Artificial intelligence: A new era of technological advancement in oncology care

Padmaj S. Kulkarni*, Shruti S. Gandhi, Sachin S. Hingmire, Chetan D. Deshmukh

Department of Medical Oncology, Deenanath Mangeshkar Hospital, Pune, Maharashtra, India

*Dr. Padmaj S. Kulkarni,
Department of Medical
Oncology, Deenanath
Mangeshkar Hospital, Pune,
Maharashtra, India.

padmaj.kulkarni@gmail.com

Technological evolutions in the field of medicine have paved a way for artificial intelligence (AI) to be a useful tool that will aid improved patient care. AI is defined as the ability of a computing device to mimic the intellectual process of humans. Furthermore, machine learning is defined as the ability of computers to learn from the data, which is an important subset of AI. AI and machine learning can be useful to determine the risk of developing cancer or its recurrences and its treatment complications and improve diagnostic investigations and prognosis of cancer.[1] However, this technological evolution has not yet completely spread to the oncology community.[2]

Many times, enormous research data make it difficult, time-consuming, and laborious for oncologists to find an answer for a specific medical question. Thus, there has been a dire need for a better tool that will analyze huge datasets, research articles, clinical trials, drugs available, genetic information, etc., and present it to the oncologist to provide patients with better oncology care. AI is the answer to such a demanding circumstance.[2]

IBM Watson for Oncology stores the growing body of medical literature, tries to understand the data to generate insights, and helps the oncologists to review the treatment options.[3] It has been installed in several hospitals across the globe, which has been reported to accurately diagnose cases of lung, colon, and rectal cancers.[1]

A research conducted by Dr. Sebastian Thrun from Stanford AI Laboratory stated that the AI-powered deep convolutional neural network algorithm outperformed board-certified dermatologists at diagnosing skin cancer. This was clearly suggestive of the necessity of AI algorithms in improving cancer diagnosis in future.[3]

AI or artificial neural network has been used to predict patient prognosis. In a study by Chen *et al.*, gene expression data were utilized, which helped researchers to classify patients into low-risk and high-risk groups with an accuracy rate of 83% ($P < 0.00001$) using the artificial neural network.

SOPHiA Genetics has developed cognitive computing in oncology which uses AI to determine gene mutations causing cancers. By speeding the interpretation of somatic genomic alterations, it offers rapid clinical-grade analytical performance and assists doctors in choosing the ideal treatment for each patient.[4] In addition, health-care providers can also use AI as a diagnostic tool in medical imaging. For example, although current US screening recalls 10% patients for further investigations, only 5% turn out to be affected by the disease. This high false recall rate leads to unnecessary medical procedures, including breast biopsies, medical costs, and psychological stress for patients. In this case, Therapixel, a company specializing in medical imaging, uses AI to deliver automated mammography analysis, which reduces costs and improves the rate of false positives.

Google AI is also developing an augmented reality microscope that uses AI, in place of manual cell counting, to detect and localize tumors. This platform uses a modified light microscope for real-time image analysis, and it presents the reports of the machine learning algorithms into the pathologists' field of view. By retrofitting it into prevailing light microscopes in clinics and hospitals, pathologists can

reduce their dependence on digital representations of the sample tissues being analyzed.[5]

In another study by Ibragimov and Xing, AI technology was developed to identify organs at risk on computed tomography simulation scans performed for head and neck radiation treatment planning. Although useful, this study highlighted the limitations of AI in the health-care sector. AI technology was inferior at segmenting objects with poorly recognizable boundaries such as parotid glands and submandibular glands. In addition, some of the barriers associated with the implementation of machine learning programs are data quality, high cost, and importantly, its acceptance by patients and health-care professionals. It is essential to provide health-care professionals with better understanding of AI with respect to its benefits and drawbacks, along with proper validation of data. Thus, this technologically evolved practice can eventually support better patient care with improved health outcomes.[1]

REFERENCES

1. Khan OF, Bebb G, Alimohamed NA. Artificial intelligence in medicine. What oncologists need to know about its potential and its limitations. Oncol Exch 2017;16:8-13.
2. Curioni-Fontecedro A. A new era of oncology through artificial intelligence. ESMO Open 2017;2:e000198.
3. Li B. AI in oncology: When science fiction meets reality. Artif Intell Oncol 2018;1:1-2.
4. Available from: https://www.sophiagenetics.com/sophia-ai/genomics/oncology.html.[Last accessed 2019 Jan 30].
5. Available from: https://www.ai.googleblog.com/2018/04/an-augmented-reality-microscope.html.[Last accessed 2018 Dec 15].