Editorial

The Integration of Artificial intelligence and Diagnostic Medicine: A New Era of Healthcare

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The healthcare industry is rapidly evolving with the advent of digital healthcare technologies, including artificial intelligence (AI), nanotechnology, and robotics. The digitization of healthcare offers various opportunities to enhance clinical outcomes, monitor clinical data, and reduce human errors. AI methods, which include machine learning and deep learning, are crucial in improving clinical systems, managing patient records, and treating various diseases. The system employs complex algorithms and can improve accuracy through self-correction. By extracting essential data from a vast pool of patients, advanced techniques are used to predict health risks and outcomes. AI has advanced with sophisticated tools such as deep neural networks, computer vision, natural language processing, and robotics[1, 2].

AI is a multi-disciplinary area that can aid in developing cost-effective, accessible, and precise medical diagnostic tools for screening and detecting chronic illnesses like cancer, diabetes, and tuberculosis. Additionally, AI tools can decrease the diagnostic processing time and costs, as well as increase healthcare system throughput, resulting in a significant reduction in stress on existing healthcare systems[3].

Numerous AI tools have been studied to aid histopathological diagnosis and identify information pathologists may find challenging to recognize. AI technology can accurately identify and quantify cells, assess immunohistochemical biomarkers, and evaluate tissue characteristics like spatial arrangement, density, and architectural patterns. Furthermore, AI applications can assist in establishing standard histological scoring criteria such as breast cancer grading and the Gleason score for prostatic carcinoma[4-6]. AI in pathological diagnosis can also be helpful for rare and complex disorders that general pathologists infrequently encounter. Through content-based image retrieval (CBIR), AI can search for and retrieve similar images from large histopathological databases. This technique enhances the likelihood of accurately diagnosing challenging cases by rapidly retrieving similar cases from easily accessible image databases that contain rare and complex cases. The image similarity reflects associated histopathological features rather than image resemblance[4, 7].

AI algorithms can identify human genetic patterns and diseases by analyzing genetic data. Deep learning algorithms, in particular, can be used for clinical diagnostic tasks, predicting RNA-Seq profiles, and advancing precision medicine for complex diseases using extensive genomic databases. Moreover, deep learning algorithms can assist in variant calling and classification and mapping and classifying phenotypic versus genotypic data. Currently, these algorithms are applied in genomic applications that involve nucleotide sequence data[8].

Machine learning models that utilize imaging can predict future outcomes for cancer patients, such as local or distant recurrence and mortality. These models can personalize care for cancer survivors, including surveillance and preventative strategies to prevent a recurrence. New imaging-based machine learning models can also predict tumor pathology and genomic alterations without actual sampling, known as "virtual biopsy". For instance, noninvasive imaging-based models for glioblastoma can predict genetic alterations within the tumor and impact clinical management. Although standardizing imaging data and creating reproducible machine learning models is necessary, it is evident that these models will significantly impact cancer care beyond just diagnosis[9].

AI can facilitate detecting lesions, providing differential diagnoses, and producing automated medical reports. Recently, it has been used to screen for diabetic retinopathy, identify skin cancers, and predict cardiovascular risk with better accuracy than established algorithms. It has also been studied to predict Alzheimer's disease progression and drug therapy response from amyloid imaging data[10-12].

In 2018, the Pakistani government established the National Centre of Artificial Intelligence (NCAI) as part of a presidential initiative to introduce an AI program. Despite this introduction, the implementation of AI in the healthcare sector in the country has encountered several difficulties. These challenges include resistance from healthcare providers, financial constraints, a shortage of trained professionals to develop diagnostic protocols for the AI algorithms, insufficient data on the public's views and the impact of AI, concerns about replacing physicians, social barriers, confidentiality issues, and potential medicolegal implications[13-14].

The use of AI has some drawbacks, including high costs, job loss, decreased human creativity, potential

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misuse, and the need for proper training. Creating awareness, cybersecurity measures, cost reduction, and backup systems can help overcome this limitations[15]. Despite challenges such as data integrity and ethical considerations, AI has the potential to revolutionize healthcare and medicine and improve efficiency if regulatory approvals are addressed.

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