Global access to medical imaging and nuclear medicine

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Medical imaging is key to accurate cancer screening, diagnosis, staging, monitoring of response, and detection of recurrence. In high-income countries (HICs), these techniques have important roles in both the planning and delivery of cancer therapies. Several studies have shown that medical imaging has a tremendous impact on treatment decisions and selection of the most appropriate plans for individual patients. Unfortunately, substantial infrastructure and personnel challenges exist for the implementation of medical imaging in low-income and middle-income countries (LMICs). The *Lancet Oncology* Commission on imaging and nuclear medicine makes a persuasive argument to include imaging as part of comprehensive approaches to reduce global morbidity and mortality from cancer and recommends actions to increase implementation in LMICs.[1] This Commission builds upon two reports published in 2015 regarding gaps in access to cancer surgery and radiotherapy in LMICs.[2,3]

A key point in this report is that the scale-up of imaging capacity should be comprehensive and strategically aligned with treatment capacity. Advanced imaging can increase the effectiveness of available treatments, but the clinical benefit is diminished if imaging results are not used in clinical decision making because of inadequate treatment resources. In a modelling study linked to the Commission, Ward and colleagues[4] used a microsimulation model of stage-specific cancer survival in 200 countries and territories for 11 cancers to show that cancer imaging can improve 5-year survival rates by more than ten times by enhancing and guiding treatments. Similarly, in the Commission itself, Hricak and colleagues[1] used a microsimulation model to show that imaging, treatment, and quality of care combined would save more than 9·5 million lives between 2020 and 2030. Furthermore, the synergy between imaging and therapy is cost-effective in the long run, which is crucial for initial investment and sustainability.

Potential funding sources to support the comprehensive scale-up of cancer care include international non-governmental organisations and domestic sources. The funding should be specific to the needs and capabilities of each LMIC. Consideration of the incidence of specific types of cancers in the local populations will also inform the strategic selection and implementation of imaging techniques. Compared with HICs, patients in LMICs might have more advanced disease, and the distributions of cancer types might differ because of environmental factors, barriers to cancer screening and primary care, and genetics.[5,6]

Although there is a gap between HICs and LMICs in all types of medical imaging, more advanced medical imaging techniques that are highly relevant to cancer, such as PET combined with CT (PET/CT), show even more pronounced inequalities. An additional challenge for nuclear medicine studies is the need for radiopharmaceuticals, with potential barriers including cost, availability, regulatory issues, and supply chain and distribution. Reliable supply and distribution chains are particularly important when considering the short half-life of radiopharmaceuticals (typically from hours to a few days) because delays can render them unusable. Another report, which focused on the use of nuclear medicine in a regional hospital in Nigeria, highlighted that, in addition to infrastructure and training, strategic plans on how to implement imaging into the clinical workflow and geographical access issues should also be considered.[7] Even in wealthier nations, substantial variation exists in the implementation of PET/CT scans.[8]

In some cases, there might be an opportunity to implement more advanced imaging techniques at an earlier stage rather than a gradual progression of medical imaging technologies—eg, ^{68}Ga generators that last for months can provide on-site and on-demand labelling of radiopharmaceuticals, such as ^{68}Ga-DOTATATE and ^{68}Ga-prostate-specific membrane antigen, which can be prepared at local sites using kits. Generators allow more rapid and inexpensive initial access to radiopharmaceuticals compared with expensive cyclotron facilities, which might be used at a later phase. Similarly, techniques such as artificial intelligence (AI) and other advances in the digital sciences could be incorporated early on. With adequate internet connectivity, AI and similar advanced computation techniques could be used with cost-effective cloud computing.

The era of the COVID-19 pandemic has also highlighted the possibilities of telemedicine in medical imaging.[9] Although physical equipment and trained personnel are still required on-site for image acquisition, other components such as downstream data processing, image analysis, and physician interpretation need not be on-site. There could be possibilities for on-line and virtual training sessions led by experts from around the world.

The 21st century has seen great and continuing advances in medical imaging and nuclear medicine, but the resulting improvement in cancer care has been largely restricted to HICs. Millions of lives could be saved over the next decade if these advances can be implemented in LMICs as part of comprehensive approaches to improving cancer care. Although technology will play a part, leadership at the international and national levels, along with recognition by stakeholders and policy makers of the key roles medical imaging and nuclear medicine play in cancer care, is most important. The *Lancet Oncology* Commission provides recommendations and goals to make this comprehensive approach to cancer care a reality.

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