# Artificial intelligence in cataract management: current and future directions

Jennifer J Palmer[1], Jane Sujuan[2]

Singapore Eye Research Institute, Singapore.

## Abstract:

The rise of artificial intelligence (AI) has brought breakthroughs in many areas of medicine. In ophthalmology, AI has delivered robust results in the screening and detection of diabetic retinopathy, age-related macular degeneration, glaucoma, and retinopathy of prematurity. Cataract management is another field that can benefit from greater AI application. Cataract is the leading cause of reversible visual impairment with a rising global clinical burden. Improved diagnosis, monitoring, and surgical management are necessary to address this challenge. In addition, patients in large developing countries often suffer from limited access to tertiary care, a problem further exacerbated by the ongoing COVID-19 pandemic. AI on the other hand, can help transform cataract management by improving automation, efficacy and overcoming geographical barriers. First, AI can be applied as a telediagnostic platform to screen and diagnose patients with cataract using slit-lamp and fundus photographs. This utilizes a deep-learning, convolutional neural network (CNN) to detect and classify referable cataracts appropriately. Second, some of the latest intraocular lens formulas have used AI to enhance prediction accuracy, achieving superior postoperative refractive results compared to traditional formulas. Third, AI can be used to augment cataract surgical skill training by identifying different phases of cataract surgery on video and to optimize operating theater workflows by accurately predicting the duration of surgical procedures. Fourth, some AI CNN models are able to effectively predict the progression of posterior capsule opacification and eventual need for YAG laser capsulotomy. These advances in AI could transform cataract management and enable delivery of efficient ophthalmic services. The key challenges include ethical management of data, ensuring data security and privacy, demonstrating clinically acceptable performance, improving the generalizability of AI models across heterogeneous populations, and improving the trust of end-users.

## Importance of research:

Current and projected HReH and CSR target performance across the sample was assessed in three ways: by pooling the total number of practitioners or surgeries from all countries and dividing this numerator by the total population of all countries reporting data (sub-Saharan Africa 'regional ratio'); by calculating the average practitioner-to-population ratio and CSR across countries (country mean); and by calculating the median practitioner-to-population ratio or CSR across countries (country median). All three are normally

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reported for comparison. Risk ratios were calculated to test for a significant difference in proportions between 2011 and 2020 regional ratios. Given that CSRs are affected by both surgeon-to-population ratios as well as by surgical efficiency ratios, 2020 CSRs were additionally predicted under two ideal scenarios (target ratio of surgeons achieved with current surgical efficiency maintained, and target surgical efficiency reached with current growth of surgeons maintained) to identify where investment might best be focused to achieve the 2,000 cataract surgeries per million population indicator in each country.

## Biography:

Assistant Manager Assistant Manager Singapore Eye Research Institute Singapore Eye Research Institute Nov 2015 - Present · six years 3monthsNovember 2015 - Present · 6 years 3 months Duke-NUS Medical School Senior Executive Senior Executive Duke-NUS Graduate Medical School Duke-NUS Graduate Medical School He has the experience having five years. He also speaks in Chinese (Simplified) English.



### About Institute:

The Singapore Eye Research Institute (SERI) was conceived with the foresight of a visionary leader, the late Professor Arthur Lim. Professor Lim, who is the founder and first Medical Director of the SNEC, had keenly pursued the idea of an eye research institute in a period of time when research was hardly in vogue in Singapore. Established in 1997, SERI is Singapore's national research institute for ophthalmic and vision research. SERI's mission is to conduct high-impact eye research that prevents blindness, low vision and major eye diseases common to Singaporeans and Asians. Over the last decade, SERI has conducted landmark research projects that have led to tangible outcomes, patient benefits, and success stories. It has paved the way for significant improvements in how eye diseases are treated and prevented, not just for Singaporeans or Asians, but on a global scale. At its inception, SERI saw a national remit in ophthalmic and vision research, and till today, despite the demarcations introduced by the healthcare clustering system, SERI bridges the clusters with a presence in each cluster. SERI ensures that its facilities and resources are open to researchers across Singapore so that the greatest benefit may be obtained from what is a relatively small clinical ophthalmology catchment area in Singapore.

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