

What is personalised healthcare in ophthalmology?

Personalised healthcare is an approach that is centred on an individual's health needs - taking into account genetic information as well as personality, lifestyle and environment, and their rehabilitation, socialisation and mobility needs.¹ The aim of personalised healthcare in ophthalmology is to find prevention and treatment strategies tailored to each individual, successfully treating specific eye diseases, and preventing vision loss.²

Advances in diagnostic tools and technologies have transformed ophthalmological care from a traditional approach to a precision approach, allowing for more personalised treatments in the future:¹

PAST	NOW	FUTURE
Traditional healthcare approach	Precision healthcare approach	Personalised healthcare approach
Treatment limited to surgical procedures (e.g. laser photocoagulation, a type of laser surgery for the eyes) which often has poor visual outcomes and high safety risks. ³	Using cutting edge technology (e.g. artificial intelligence and genetic 'biomarker' testing) to more accurately diagnose eye disease and tailor care with targeted treatments (e.g. Anti-vascular endothelial growth factor (anti-VEGF) treatment used for wet age-related muscular degeneration (AMD), which have helped to preserve vision which, in the past, may have been lost completely). ⁴⁻⁶	Tailoring care for every person's unique eye disease, taking into account the genetic information of each patient and their condition, as well as the person's lifestyle and environment. ⁶⁻⁸

Through what methods could personalised healthcare be achieved in ophthalmology?

Artificial Intelligence

AI, based on deep learning, is a broad area of science which aims to develop computers and machines that have the ability to use information in the same way that people do.⁹

It is expected to have a dramatic impact on medicine, by improving our ability to diagnose disease and select the most suitable treatments for individual patients.

It allows large amounts of data to be analysed very quickly, empowering healthcare professionals to make more effective, and efficient, treatment decisions.¹⁰

While the widespread use of AI in ophthalmology is still something for the future, one potential application is to more accurately predict the development of wet-AMD, allowing doctors to diagnose and start treatment earlier.¹¹

Genetic Information (Biomarkers)

Biomarkers are substances found in cells (e.g. genes) that provide important information about a specific eye disease.^{12,13}

By using detailed eye images and gathering genetic information, it is possible to carry out 'biomarker testing'.

This could allow us to analyse the genotypes of patients with inherited retinal diseases (for example, for people whose disease runs in their family), making it possible to track their retinal condition with the aim of leading to an earlier, more accurate diagnosis of disease.¹⁴

In addition, analysis of biomarkers could allow us to predict disease progression and the effectiveness of a specific treatment.^{15,16}

Digital Health Tools

As digital technology continues to develop, it could become increasingly possible for patients to monitor their retinal conditions from home, as well as track lifestyle information that affects vision like quality of sleep, mood and activity levels.¹⁷

Technological solutions, such as virtual appointments and consultations, could improve access to eye care services – potentially reducing the burden on people living with retinal conditions who may not easily be able to attend face-to-face consultations.^{18,19}

Research and Development

Research and development is also fundamental to the development of personalised healthcare. This includes:

- Collecting large amounts of datasets from clinical trials and real-world settings (this, in turn, could ensure more effective and clinical trials going forward)²⁰
- Ensuring valuable research is put into all forms of retinal disease, including why a certain disease develops and what causes it²¹
- Development of improved imaging and genomic technologies²²
- Biomarker testing for patient selection and stratification²³

What are the potential benefits of personalised healthcare in ophthalmology?

- Improved health outcomes due to more accurate and more personalised detection, diagnosis and treatment of eye disease²⁴
- Empowered patients and families through managing potential health risks and disease knowledge²⁴
- Improved quality of life for people with eye disease and their families²⁴
- Potential lower financial impact²⁵
- Promoting health and wellbeing of society and better use of healthcare resources²⁴
- The ability to track retinal degeneration²⁰
- The potential to capture important information earlier, which could prevent disease progression²⁴

Conclusion

The future of personalised care in ophthalmology certainly looks bright – but work still needs to be done to implement it. **Partnerships, collaborations** and **integrated solutions** always play an important role in drug discovery and development – and this certainly rings true within personalised healthcare and ophthalmology.

Many patients are now able to access some form of genomic testing.^{26, 27}

For more information on genomic testing and personalised healthcare tools that might be available to you, please speak with your healthcare team.²⁸

Glossary

1. Age-related macular degeneration - An eye disease that can blur central vision. It happens when aging causes damage to the macula, and comes in both dry and wet forms.²⁸
2. Anti-VEGF treatment - Anti-VEGF treatments are a group of medicines which reduce new blood vessel growth. They can be used to treat a number of eye conditions that cause new blood vessel growth or swelling under the macular area of the retina.²⁹
3. Artificial Intelligence - The ability of computers and machines to use information as people do. Computers and machines can process information to identify patterns, solve problems and answer questions. Artificial intelligence can analyse and interpret large amounts of data. It could help implement personalised healthcare in practice.⁶
4. Biomarker - A substance found in the genetic information of cells (e.g. genes) that provides important information about an eye disease. Biomarkers might be able to detect early damage to the eye.^{12,13} New biomarkers in the eye are being discovered.¹⁵
5. Diabetic macular oedema - An eye disease that can blur and distort central vision. It happens when diabetes damages blood vessels in the eye, causing fluid to leak and build up in the macula.²⁹
6. Retina - A thin layer of tissue at the back of the eye that senses light and sends signals to the brain to allow a person to see. It contains many layers.³⁰

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