The benefits of integrating medical imaging and nuclear medicine

The *Lancet Oncology* Commission's important report on medical imaging and nuclear medicine provides a blueprint for the coordinated implementation of diagnostic imaging, treatment systems, data integration tools, and workforce training programmes for the next decade.[1] It outlines the substantial health and economic benefits to be gained from investment in the scale-up of cancer imaging capacity for both adults and children, especially in low-income and middle-income countries (LMICs). Moreover, if investments in radiotherapy, surgery, and medical treatment occur alongside investments in imaging equipment, the forecasted health and economic benefits could be substantial.

The microsimulation model provides compelling estimates. Most notably the base case, which would solely involve investment in diagnostic imaging infrastructure, suggests that more than 2 million lives and tens of millions of life-years could be saved between 2020 and 2030. Correspondingly, gains in productivity would run to more than US$1 trillion—an almost 180-fold net return on investment. However, more importantly, when such investments are combined with treatment systems in the comprehensive scale-up scenario, the numbers of incremental lives and life-years saved rise further by a factor of four and the corresponding benefit to lifetime productivity and net economic value runs to more than $2·6 trillion.

To begin such a process of transformation, the authors rightly suggest the implementation of focused programmes, at a country or regional level, as the best way to deliver the growth in required infrastructure. Such programmes would of course require financing based on sound clinical and economic benefits, not only in the purchasing of equipment, but also in workforce training and its scalability. The lack of a skilled, available, and scalable workforce of radiologists, radiographers, physicists, nurses, and technologists to operate care services is often overlooked in the race to build infrastructure, so the report rightly emphasises the necessity to manage such programmes holistically, whereby imaging and treatment equipment installation, digital platforming, servicing procedures, and staff recruitment and training should be done with a view to addressing the entire value stream and care pathway. One missing link will likely cause the rest of the offering to fail.

The coordinated procurement of flexible financing, investment in the training of professionals in pathology and radiology, installation of affordable infrastructure, use of simplified models of care, such as rapid diagnostic or one-stop clinics, that leverage scalable digital integration platforms that incorporate mobile teleradiology and telemedicine technology beyond the hospital or clinic walls will also be key to delivering the clinical and economic outcomes outlined above.

The *Lancet Oncology* Commission report also emphasises the importance of the multimodal nature of cancer diagnosis—ie, knowledge of disease pathology, imaging, medical history or records, and increasingly genetic data—which is crucial to the planning of the best available treatment and treatment combinations. However, because there is a serious shortfall in the number of professionals trained in these disciplines, comprehensive training programmes in pathology, blood and urinary analyses, radiochemistry, pharmacy, and quality also need to be put in place to provide multimodal testing, supply quality-tested diagnostics, and for dispensing treatments.

Turning to medical treatments, the emergence of radiotherapy and theranostics as a cost-effective means of treating cancer is becoming clearer. Advances in the way these treatments are used with surgery, chemotherapy, and immunotherapy could transform the care focus from palliative to curative. Digital tools and machine learning algorithms, which are being introduced around the world, could also be used for the management and triage of patients with cancer, or to prioritise populations at high risk from specific cancers—eg, lung, colorectal, liver, cervical, ovarian, prostate, and breast.

Although digital science and novel analytical tools, such as artificial intelligence and machine learning, have the potential to transform the availability of and access to high-quality diagnosis and decision making, especially in LMICs, the adoption of such advanced

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technology may still be a few years away, so the authors also correctly state that some form of imaging is always better than nothing. Indeed, even if the available imaging is not ideal, the rapid growth in evidence-based information is helping enormously to guide the procurement of the most appropriate equipment for each setting.

In time, the installation of digital technologies to store, integrate, manage, and analyse data will be key to preventing the newly curated imaging, pathology, patient history, and genetic data from being lost, remaining fragmented, or being inaccessible for timely, immediate decision making, or, more importantly, learning for algorithmic decision making in the future. Such additional infrastructure will, in future, stop cancer care being driven by trial and error and accelerate personalised and precision cancer care. In conclusion, the rationale for investment in imaging and treatment solutions is clear. Realising these benefits will require coordinated financing and investment in people, training, infrastructure, and digital technologies. Importantly, it will also take time, trust, close cooperation, and partnership.

I am the President and Chief Executive Officer of GE Healthcare and therefore a full-time employee of the company. I have had my travel costs reimbursed by GE Healthcare.

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1 Hricak H, Abdel-Wahab M, Atun R, et al. Medical imaging and nuclear medicine: a *Lancet Oncology* Commission. *Lancet Oncol* 2021; published online March 4. https://doi.org/10.1016/S1470-2045(20)30751-8.