI examinations are performed per scanner per day. On the other hand, there is a tendency for inappropriate or overuse of valuable MRI resources driven by reimbursement practices and economic incentives in some countries. In order to provide these limited services to patients who will benefit most from the examinations, appropriateness of utilization should be evaluated and prioritization based on clinical need may address the long wait times that is encountered in many underserved populations.

MRI forms an integral and standard component in the provision of quality imaging services. Its availability is also paramount in driving radiology research, elevating the standing of the radiology community and advancing this specialty in developing countries. To deliver MRI services to resource limited, underserved populations, joint efforts by all stakeholders are essential in bridging the gap and thus, taking a step towards improving global health.