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Letter to the Editor

The future of Artificial Intelligence in Ophthalmology

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To the Editor:

Health systems across the world are facing a growing challenge of providing eye care for their populations. The prevalence of eye conditions which can lead to visual impairments in projected to increase, from 596 million people with distance vision impairment in 2020, to 895 million people in 2050 [1]. However over 90% of those affected have a treatable or preventable cause, and are primarily found in low and middle-income countries.

Diabetic retinopathy (DR) is the leading cause of preventable blindness in adults worldwide. It is evident from the literature that early diagnosis and timely treatment can help prevent visual loss and blindness, and most developed countries have regular screening programmes in place to improve diagnosis, monitoring and treatment [2]. These programmes are costly to establish, and with the prevalence of diabetes and subsequently DR increasing, the financial strain is even more burdensome. At present, the majority of programmes require specialists to grade fundoscopic images. Unfortunately, developing countries are unable to establish sustainable screening programmes for their populations due to these factors.

Digital ophthalmology has played a major role in improving the delivery of eye care and the development of artificial intelligence (AI) in particular, has opened the door to improving access to and the efficiency of eye care services. Ophthalmology has become known as a pioneer in the application of AI to clinical practice, with the development of deep learning algorithms that can accurately predict and diagnose conditions. Deep learning is a machine learning technique which learns to perform specific tasks by analysing large amounts of data. The literature on state-of-the-art DR screening technologies is rapidly growing, and a recent review found them to have robust performance in detecting DR [3]. The review noted that a majority of these were not commercially available and were not yet incorporated into clinical practice. The main advantage of automated DR screening technologies is that they can grade images much quicker than humans and the number they can process is only limited by hardware. Whilst they have been shown to be robust and accurate, human graders are required to improve specificity, by grading unclear, irregular or low quality images.

It is important to consider future challenges in implementing AI in the specialty, at scale. Specifically, human factors need to be explored and addressed, such as patients and doctors' perceptions towards the efficacy, safety and trustworthiness of AI. For example, there are medicolegal issues to consider, in terms of how much responsibility would be assigned to an algorithm compared to the practitioner. There are also concerns relating to the interpretability of AI models. When an AI algorithm analyses image or data, it does so based on self-generated rules and we do not fully understand how a model reaches its conclusion. This is referred to as the "black box" problem [4], and poses ethical dilemmas for practitioners. There is hesitancy and mistrust amongst some clinicians due to a lack of exposure and education on AI. Clinicians are not conventionally trained or taught how AI works, and their engagement with it is largely limited to a user interface level. Ensuring AI teaching is incorporated into medical curriculums would help facilitate their integration into the development of new technologies.

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