



Brien Holden Vision Institute

AN INTRODUCTION TO OPTOMETRY

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THIS CHAPTER INCLUDES A REVIEW OF:

- What is Optometry
- The Origins of Optometry
- The Profession of Optometry
- The Role of Healthcare Systems
- Career Prospects in Optometry
- Key Organisations

WHAT IS OPTOMETRY?

The World Council of Optometry (WCO), which is the global organisation representing around 300,000 optometrists in 90 countries, has defined optometry as:

“A healthcare profession that is autonomous, educated, and regulated (licensed/registered), and optometrists are the primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection/diagnosis and management of disease in the eye, and the rehabilitation of conditions of the visual system”.

The optometrist's role goes beyond the correction of refractive errors such as long and short-sightedness using spectacles and contact lenses. It also includes detection and monitoring and treatment of eye disease, management of paediatric and age-related eye disorders, binocular vision problems, care of patients with low vision, offering advice on colour vision and assessing the role of vision at work and in sport.

Historically the optometrist's formal responsibility was to recognise and refer abnormality and stopped short of diagnosis and management. However, the latter half of the 20th century saw a steady increase in optometrists' being involved in the primary care of patients with diabetes and glaucoma and other ocular conditions and this has given rise to more emphasis on the study and management of these conditions.

THE ORIGINS OF OPTOMETRY

The early history of optometry was linked to the work of opticians as the correction of refractive errors depended on experiments with lenses. The oldest lens that is known is a plano-convex piece of polished rock crystal, 3.8 cm in diameter with a focal length of 11.5 cm found in the ruins of Nineveh, and others date back to 1200 B.C. It is uncertain whether or not they were used to aid vision. It is more likely they were used as burning glasses. Pliny, the philosopher, recorded them as being used by physicians for cauterising wounds. However, it is known that the Romans used glass bowls of water as magnifiers.

The Greeks worked out the laws of reflection in mirrors but did not fully understand the principles of refraction. They also knew of the crystalline lens in the eye but had no knowledge of the retina and thought that rays of light came from the eyes, a myth that existed until Leonardo da Vinci's investigation into the physics of light rays led to establishing the role of the retina.

Another major step in the development of knowledge about optics came in 1268 when Roger Bacon, an English Franciscan monk wrote his works in which he devoted considerable space to optics. The significance for refraction is that he demonstrated that 'by placing a segment of a sphere on a book with its plane side down, one can make small letters appear large'. It was the first time that it was suggested that plano-convex lenses could be used to improve the poor vision of older men. However, he did not pursue this theory and it was left to an unknown glass worker, probably from Murano in Italy, to manufacture the first spectacles around 1280.

No historians have been able to trace the inventor of spectacles although there is a legend that they were invented by an Italian named Armato degli Armati supported by an inscription on his tombstone:

*Here lies Salvino d'Armato degli Armati, of Florence, the inventor of spectacles.
May God forgive his sins. He died Anno Domino 1317.*

A quotation from Fra Giordano Di Rivalto confirms that spectacles were indeed invented in the late 13th century when he wrote in 1305, 'it is not yet twenty years since the art of making spectacles, one of the most useful arts on earth, was discovered'. By 1300, laws were enacted in Venice to control the quality of lenses. The spectacles of this time and up to the beginning of the 16th century were primitive being made of horn, bone, leather or metal in two pieces and held together by a rivet, these were eventually replaced by one-piece mounts but the problem remained as to how to keep the spectacles on the nose. Towards the end of the 16th century the Spanish fastened these spectacles by means of threads passed behind the ears but it was not until the early 18th century that spectacles with sides appeared.

By the end of the 16th century guilds of spectacle makers were established in Italy, France and Germany. While these spectacle makers controlled apprenticeships, discipline and quality, they gradually declined. One still exists today however and that is the Worshipful Company of Spectacle Makers in the United Kingdom, chartered by King Charles I in 1629. Its history embodies that of the development of optometry from the manufacture of spectacles, the skill of opticians in the design and production of optical instruments and the move from customers buying spectacles on a trial and error basis to custom made.

In the 1780's, Franklin improvised what later became known as bifocals but it was not until the beginning of the 19th century that astigmatism was understood and in 1827 the first spectacles were made to correct it by an optician named Fuller in Ipswich in the UK. The terms bifocal and trifocal were introduced by John Isaac Hawkins in London who also patented a trifocal.

The development of spectacles and optical lenses is only one part of optometry. The 19th century saw significant discoveries which led to the rapid development of the science of ophthalmic optics and these would be reflected in the establishment of optometry as a profession in the late 19th century and onwards. It was Donders, a Dutch ophthalmologist and medical scientist who, in 1864, published 'Anomalies of refraction and Accommodation of the Eye', which for the first time explained the nature of hypermetropia and presbyopia. It also showed how spectacles could be used for the correction of a squint. Around the same time Helmholtz, a German physician and physicist made significant contributions to the mathematics of the eye and theories of vision, visual perception and colour vision.

In the United States, the first college of optometry in the world was established in Illinois in 1872 followed by the New England College of Optometry in 1894. The American Optometric Association was formed in 1922. In 1891, a London School of Optics and Sight Testing was established by the optical industry in the UK but it was not until some years later, under the direction of the newly established British Optical Association, that the Worshipful Company of Spectacle Makers introduced national examinations for ophthalmic opticians. The British Optical Association was formed by a dissident group of opticians in 1895 and they held the first examinations in 1896, thus setting a national standard for ophthalmic opticians (known today as optometrists) in the UK.

It was almost simultaneous that the professions of optometry and ophthalmic optics came into being, blending together the developments in spectacles and the optics of lenses with visual optics and the physiology of the eye. In the UK legal action brought against a sight-testing optician established that the recognition of abnormalities of the eye and referral to a medical practitioner should be considered the responsibility of an ophthalmic optician.

Throughout the 20th century the scope of practice of optometry has developed with an increasing emphasis on health care. Optometrists around the world are aiming to obtain the right to use diagnostic and therapeutic drugs. In the UK diagnostic drugs have been used since the very early days of the profession in the 20th century simply because

there was no legal barrier to their use. The US followed a long time afterwards and achieved the right to use therapeutic drugs in 1976.

In 2008 Dr Simon Barnard, a UK optometrist, made the following statement about the development of Optometry:

"Optometry has developed, and continues to develop differently and at different rates throughout the world. However, in these developments there are some basic principles that can be recognised and are shared by the optometry profession in most countries. What usually occurs, but not necessarily in this order, is:

- *a recognition (usually by the profession's leaders) of the need to advance and expand the education of the profession;*
- *implementation of that education by the training institutions and/or professional body*
- *a change in state legislation*
- *implementation and integration of these developments into optometric practice.*

In some cases a change in the law and even state wide education has not been, or indeed may not be necessary. If the law does not specifically forbid a technique or a use of a drug and optometrists have been carrying out certain procedures for a while, then, in some countries precedent creates a 'fait accompli' that may be difficult for legislators to reverse."

THE PROFESSION OF OPTOMETRY

THE EYE CARE PROFESSIONALS:	<p>Optometrists</p> <p>As previously described, optometry has its origins in the manufacture and selling of spectacles and optical instruments from the 14th century onwards. As knowledge of the eye and more sophisticated forms of lens production increased, the ability to refract and make prescribed spectacles was refined and improved. Alongside this, techniques were discovered which allowed the examination of the eye to identify abnormalities. Some opticians chose to refract, examine eyes and dispense spectacles and this gave rise to the hybrid profession of optometry. Optometrists refract, write prescriptions, dispense or 'sell' spectacles and fit and sell contact lenses. Some argue that this compromises the ability of an optometrist to give independent advice as there is an opportunity to increase income by 'selling' product and over prescribing, an argument that is often used by ophthalmology as a reason for not recognising or working with optometrists. However, there is little evidence to show that this is the case.</p>
	<p>Ophthalmologists</p> <p>Ophthalmologists are medically qualified practitioners who have specialised in ophthalmology and whose scope of practice includes surgery, diagnosis and treatment of disorders of the eye including refraction and the fitting of contact lenses. Ophthalmologists may specialise in surgery or work as medical ophthalmologists in private practice where, in some countries, they undertake similar work to optometrists.</p>
	<p>(Dispensing) Opticians</p> <p>Opticians undergo further education, apprenticeships or special education and are qualified to assemble and fit spectacles. In some countries they are also allowed to refract and to fit contact lenses and low vision aids. Opticians are independent professionals and may work in private practice or in hospitals.</p>
	<p>Orthoptists</p> <p>Orthoptists receive training at a further or higher education level and specialise in the detection and treatment of anomalies of binocular vision. In some countries they carry out screening tests in support of ophthalmology. Generally orthoptists only work under the supervision of an ophthalmologist.</p>
ETHICAL RESPONSIBILITY:	<p>So, what is a professional? One definition might be getting paid to give independent advice. Another might be a commitment to perform at the highest level, to give your best at all times. Yet another may be exhibiting a courteous, conscientious, and generally business-like manner in the workplace. While all of these are partially correct, there are many facets to being a true professional. These are general principles which are the basis used by each and every profession in developing a code of ethics for its members. This will be discussed in more detail in Chapter 13.</p> <p>It is accepted that independent health care practitioners have to subscribe to an appropriate code of ethics and professional conduct. They also have to ensure that they take responsibility for their own actions and have adequate professional indemnity insurance. Part of the ethical responsibility of optometrists is working with other professionals and the referral of patients for an ophthalmology consultation where necessary and appropriate.</p>

OPTOMETRIC EDUCATION

Professional education is the process by which men and women prepare for exacting, responsible service in the professional spirit. The term may be restricted to education of professionals requiring well informed and disciplined insight and skill of a high order. Less exacting education or training may be designated as vocational or technical education.

The foundation of professional education should not only be based on technical skill, but also a sense of social responsibility, an appreciation of social and human values and relationships, and disciplined power to see realities without prejudice or blind commitment. While professionals largely set the pattern of national life, that pattern is much influenced by their earlier intellectual and moral experiences, especially their professional training. The standards and motives of professional practice that will be seen in the coming years are largely being made in the professional schools of today.

Optometry is a global profession and historically its education has grown from, and in some countries is still developing from, a technical optics base. The WCO's concept of optometry makes it clear that optometry is a graduate profession and as such is taught in universities around the world. The length of the courses depend on the scope of practice in individual countries but the minimum period is generally accepted as four years, which will include both theoretical, practical and clinical experience.

Basic sciences such as biology, biochemistry, physics and mathematics are essential for the study of optometry and these subjects may be studied before entry or during the course.

The WCO Global Competency-Based Model of the Scope of Practice of Optometry, which encompasses the knowledge and skills of an optometrist, is divided into four parts:

1. OPTICAL TECHNOLOGY SERVICES:	Management and dispensing of ophthalmic lenses, ophthalmic frames and other ophthalmic devices that correct defects of the visual system
2. VISUAL FUNCTION SERVICES:	<i>Optical Technology Services, plus</i> Investigation, examination, measurement, diagnosis and correction/management of defects of the visual system
3. OCULAR DIAGNOSTIC SERVICES:	<i>Optical Technology Services, plus Visual Function Services, plus</i> Investigation, examination and evaluation of the eye and adnexa, and associated systemic factors, to detect, diagnose and manage disease
4. OCULAR THERAPEUTIC SERVICES:	<i>Optical Technology Services, plus Visual Function Services, plus Ocular Diagnostic Services, plus</i> Use of pharmaceutical agents and other procedures to manage ocular conditions/disease

This model recognises the differences in the education and scope of practice of optometry in countries with different cultures and regulations and allows for a ladder of development of a full optometric qualification. Today professionals achieve the right to practice by demonstrating their competency.

Competency is the ability to perform the activities within an occupation to the standard expected in employment. Competencies are the skills, attitudes and knowledge needed to be able to practise.

Entry-level competency refers to standards for the profession of optometry in a particular country and describe what skills and knowledge a person needs to be regarded as sufficiently qualified to be registered to practise in that country.

SPECIALIST QUALIFICATIONS IN OPTOMETRY

Newly qualified optometrists should realise that their competencies are at an entry level standard and that their skills will increase with experience. They should understand the limits of their knowledge and not hesitate to seek advice from or refer patients to colleagues or other professionals if they feel that they are not competent to deal with a specific problem.

In addition to developing competencies in general practice, optometrists have the opportunity to specialise in areas of practice and gain higher qualifications. These include:

- Paediatrics
- Geriatrics
- Contact Lenses
- Public Health
- Low Vision
- Binocular Vision (Orthoptics)
- Sports Vision
- Learning Disabilities
- Environmental and Occupational Vision
- Ocular Disease
 - Glaucoma
 - Diabetes
- Teaching and Research

This is all part of the lifelong learning process, which is essential in order to retain professional competency, a statutory requirement in most countries regulating optometry and may be called continuing professional development (CPD), continuing professional education (CPE) or continuing education and training (CET). Graduation is the start of lifelong learning, not the end.

THE GLOBAL ROLE OF OPTOMETRY

The profession of optometry is a mixture of legal, educational, practice management, service delivery and public health initiatives that is unique to every country and based on culture, educational and regulatory frameworks. The aim of WCO is to promote the establishment of a common global standard of optometric care for the public benefit.

Whilst optometry is more than just the correction of refractive error, refractive error is its core business. Uncorrected refractive error is the second highest cause of blindness and the main cause of visual impairment globally.

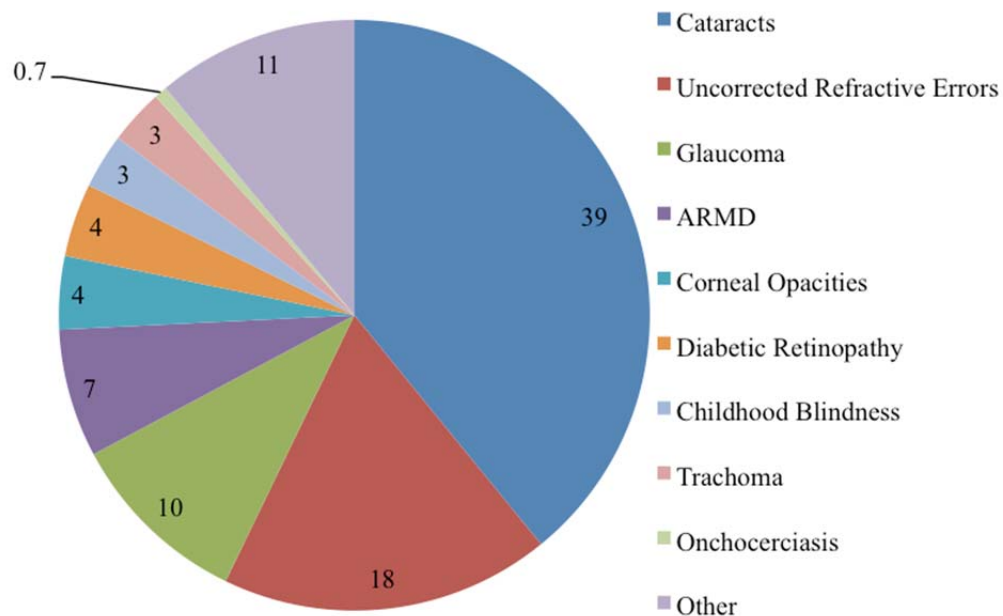


Figure 1.1 Percentage of global causes of blindness (based on Presenting Vision)

KEY FACTS PUBLISHED BY THE WORLD HEALTH ORGANISATION

- About 285 million people are visually impaired worldwide: 39 million are blind and 246 have low vision.
- About 90% of the World's visually impaired live in developing countries.
- Globally, uncorrected refractive error is the main cause of visual impairment but in middle and low-income countries cataracts remain the leading cause of blindness.
- The number of people visually impaired from infectious diseases has greatly reduced in the last 20 years.
- 80% of all visual impairment can be avoided or cured.

In addition it has been estimated that a further 517 million people with presbyopia have no spectacles and that 410 million of these are prevented from performing near tasks in the way required.

These figures demonstrate the enormous task that eye care practitioners, including optometrists, have in eliminating avoidable blindness and visual impairment. Solutions will vary but there needs to be an understanding of the needs of the developing world and the developed world needs to accept that it also has its own problems of avoidable blindness and visual impairment related to lifestyle and an aging population.

THE ROLE OF HEALTHCARE SYSTEMS

A health care system is the organization of people, institutions, and resources to deliver health care services to meet the health needs of target populations.

There is a wide variety of health care systems around the world, with as many histories and organizational structures as there are nations. In some countries, health care system planning is distributed among market participants. In others, there is a concerted effort among governments, trade unions, charities, religious, or other co-ordinated bodies to deliver planned health care services targeted to the populations they serve. However, health care planning has been described as often evolutionary rather than revolutionary.

The goals for health systems, according to the World Health Organization, are good health, responsiveness to the expectations of the population, and fair financial contribution. Progress towards these goals depends on how systems carry out four vital functions: provision of health care services, resource generation, financing, and stewardship. Other dimensions for the evaluation of health care systems include quality, efficiency, acceptability, and equity.

Health care systems are dedicated to the provision of high quality, patient-centred care. They include the provision of health care at primary, secondary and tertiary levels.

PRIMARY CARE:	<ul style="list-style-type: none"> ▪ Primary care is provided by individuals who are the first point of contact with patients. This level of care is concerned with preventive and protective care in an attempt to prevent patients from entering into the secondary and tertiary levels. It has been noted that most medical issues can be treated at primary level. These medical issues include acute and chronic illnesses, the management for which involves the provision of health promotion and education for individuals from all walks of life. Primary care not only considers the needs of the patient being taken care of but also those of the community.
SECONDARY CARE:	<ul style="list-style-type: none"> ▪ Secondary care is usually provided by medical specialists at local community hospitals, offices or clinics. Patients entering at this level of care are usually referred by primary care providers. Patients referred to this level of medical care require further diagnostic expertise and procedures which are performed by specialists.
TERTIARY CARE:	<ul style="list-style-type: none"> ▪ Tertiary care is provided by specialist hospitals and specialized clinics with specialized diagnostic and treatment facilities that are not generally available at the local community hospitals or clinics.

CAREER PROSPECTS IN OPTOMETRY

PRACTICE BASED:	<p>Independent Practice</p> <ul style="list-style-type: none"> Practice based optometrists may work as a solo practitioner, working in a partnership or group practice possibly working with other eye care or health care practitioners, including ophthalmologists. <p>Corporate Practice (Chains)</p> <ul style="list-style-type: none"> Practice based optometrists may otherwise decide to work for a company with multiple outlets. This can give opportunities for gaining experience in practice management.
PUBLIC SECTOR:	<ul style="list-style-type: none"> Optometrists choosing to work in the public sector usually find themselves working within a hospital or outreach setting, together with other health care practitioners and gives opportunities to expand competencies associated with pathology.
ACADEMIC:	<ul style="list-style-type: none"> Optometrists who pursue academics work in university departments teaching optometry and undertaking research. <p>This would usually mean having a Masters or PhD.</p>
OPTICAL INDUSTRY:	<ul style="list-style-type: none"> Optometrists may also seek employment in large corporations such as contact lens companies where they undertake a variety of roles from product research to clinical training of optometrists, ophthalmologists and opticians.
CONSULTANCY:	<ul style="list-style-type: none"> Optometrists can work as consultants on eye care matters for a large variety of organizations including expert witness work.

KEY ORGANISATIONS

WORLD COUNCIL OF OPTOMETRY (WCO) www.worldoptometry.org	<ul style="list-style-type: none"> WCO is the international organization representing, through its regions, over 90 countries globally, together with professional associations, schools and colleges of optometry and regulatory bodies. Its regions coincide with those of the WHO: <ul style="list-style-type: none"> Africa Asia Pacific Eastern Mediterranean Europe North America South America
World Optometry Foundation (WOF) www.worldoptometry.org/en/WOF	<ul style="list-style-type: none"> WOF is the charitable and fundraising arm of WCO.
World Health Organisation (WHO) www.who.int	<ul style="list-style-type: none"> The World Health Organization is a specialized agency of the United Nations (UN) that acts as a coordinating authority on international public health with headquarters in Geneva, Switzerland. WHO has a group responsible for the prevention of blindness. WCO is recognised as a partner organisation.
International Agency for the Prevention of Blindness (IAPB) www.iapb.org	<ul style="list-style-type: none"> IAPB works to encourage the formation of national prevention of blindness committees and programmes, led by governments with input from the WHO, local and international non-governmental organisations. These now exist in over eighty countries.
VISION 2020 www.v2020.org	<ul style="list-style-type: none"> Vision 2020 is a joint programme between WHO and IAPB aimed at eliminating avoidable blindness by the year 2020.
Optometry Giving Sight www.givingsight.org	<ul style="list-style-type: none"> Optometry Giving Sight is a joint initiative between IAPB, WCO and BHVI to raise funds from optometry and the optical industry to support uncorrected refractive error and low vision sustainable projects.

In addition, there a large number of national optometric associations, schools and colleges of optometry and regulatory bodies whose web sites contain information which is useful for optometry students and graduates. The list below is not exhaustive but gives the web addresses for some of the larger organisations.

1. American Optometric Association www.aoa.org
2. American Academy of Optometry www.aaopt.org
3. Association of Schools and Colleges of Optometry www.opted.org
4. Optometrists Association Australia www.optometrists.asn.au
5. Canadian Optometric Association www.opto.ca
6. The Optometry Council of Australia and New Zealand www.ocanz.org
7. South African Optometric Association www.saoa.co.za
8. Nigerian Optometric Association www.nigoptom.org
9. European Council of Optometry and Optics www.ecoo.info
10. European Academy of Optometry www.eaoo.info
11. The College of Optometrists (UK) www.college-optometrists.org
12. The Association of Optometrists (UK) www.aop.org.uk
13. The General Optical Council (UK) www.optical.org
14. The African Council of Optometry www.afcoptom.org
15. The Asia Pacific Council of Optometry www.asiapacificoptometry.org
16. La Asociación Latinoamericana de Optometría y Óptica www.aldoo.org
17. Colegio Nacional de Ópticos-Optometristas de España www.cnoo.es

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