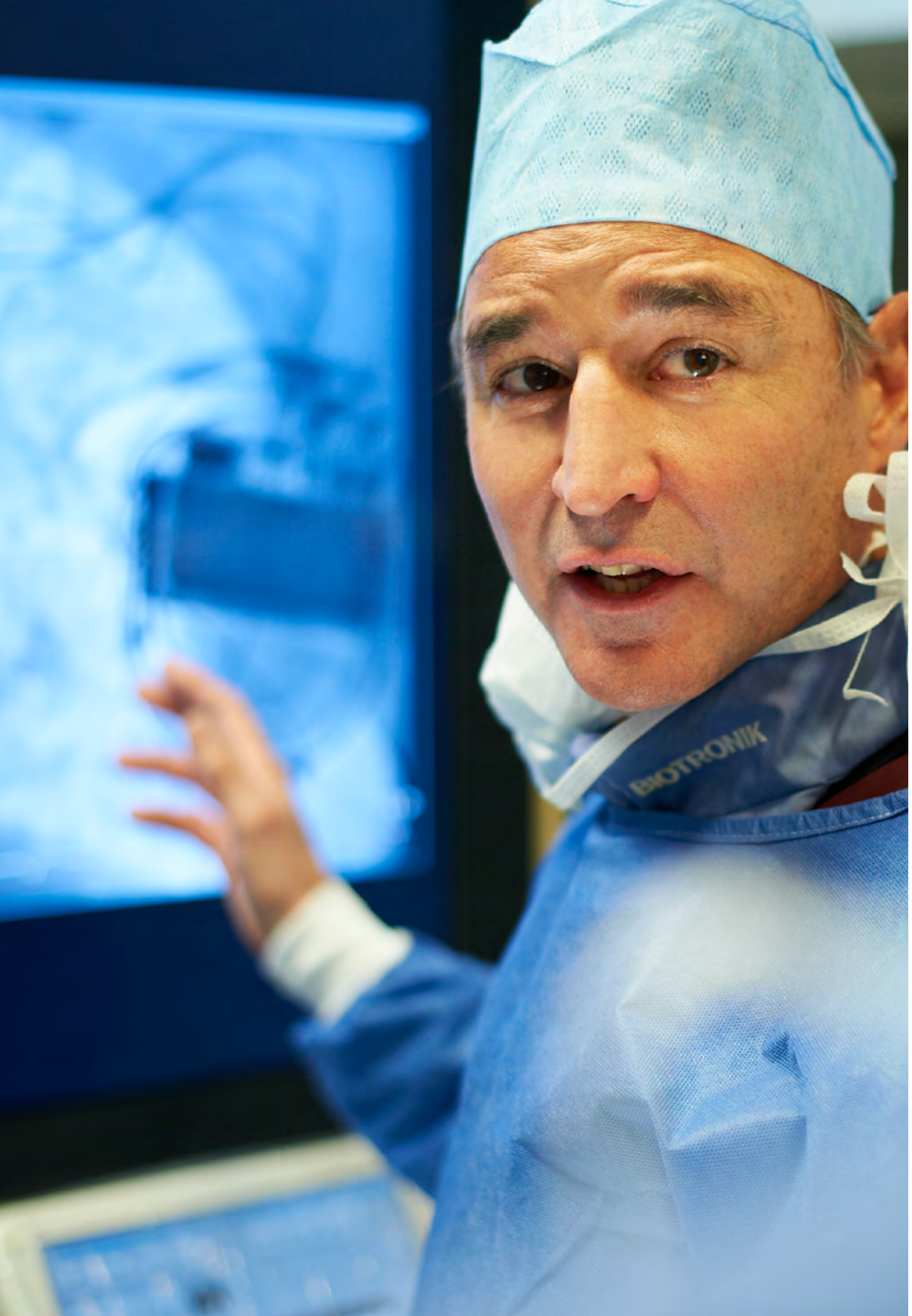
PHILIPS

Beyond the scan:

Transforming healthcare with medical imaging



Contents

The growing need for medical imaging

Enhancing medical imaging is a crucial precondition to address the rapidly growing burden of noncommunicable diseases (NCDs). Recognizing the urgency of this issue, the World Health Assembly adopted a resolution in 2025 that seeks to enhance the global capacity of medical imaging.[1] In addition, the 2025 UN General Assembly political declaration on noncommunicable diseases calls for essential action to achieve the 2030 goal of reducing premature mortality from NCDs by one third. However, despite advances such as AI and virtualization that boost its value, medical imaging remains underprioritized in today's health systems policy agenda.

Increased investment is urgently needed in many countries to reduce waiting lists, save costs and meet health objectives. Significant disparities exist in access to imaging, especially in, but not limited to, low- and middle-income countries (LMICs). Opportunities to strengthen imaging in LMICs are imminent and poised to bring high value to patients. Some return-on-investment models in cancer diagnostic care show that this value may be as high as USD 31.61 for every USD 1 invested. Nevertheless, the importance of diagnostic services tends to be overlooked by policymakers and continues to be the greatest gap in global healthcare systems.[2]

Healthcare systems are facing rapid increases in NCDs, including diabetes, cardiovascular diseases, respiratory conditions, dementia, oral health disorders and cancer among others. NCDs account for 74% of global deaths.[3] However, the 2025 political declaration of the UN General Assembly to reduce premature mortality from NCDs by one-third[4] is highly dependent on universal access to medical imaging. Addressing this challenge is especially important for aging populations in LMICs where a healthier labor force will help to spur economic growth.

Medical imaging is essential across the full cycle of care, including:

1. early intervention,
2. guiding effective and cost-efficient care and
3. efficient monitoring.

It's one of the cornerstones of modern medicine. Thus, it's no surprise that the use of medical imaging has increased tremendously, with the number of imaging procedures in Europe alone increasing by 80% since 2000.[5]

However, healthcare systems have limited budgets and must align the need for medical imaging with tight fiscal envelopes by demonstrating that it improves healthcare productivity and delivers savings. The current productivity of medical imaging improves further due to increasing the efficiency of care workflows, the accuracy and reliability of the diagnostic process, and separating low- from high-value care and preventing clinical waste. As medical imaging is at the forefront of the AI revolution, this seems to be within reach. Once overlooked by policymakers, medical imaging is becoming a major driver in improving the quality of healthcare worldwide.

Medical imaging is highly cost-effective

Medical imaging is crucial for helping clinicians make diagnostic decisions, which means that radiology is much more than a simple cost center for a hospital.[6] Every year a total of 7 billion diagnostic imaging exams influence 70% of all healthcare decisions in the US. We also see 20% of requested exams are never performed due to various circumstances.[7]

Academic research shows high cost-effectiveness ratios for medical imaging. Additional investments to upgrade the world's installed base toward the lower levels of high-income countries create universal access for all and seem relatively minimal: USD 6.84 billion over a 10-year period (2020-30). Low costs for imaging along the care pathway (7% of all cancer spending in the US) and the fact that it saves an estimated 55 million life-years, demonstrate the cost-effectiveness of investing in medical imaging for cancer care. Upfront Investments will be easily paid back through lifetime productivity gains. LMICs may see investments in medical imaging as among the wisest healthcare investments to pursue.[8]

However, there is room for improvement. The diagnostic process is complex, fragmented and iterative which may inflate the risk of errors, delays and associated harm. The Organisation for Economic Co-operation and Development (OECD) estimates a diagnosis error rate of up to 15% in the wider diagnostic system (both imaging and laboratory tests).[9] One study from the US found that between 6% and 17% of all adverse hospital events can be traced back to diagnostic errors.[10] Misdiagnosis is the single largest source of serious harm, resulting in 371,000 deaths and 424,000 permanently disabled patients in US hospitals every year.[11] The OECD estimates that the financial consequences of diagnostic errors account for roughly 17.5% of all healthcare expenses. Misdiagnosis elevates care expenses the most at 11%, followed by overdiagnosis including imaging for low back pain, headaches and low risk cardiac patients at 5.5%, and underdiagnosis contributing another 1%.[12] As much as 80% of all harm caused by delayed or misdiagnosis may be preventable; halving the diagnostic error rate reduces patient suffering and frees up as much as 8% of healthcare expenditure or USD 676 billion.[13] As LMICs face significantly fewer overdiagnoses than affluent states, the relative level of cost-effectiveness will be higher in these countries.[14]

New technologies may further increase the cost-effectiveness of medical imaging. Advanced medical imaging techniques may yield savings by reducing low-value downstream procedures and treatment. Studies have shown that the availability of an MR-scan can shorten multidisciplinary meetings for pre-operative breast cancer patients by 5% on average. Diagnostic pathways in coronary heart disease that included MR were identified as being the most cost-effective and complied with the cost-effective thresholds in the UK.[15] Screening for lung cancer with low-dose CT reduces mortality by 20%.[16]

Box 1: Spectral detector dual-energy CT

Spectral technology delivers downstream cost reduction by improving diagnostic accuracy and helping to avoid low-value follow-up tests. This drives cost efficiency and enhances patient pathway management. One study from Denmark found that spectral CT resulted in 25% less costs than conventional CT due to fewer follow-up procedures in patients with suspected occult cancers.[17] A US study found that dual-energy CT iodine maps of the abdomen and pelvis are associated with decreased follow-up exams, suggesting that this may benefit patient care and decrease institutional costs.[18] AI and other smart technologies can further boost the performance of CT systems, reducing costs and potentially making imaging care accessible to more patients.

Innovations in imaging workflows are also of critical importance. One recent simulation study on optimized, person-centered workflow design that included facility layout, dockable tables and an abbreviated scanning protocol doubled the number of daily MR breast cancer screenings under the most promising scenario.[19] Because modern imaging generates an overwhelming amount of data, solutions like integrative diagnostics may help manage, organize and deliver patient information more efficiently. Integrative diagnostics represents the convergence of medical imaging, pathology and clinical laboratories through advanced technologies, as these tests are typically requested in combination. It seeks to optimize pre-analytic, analytic and post-analytic workflows to provide targeted information for clinical decision-making and break the current siloed reporting of individual specialties.[20] Community diagnostic centers that provide rapid, local access to diagnostic tests across the entire care spectrum can be seen as one embodiment of integrative diagnostics.

To sum up, medical imaging can be a highly effective contribution to delivering better care for more people without compromising financial sustainability.

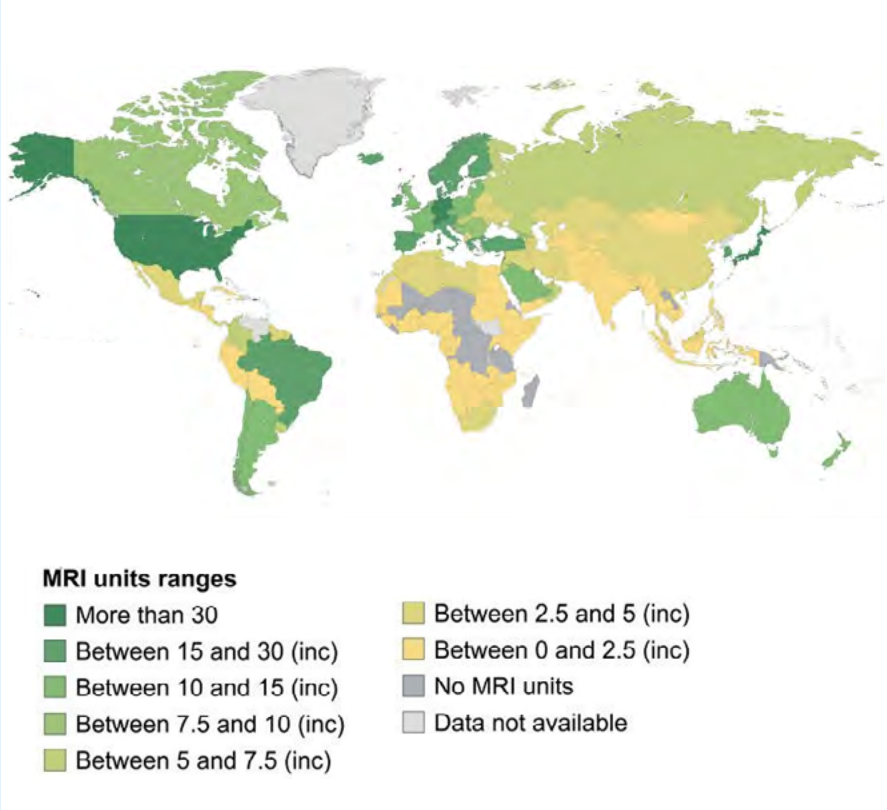
Gaps in access to medical imaging

Despite the high cost-effectiveness ratios of medical imaging and the comparatively low cost of equipment, substantial gaps in access are common. An estimated two-thirds of the global population has no access to medical imaging.[21] In many LMICs, medical imaging equipment, not including ultrasound and x-ray, is still largely absent. Lack of imaging services creates substantial gaps and inefficiencies for integrative diagnostics, patient treatment, therapy guidance patient monitoring and treatment response. Reducing the current disparities in access is essential to achieve universal health coverage.

Even in countries with a larger installed imaging base, the waiting times for a scan can sometimes be substantial. Gaps in access may be critical in care pathways, such as oncology, stroke, respiratory and cardiovascular care. Globally, up to 70% of people with COPD or asthma are undiagnosed and 95% of stroke patients lack access to interventional treatment. In New Zealand, 51% of lung cancer cases are diagnosed through emergency care, versus 28% in Ontario, Canada and 21% in the US.[22] In valvular disease, which is common in 25% of people over 60 and may induce heart failure, 95% of these patients remain undiagnosed. Developments in intracardial ultrasound and minimally invasive treatments can help address these challenges.

A substantial variation exists between countries in installed imaging equipment (Figure 1). High-income countries that run a comparatively dense network of hospital facilities, such as the US and Germany, tend to have the greatest number of MR (and CT) devices. However, even in the US, growth of imaging demand through 2055 is projected to increase by 27%, with the patient-to-imaging ratio doubling among adults 65 and older.[23] The UK and the Netherlands, which have comparatively fewer hospitals than the US and Germany, typically maintain a smaller equipment base. However, the most striking takeaway in Figure 1 is the low installed base of MR equipment across large parts of the globe, a situation that is similar for CT (not shown). Policies that set minimum standards for medical equipment could help to ensure more equitable access to diagnostic infrastructure.[24]

Figure 1: Estimates of the number of MR units per million inhabitants[25]



Maintenance of the equipment installed base is crucial for ensuring patient value. Medical devices become outdated and replacement rates don't always keep pace with technological advancements. In the EU, almost 30% of currently installed MR and CT equipment is over 10 years old. As medical imaging technology evolves, equipment modernization may increase disparities in some countries. Systematic renewal programs with protected funding could address this challenge.

There is a need for upfront investments to close any gaps in access to medical imaging, but many countries struggle to provide the necessary capital. The cost of increasing the availability of medical imaging equipment in LMICs towards the lower standards of high-income countries has been estimated to be around USD 6.84 billion.[26] Such investments must fit tight budgets for capital investments. OECD estimates that its member states on average need to spend 0.13% of their GDP to close current gaps in medical equipment and software.[27] The costs of managing medical imaging equipment are also substantial: top-notch maintenance, Picture Archiving and Communication Systems (PACS) and reliable access to high-speed internet are required for effective performance. Highly skilled staff are another requirement. Modern imaging is embedded in a complicated and rapidly evolving ecosystem, and a high level of education and training is paramount. However, trained staff are scarce and aging out of the workforce: 45% of European radiologists are over 51 years of age.

Next level productivity: AI, portability and teleradiology

The rapid advance of AI[28] is driving the evolution of radiology: currently 77% of FDA approved AI medical devices are in radiology.[29] AI enhances diagnostic accuracy and workflow efficiency (Box 2). Deep learning models can identify abnormalities, such as lung nodules, with greater speed and accuracy compared to traditional methods.[30] Other AI advancements include reduced diagnosis times, more streamlined workflows and better patient outcomes.[31] New technologies are enabling better access by bringing medical imaging closer to the patient. Ultrasound is exemplary, but helium-free MR can also increase portability through the use of mobile units. Additionally, teleradiology and radiology operations command centers (ROCCs) can enable more efficient time-capacity utilization of radiologists and operating staff. More importantly, these innovations may be used concurrently. For example, a nurse may use a mobile ultrasound to accurately capture an image from a patient, AI can interpret the image, and a consultation can occur virtually by connecting remotely to a chatbot or radiologist.

Box 2: Disruptive innovations in radiology speed productivity

1) Artificial intelligence (AI)

AI is elevating medical imaging capabilities, particularly in analysis and interpretation. Utilizing deep learning techniques like convolutional neural networks, AI excels at detecting intricate patterns and anomalies, often achieving higher accuracy than human practitioners. Moreover, AI can support clinicians by decreasing cognitive burden, streamlining workflow and enabling faster diagnostic processes, which leads to improved patient outcomes across healthcare settings.[32]

2) Portability

Many new technologies are especially valuable in remote rural areas and emergency departments, such as handheld ultrasound machines that can provide immediate imaging for trauma patients.[33] Helium-free MR machines can be used in mobile units due to decreased weight, allowing improved accessibility in communities that are difficult to reach or in areas with reduced space availability.

3) Teleradiology

Teleradiology and radiology operations commands centers connect patients and equipment with remote radiologists. Teleradiology is growing rapidly, being driven by a shortage of radiologists, an increased focus on efficiency, growing numbers of outpatient treatments, more requests for second opinions and rising demand for reporting outside of office hours. One report predicts an annual market growth of over 25% with Asian countries, like China and India, seeing the most rapid growth.[34]

Skilled workforce is needed

Diagnostic skills rely on calibrating measurements, careful assessment and continuous feedback that often involve multiple care teams. Radiologists require extensive training and typically face five years of additional training after their medical degree. In the US, the UK and many other countries, worker shortages are widespread. Clinical staff, including radiologists and radiographers, and operational staff, such as medical technology experts, are all in short supply. For example, in the US, the demand for radiologists is expected to reach a shortfall of 140,000 full-time equivalents by 2036.[35]

While structural gaps currently exist in educational capacities,[36] use of technology could help to address these challenges. For example, the integration of virtual (VR) and augmented reality (AR) may enhance the educational experience. VR reading rooms allow radiologists to engage with 3D imaging data, boosting diagnostic accuracy. Immersive platforms, such as ROCCs, may facilitate collaboration among professionals and promote case discussions regardless of location.[37]

A policy agenda

Medical imaging plays a critical role in modern healthcare, particularly in the prevention and control of NCDs. The recent WHO resolution on strengthening medical imaging capacity demonstrates that safe, affordable and high-quality imaging is a cornerstone of accessible healthcare – but it continues to lack adequate policy attention. For example, radiologists have minimal representation on international committees, and relevant policy documents are scarce.[38] Two key challenges lay ahead:

1. increasing imaging capacity in underserved areas and
2. capturing the benefits of next-generation imaging systems by widespread use of innovations such as AI, teleradiology and point-of-care testing.

What policies to pursue?

1. Set standards and secure capital (2026–2027)
Policies that set standards for timely imaging are advised but only exist in a handful of countries.[39] WHO and medical societies should publish minimum imaging capacity benchmarks in 2026. Governments are recommended to establish dedicated multi-annual capital budgets with mandatory 7–10 year equipment replacement cycles. Development banks should lead innovative financing through blended finance, public-private partnerships and social impact bonds to address the USD 6.84 billion global gap.

2. Deploy hub-and-spoke networks (2026–2028)
Countries should pilot integrated diagnostic networks connecting remote sites to centralized command centers using teleradiology and telehealth platforms. Priority should go to underserved regions and geographically dispersed populations. Deploy technology-agnostic solutions integrating CT, MR, ultrasound and X-ray based on population needs.

3. Modernize payment systems (2026–2027)
Governments are encouraged to reform reimbursement systems to make diagnostic value visible rather than embedding imaging as cost centers. Creating codes for AI-enhanced services and digital diagnostic delivery, including telehealth and remote interpretation, will enable appropriate financing. Support shifts toward integrated diagnostics platforms optimized for each country's context.

4. Build workforce capacity (2026–2030)
Scaling education infrastructure through regional centers of excellence with public-private partnerships is essential. Embed AI and digital tools in medical curricula from the start. Creating sustainable career pathways can address critical workforce shortages. Human capacity needs to grow in parallel with technology deployment.

5. Strengthen digital infrastructure (2026–2030)
Countries are advised to develop integrated strategies for data interoperability, cloud storage, high-speed connectivity and AI deployment that enable both workforce productivity and network scalability. Implementing quality monitoring systems will track diagnostic performance and patient outcomes.

How do you pursue these policies?

Capturing the value of medical imaging within the wider healthcare sector is a complex and highly political endeavor. This task requires deep partnership between multiple policymakers covering topics from payment, regulation and provision to communication, planning and beyond. The alignment of multiple policy tools is essential for creating leverage and steering change, in addition to strong stewardship and collaboration between all stakeholders. Improving healthcare systems worldwide is an attainable goal that will improve the lives of millions and enable better care for more people.

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