

MEMBERSHIP IN OPHTHALMOLOGY

1 GENERAL INFORMATION

1.1 PREAMBLE

The prevalence of blindness in Ghana is estimated to be one percent, 80% of which is preventable or treatable. The national ratio of ophthalmologists to population is 1:500 000. This however varies from region to region and from urban to rural ranging from 1:150 000 to 1:1 850 000

It is envisaged that minimum ratio of one ophthalmologist to 500 000 population would be achieved and uniformly distributed throughout the country by the year 2010. This ratio should continue to improve over the long term so that by the year 2020 quality basic eye care will be accessible to all people resident in Ghana.

Efforts will be made to address the need of providing basic safe eye care by training a highly efficient and knowledgeable middle level Membership Ophthalmologists.

1.2 JOB DISCRPTION

- Clinical medical, optical and surgical ophthalmic duties. He/she is the intermediate point of referral for all other eye care workers
- Training eye care workers at levels under him/her
- Administration of eye care programme
- Research

1.3 GOAL

- To produce a specialist with the requisite amount of knowledge, skills and attitudes to be able to practice independently as a specialist.
- Such a specialist at the end of his training should be capable of critically reviewing new development and research findings in science and medicine as they apply to ophthalmology.
- He/she should be able to contribute to his specialty through publications and is also expected to participate in the training of all other eye care workers at all levels under him/her.

1.4 CORE COMPETENCIES AND SUB-COMPETENCIES

In addition to the specialized cognitive and technical skills described in this curriculum, several generic core “competencies” are expected of ophthalmic, as well as other, medical specialists, See the promulgation by the Accreditation Council for Graduate Medical Education (ACGME). Their website is www.acgme.org.

These core competencies include the following:

- Patient care
- Medical knowledge

- Practice-based learning and improvement
- Interpersonal and communication skills
- Professionalism, and
- Systems-based practice.

1.5 *Patient Care*

Trainees (“residents”) must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Residents are expected to:

- communicate effectively and demonstrate caring and respectful behaviours when interacting with patients and their families;
- gather essential and accurate information about their patients;
- make informed decisions about diagnostic and therapeutic interventions, based on patient information and preferences, up-to-date scientific evidence, and clinical judgment;
- develop and carry out patient management plans;
- counsel and educate patients and their families;
- use information technology to support patient care decisions and patient education;
- perform competently the medical and invasive procedures considered essential for the area of practice;
- provide health care services aimed at preventing health problems or maintaining health;
- work with health care professionals, including those from other disciplines, to provide patient-focused care.

1.6 *Medical Knowledge*

Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care. Residents are expected to:

- demonstrate an investigatory and analytic thinking approach to clinical situations;
- know and apply the basic and clinically supportive sciences which are appropriate to ophthalmology.

1.7 *Practice-based Learning and Improvement*

Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices. Residents are expected to:

- analyze practice experience and perform practice-based improvement activities using a systematic methodology;
- locate, appraise, and assimilate evidence from scientific studies related to their patients’ health problems;
- obtain and use information about their own population of patients and the larger population from which their patients are drawn;
- apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness;
- use information technology to manage information, access on-line medical information; and support their own education; and
- facilitate the learning of students and other health care professionals.

1.8 *Interpersonal and Communication Skills*

Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, patients' families, and professional associates. Residents are expected to:

- create and sustain a therapeutic and ethically sound relationship with patients;
- use effective listening skills and elicit and provide information using effective non verbal, explanatory, questioning, and writing skills; and
- work effectively with others as a member or leader of a health care team or other professional group.

1.9 *Professionalism*

Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population. Residents are expected to:

- demonstrate respect, compassion, and integrity; a responsiveness to the needs of patients and society that supercedes self-interest; accountability to patients, society, and the profession; and a commitment to excellence and on-going professional development;
- demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent, and business practices; and
- demonstrate sensitivity and responsiveness to patients' culture, age, gender, and disabilities.

1.10 *Systems-based Practice*

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Residents are expected to:

- understand how their patient care and other professional practices affect other health care professionals, the health care organization and the larger society, and how these elements of the system affect their own practice;
- know how types of medical practice and delivery systems differ from one another, including methods of controlling health care costs and allocating resources;
- practice cost-effective health care and resource allocation that do not compromise quality of care;
- advocate for high quality patient care and assist patients in dealing with system complexities; and
- know how to partner with health care managers and health care providers to assess, coordinate, and improve health care and know how these activities can affect system performance

Professional attitudes and conduct require that trainees must also have developed a style of care which is:

- humane (reflecting compassion in providing bad news, if necessary; the management of the visually impaired; and recognition of the impact of visual impairment on the patient and society);
- reflective (including recognition of the limits of his/her knowledge, skills and understanding);

- ethical;
- integrative (including involvement in an inter-disciplinary team for the eye care of children, the handicapped, the systemically ill, and the elderly); and
- scientific (including critical appraisal of the scientific literature, evidence-based practice and use of information technology and statistics).

1.11 QUALIFICATION FOR ACCEPTANCE TO THE PROGRAMME

A medically qualified candidate who has

- Registered with the Ghana Medical and Dental Council
- Completed one year of non ophthalmic general medical practice preferably in a Regional or District Hospital.
- An entry exam for selection of candidates may be conducted
- A candidate who has pursued the West African College of Surgeons DO course may enroll to do the Membership Programme.

1.12 DURATION

The duration of the course shall be 3 years

1.13 ASSESSMENTS

Various Work Based Assessments (WBAs) will be used to assess residents while in training.

- Competence in patient management and health promotion and disease prevention is assessed using Case based Discussion (CbD).
- Clinical Rating Scale (CRS) and Objectively Structured Clinical Examination (OSCE) will be used to assess the resident's clinical skills.
- Procedural skills will be assessed by Direct Observation of Procedural Skills (DOPS)
- Most of the "Attitudes, Ethics & Responsibilities" and Communication skills will be assessed using Multiple Source Feedback (MSF) where appropriate persons are approached to give feedback on the resident's performance.
- Technical skills will be assessed using Objectively Structured Assessment of Technical Skills (OSATS)
- Log Books will be kept by each resident and regularly assessed by trainers

1.14 REQUIREMENTS FOR CERTIFICATION

A candidate will be awarded the certificate of Member of the Ghana College of Surgeons, Faculty of Ophthalmology after passing all prescribed examinations.

These shall be

- a. The Part 1 Examination
- b. The Part 2 Examination

1.14.1 The Part 1 Examination will be in the Basic sciences

The examination shall consist of a 3 hour MCQ paper.

A candidate must score at least 50% to pass the primary examination.

1.14.2 The Part 2 Examination will be in the principles and practices of optics, refraction, medical and surgical ophthalmology. The candidate must have passed the Part1 exams and spent

another 2 and half years in clinical Ophthalmology and prescribed rotations in Neurology, Endocrinology, Haematology, Pathology, ENT, Plastic surgery and Neurosurgery before being admitted to this examination.

- Written Papers.
 - Paper I – MCQ – 2 hrs
 - Paper II - Visual Optics and Refraction - 3 hrs
 - Paper II - Medical and Surgical Ophthalmology - 3 hrs
- Clinical/ Practical
 - Refraction – Practical and Oral
 - Clinical examination – Long and short cases
- Oral – Viva voce

1.14.3 Conditions for pass:

Candidates must pass the Refraction practicals in addition to passing the clinical examinations and score 50% of the overall marks to pass the Part 2 examination.

2. PROGRAMME STRUCTURE

2.1 Year 1 Semester 1 Ophthalmic and General Basic Sciences
Revision
Primary Exams

2.1.1 COURSE

- Anatomy 1 (Head & Neck)
- Anatomy 2 (Ophthalmic)
- Physiology 1 (General Principles)
- Physiology 2 (Ophthalmic Physiology)
- Pathology 1 (General Principles,
- Immunology & Microbiology)
- Pathology 2 (Ophthalmic)
- Biochemistry, Molecular & Cell Biology

2.2 Year 1 Semester 2 Optics and refraction, Clinical methods acquired in
General clinics, casualty clinics and ward rounds;
Minor operations, Accident and emergency
Ophthalmology
Internal assessment

2.2.1 COURSE

- To describe the basic principles of optics and refraction.
- To list the indications for and to prescribe the most common low vision aids.
- To perform the basic anterior segment (e.g., basic refraction, basic retinoscopy, slit lamp biomicroscopy) and posterior segment examination skills (e.g., dilated fundus

examination, use of magnification and lenses, 90 Diopter lens, three mirror Goldmann contact lens) and to understand and use basic ophthalmic instruments (e.g., tonometer, lensometer).

- To triage and manage ocular emergencies (e.g, central retinal artery occlusion, giant cell arteritis, chemical burn, acute angle closure glaucoma, endophthalmitis, open or closed globe injuries).
- To perform minor external and adnexal surgical procedures (e.g., chalazion excision, corneal foreign body removal, use of foreign body corneal drill for removal of a rust ring, conjunctival biopsy, corneal scraping, isolated entropion).
- To identify the key examination techniques and management of basic and most common medical problems in the subspecialty areas of glaucoma (e.g., primary open angle glaucoma), cornea (e.g., dry eye, microbial keratitis), orbit and oculoplastics (e.g., common lid lesions, ptosis), retina (e.g., macular disorders, retinal detachment, diabetic retinopathy), and neuroophthalmology (e.g., optic neuropathy, ocular motor neuropathy, pupillary abnormalities, visual field defects).
- To describe indications for, performance of, and complications of common anterior segment surgery, (e.g., cataract extraction, trabeculectomy, peripheral iridectomy), and to assist at surgery.
- To describe the common but serious genetic ocular disorders (e.g., retinal and macular dystrophies).
- To recognize the most common ophthalmic histopathology findings and to recognize basic histopathology of common ocular lesions (e.g., retinal detachment, pterygium, corneal button removed at keratoplasty).

2.3 Year 2 Semester 1 Practice of refraction, General Clinics, Casualty, Wet lab, Ward Rounds, Tutorials, Journals review, Specialist clinics Seminars: Disorders of adnexal and external eye Disorders Internal assessment

2.3.1 COURSE

(In addition to Year 1 Course)

- To describe the more advanced principles of optics and refraction.
- To list the indications for and uses of more advanced low vision aids.
- To perform more advanced anterior segment (e.g., more complex refractions, including contact lens and post-operative refractions, intermediate retinoscopy, including moderate astigmatism, examination of young children, intermediate techniques of slit lamp biomicroscopy) and posterior segment examination skills (e.g., more advanced techniques of dilated fundus examination, including scleral depression, use of magnification and lenses to diagram and describe retinal lesions).
- To recognize and treat ocular emergencies (e.g, central retinal artery occlusion, giant cell arteritis, chemical burn, acute angle closure glaucoma, endophthalmitis, traumatically open globe), as well as the short and long term complications of these disorders.
- To perform more advanced external and adnexal surgical procedures (e.g., isolated ectropion and isolated entropion repair, removal of small, localized, and benign lid lesions, pterygium excision).
- To identify the key examination techniques and management of the less common surgical problems in the subspecialty areas of glaucoma (e.g., secondary open angle and closed

angle glaucoma), cornea (e.g., fungal and other less common microbial keratitis, corneal transplantation), ophthalmic plastic surgery (e.g., extensive benign and common lid lesions, ptosis), retina (e.g., primary retinal detachment, mild to moderate proliferative and nonproliferative diabetic retinopathy and laser treatments), and neuro-ophthalmology (e.g., less common optic neuropathy, supranuclear palsies, myasthenia gravis, more complex visual field defects).

- To perform common anterior segment surgery (e.g., cataract extraction, trabeculectomy, peripheral iridectomy).
- To recognize, and refer if indicated, some major genetic ocular disorders (e.g., neurofibromatosis I and II, tuberous sclerosis, von Hippel-Lindau syndrome, retinoblastoma, retinitis pigmentosa, macular dystrophy).

2.4 Year 2 Semester 2 Extra Faculty Rotations in Neurology, Endocrinology, Haematology, Pathology, ENT, Plastic surgery and Neurosurgery

2.5 Year 3 Practice of refraction, General Clinics, Ward Rounds, Tutorials, Seminars, Journals review, Specialist clinics

2.5.1 COURSE

- To perform more advanced external and adnexal surgical procedures (e.g., lacrimal gland procedures, complex lid laceration repair, e.g., canalicular and lacrimal apparatus involvement).
- To identify the key examination techniques and management of complex but common medical and surgical problems in the subspecialty areas of glaucoma (e.g., complicated or post-operative primary and secondary open and closed angle glaucoma), cornea (e.g., unusual or rare types of microbial keratitis), ophthalmic plastic surgery (e.g., less common and more complex lid lesions, re-operation or complex or recurrent ptosis), retina (e.g., complex retinal detachment, tractional retinal detachments and severe proliferative diabetic retinopathy, proliferative vitreoretinopathy), and neuro-ophthalmology (e.g., unusual optic neuropathy, neuroimaging, supranuclear palsies, uncommon visual field defects).
- To perform and treat complications of common anterior segment surgery, (e.g., cataract extraction, trabeculectomy, peripheral iridectomy).
- To recognize, evaluate, and treat, if possible, the major genetic ocular disorders (e.g., neurofibromatosis I and II, tuberous sclerosis, von Hippel-Lindau syndrome, retinoblastoma, retinitis pigmentosa, macular degenerations).
- To recognize uncommon or rare but classic ophthalmic histopathology findings.

I.

Trainees at all levels of training should be able to describe the key features and apply in clinical practice the results of evidence-based medicine in ophthalmology, including, but not limited to, the results of the following clinical trials

The Herpetic Eye Disease Study (HEDS)

The Fluorouracil Filtering Surgery Study (FFSS)

The Normal Tension Glaucoma Study

The Ocular Hypertension Study (OHTS)

The Glaucoma Laser Trial (GLT)
The Optic Neuritis Treatment Trial (ONTT)
The Ischemic Optic Neuropathy Decompression Trial (IONDT)
Studies of the Ocular Complications of AIDS (SOCA)
Branch Vein Occlusion Studies (BVOS)
Macular Photocoagulation Study (MPS)
Age-Related Eye Disease Study (AREDS)
Verteporfin in Photodynamic Therapy (VIP) Study
Treatment of Age-Related Macular Degeneration with Photodynamic Therapy (TAP)
Silicone (oil) Study
The Submacular Surgery Trials (SST)
The Multicenter Trial of Cryotherapy for Retinopathy of Prematurity (CRYO-ROP)
Central Vein Occlusion Studies (CVOS)
Diabetes Control and Complications Trial (DCCT)
Diabetic Retinopathy Study (DRS)
Early Treatment Diabetic Retinopathy Study (ETDRS)
Randomized Trial of Acetazolamide for Uveitis-Associated Cystoid Macular Edema
Collaborative Ocular Melanoma Study (COMS)

3 COURSE DESCRIPTION

Part 1

3.1 ANATOMY

3.1.1 The Orbit and adnexa

- Osteology, orbital foramina
- Eyelids
- Conjunctiva
- Lacrimal gland and lacrimal drainage system
- Extraocular muscles
- Intraorbital nerves, vessels
- Orbital fascia

3.1.2 Ocular anatomy

- Conjunctiva
- Cornea
- Sclera

- Limbus and anterior chamber angle
- Iris and pupil
- Lens and zonule
- Ciliary body
- Choroid
- Retina and retinal pigment epithelium
- Vitreous
- Optic nerve

3.1.3 **The Cranial Cavity**

- Osteology of the skull
- Meninges, blood supply, nerve supply
- Venous sinuses
- Foramina and their contents
- Cranial fossae
- Pituitary gland and its relations

3.1.4 **Central Nervous System**

- Cerebral Hemispheres and cerebellum including - surface appearance, cortical areas, ventricles, formation and circulation of cerebrospinal fluid, blood supply and venous drainage, microscopic anatomy of the visual cortex
- Brain stem and cranial nerve nuclei
- Cranial nerves
- Spinal cord
- Visual pathways
- Control of eye movements
- Autonomic nervous system and the eye

3.1.5 **Head and neck**

- Nose, mouth and paranasal sinuses

- The face and scalp, muscles nerve and vessels
- Salivary glands
- Temporomandibular joint
- Inferotemporal fossa and pterygopalatine fossa
- Carotid arteries and jugular veins
- Respiratory system, anatomy of the mouth, pharynx, soft palate, larynx, trachea
- Lymphatic drainage of the head and neck

3.1.6 **Cardiovascular system**

Gross anatomy of the heart, and major blood vessels. Microscopic anatomy of arteries, veins and capillaries

3.1.7 **Embryology**

General embryology of relevance and detailed knowledge of the embryology of the eye, orbit, adnexae and visual pathways, with particular emphasis on the understanding of embryology relevant to the understanding of congenital anomalies of the eye.

3.2 **MOLECULAR AND CELL BIOLOGY**

3.2.1 **Cells and cell membranes**

3.2.2 **Cytoskeleton**

3.2.3 **Cell motility and contractility**

3.2.4 **Nucleus**

3.2.5 **Cell-cell communication**

3.2.6 **Protein synthesis**

3.2.7 **Receptor physiology - secondary messenger systems and intracellular signaling**

3.2.8 **Understanding molecular biological techniques including**

- polymerase chain reaction
- Northern and Southern blotting
- In situ hybridisation

3.2.9 **Extracellular matrix with particular respect to ocular structures (see biochemistry)**

3.3 PATHOLOGY

3.3.1 General principles including:

- Acute inflammation including
 - chemical mediators
 - cellular mechanisms
- Wound healing
- Chronic inflammation
 - Types
 - Granulomata
 - immune mechanisms
 - ulceration
- Chronic inflammation II
Specific examples
- Immunological mechanisms
(types I to V) of tissue injury
- Graft rejection
- Degenerations including
 - Amyloidosis
 - calcification
- Ageing and atrophy
- Hypertrophy, hyperplasia and metaplasia
- Vascular disorders including
 - Atheroma
 - Thrombosis
 - embolism (including pulmonary embolism)
 - ischaemia and infarction
 - congestion and oedema
 - angiogenesis

- hypertension
- aneurysms
- diabetic microangiopathy
- Shock
- Neoplasia
 - definition, terminology, concepts
 - benign and malignant tumours
 - carcinogenesis
 - gene control
 - oncogenes
 - geographical and environmental factors
 - pre-neoplastic conditions
 - effects of irradiation and cytotoxic drugs

3.4 BIOCHEMISTRY

3.4.1 General principles including:

- Cellular biochemistry
 - Organisation of the cell organelles, plasma membrane, cytoskeleton, nucleus, cell-cell communication, ion and solute transport
 - Protein and nucleic acid synthesis
 - Transport processes in systems and tissues
 - Molecular biology
- Connective tissue and extracellular matrix
 - Collagen, synthesis/degradation
 - Basal lamina type 4 collagen, laminin, fibronectin, proteoglycans, glycoproteins
- Receptors, signal-transduction and second messengers
 - Adenylate cyclase, hormone receptors, G-proteins
 - Phosphoinositide system (P1)
 - Atrial natriuretic factor

- Retinal neurochemistry and photochemistry
- Active oxygen species
 - Free radicals and H₂O, scavengers, lipid peroxidation, phospholipase A
- Eicosanoids
 - Prostaglandins, leukotrienes
- Aerobic and anaerobic metabolism
- Role of calcium in regulating cell processes
- Drug metabolising enzymes
 - (Cytochromes and mixed function oxidases)

3.5 PHARMACOLOGY

3.5.1 General principles including:

- Mechanisms of drug actions (including receptor pharmacology and biochemical pharmacology)
- Mechanisms of drug toxicity
- Pharmacokinetics and pharmacodynamics- absorption, distribution, metabolism and excretion of drugs
- Catecholaminergic pharmacology
 - Adrenergic, non-adrenergic, peptonergic, cholinergic
- Cholinergic pharmacology
- Serotonergic pharmacology
- Histaminergic pharmacology
- Pharmacology of drugs used in inflammation
- Pharmacology of drugs used in glaucoma
- Local anaesthetics
- Analgesics

These principles apply to the drugs commonly used in ophthalmology both systemic and local.

3.6 PHYSIOLOGY

3.6.1 General principles including:

- Maintainance of homeostasis
 - characteristics of control systems - nervous and hormonal
 - body fluids - volume, osmolarity, osmotic and oncotic pressure, and electrolyte (including H⁺) concentrations
- Excitable tissues - nerve and muscle
 - structure and function of nerve cell
 - membrane potential
 - action potential
 - nerve conduction
 - synapse
 - the motor unit, neuromuscular junction, motor end-plate
 - muscle
- Blood
 - plasma composition and functions
 - immune mechanism
 - blood groups
 - haemoglobin and red and white cell formation and destruction
 - anaemias
 - clotting and fibrinolysis
- Cardiovascular system
 - pressure resistance and flow in blood vessels
 - blood pressure and blood flow
 - the activity of the heart and its control
 - cardiac output
 - control mechanisms within the CVS
 - transcapillary exchange, tissue fluid formation
- Respiratory system

- Structure
- lung volumes
- composition of respiratory gases
- lung mechanics
- gas exchange in the lung
- carriage of O₂ and CO₂ in blood
- ventilation-perfusion relationships
- chemical and neural control of ventilation
- Nervous system and special senses
 - Receptors
 - Synapses
 - afferent pathways
 - efferent pathways
 - cerebral cortex
 - control of movement
 - hearing
 - pain and its control
 - autonomic nervous system
 - cholinergic transmission
 - adrenergic transmission
- Endocrinology
 - hormonal control
 - hypothalamus
 - pituitary
 - thyroid / parathyroid
 - adrenals
 - pancreas

- Nutrition
 - dietary requirements
 - absorption
 - vitamins
- Kidney and adrenal cortex
 - glomerular and tubular function
 - osmolality and pH of body fluids

3.6.2 **Ocular physiology including**

- Biochemistry of tears and lacrimal system
- Physiology of aqueous production and drainage including principles of intraocular pressure measurement
- Physiology and biochemistry of the cornea
- Lens metabolism
- Biochemistry of the vitreous
- Retinal physiology including phototransduction
- Retinal pigment epithelium
- Choroid
- Blood ocular barrier

3.6.3 **Physiology of vision including:**

- Visual acuity
- Accommodation
- Pupillary reflexes
- Light detection
- Dark adaptation
- Colour vision
- Electrophysiology of the visual system
- Visual fields

- Contrast sensitivity
- Eye movements
- Stereopsis
- Motion detection
- Visual perception
- Magnocellular and parvocellular pathways

3.7 MICROBIOLOGY

3.7.1 General principles including:

- The biological and clinical behaviour of the micro-organisms responsible for infection
- Elementary principles of microbial pathogenesis e.g. concepts of colonisation, invasion, endotoxins, exotoxins, virulence and pathogenicity etc.
- Gram staining and classification
- Commensal eye flora
- Viruses including classification, structure and replication, antiviral agents, and laboratory methods of viral detection. Viral infections of the eye.
- HIV and AIDS
- Fungi, classification, factors which predelict to fungal infection, antifungal agents.
- Toxoplasmosis, Chlamydia, Acanthamoeba, helmithic infections
- Principles of sterilisation, disinfection and asepsis, and the application of these to current practice and practical procedures
- Spectrum of activity, mode of action, and pharmacokinetics and of the principal antimicrobials, bacterial resistance

3.8 IMMUNOLOGY

- 3.8.1 Principles of immunology e.g. non-specific resistance, genetic basis of immunity, cellular and humoral mechanisms
- 3.8.2 Host defence mechanisms with particular reference to the eye
- 3.8.3 Mechanisms of immunologically-induced tissue damage with special reference to the eye
- 3.8.4 MHC antigens, antigen presenting cells and antigen processing

3.8.5 Immunodeficiency and immunosuppression

All syllabuses are indicative of the areas of knowledge expected of candidates. The syllabuses, however, are not intended to be exhaustive or to exclude other items of knowledge which are of similar relevance.

Reading list

The following are examples of the textbooks required for the Part 1 Fellowship/Part 1 Membership Examination. In terms of the general textbooks, only the relevant sections need be studied.

The Eye: Basic Sciences and Practice. Forrester JV, Dick AD, McMenemy P, Lee WR. WB Saunders Ltd, London.

Duane's Foundations of Clinical Ophthalmology. JB Lippincott Co, Philadelphia.

Adler's Physiology of the Eye. Ed Hart WM. Mosby.

Physiology of the Eye: An Introduction to the Vegetative Functions. Fatt I, Weissman BA. Butterworth-Heinemann.

Clinical Anatomy of the Eye. Snell RS, Lemp MA. Blackwell Scientific Publications.

Wolff's Anatomy of the Eye and Orbit: Comparative Anatomy of the Visual Apparatus. Bron AJ, Tripathi R, Warwick R, Marshall J. Chapman and Hall.

Pathology for the Primary FRCS. Gardiner DL, Tweedle EF. Arnold Publishers.

Ocular Pathology: A Text and Atlas. Yanoff M, Fine BS. JB Lippincott Co, Philadelphia.

Atlas of Ocular Pathology. Yanoff M, Fine BS. Mosby-Wolfe.

Human Physiology. Vander AJ, Sherman JH, Luciano DS. McGraw, Hill.

Medical Microbiology. Greenwood D, Slack R, Peutherer J. Churchill Livingstone.

Elements of Medical Genetics. Emery AEH, Mueller RF. Churchill Livingstone.

Neuro Ophthalmology. Glaser JS, 2nd edition, 1990. JB Lippincott Co, Philadelphia.

Chapter 4: The Visual Sensory System. Chapter 10: Supranuclear Disorders of Eye Movement.

Please read the sections on the pathways.

Biochemistry of the Eye. Whitehart R. Butterworth-Heinemann.

Havener's Ocular Pharmacology. Mauger TF, Craig EL. Mosby.

MCQs in Ophthalmology. Vivian A, Manners R. Butterworth-Heinemann.

MCQs in Basic Science Ophthalmology. Ferris J. Foreword by Easty D. BMJ Publishing Group, London.

It would be advisable to read the mini reviews which are published in the British Journal of Ophthalmology and in "Eye".

THIS READING LIST MUST BE LOOKED AT IN CONJUNCTION WITH THE SYLLABUS

4 PART 2

OPTICS

4.1 PHYSICAL OPTICS

4.1.1 Properties of light

- Electromagnetic spectrum
- Wave theory
- Particle theory
- Diffraction
- Interference
- Resolution
- Polarisation
- Scattering
- Transmission and absorption
- Photometry
- Lasers

4.2 GEOMETRIC OPTICS

4.2.1 Reflection

- Laws of reflection
- Reflection at a plane surface
- Reflection at curved surfaces

4.2.2 Refraction

- Laws of refraction (Snell's Law)

- Refraction at a plane surface
- Refraction at curved surfaces
- Critical angle and total internal reflection

4.2.3 Prisms

- Definition
- Notation of prisms
- Uses in ophthalmology (diagnostic and therapeutic)
- Types of prism

4.2.4 Spherical lenses

- Cardinal points
- Thin lens formula
- Thick lens formula
- Formation of the image
- Vergence power (dioptric power)
- Magnification
- Spherical decentration and prism power
- Lens form

4.2.5 Astigmatic lenses

- Cylindrical lenses
- Maddox rod
- Toric lenses Conoid of Sturm Jackson's cross cylinder Notation of lenses Spectacle prescribing
- Simple transposition
- Toric transposition

4.2.6 Identification of unknown lenses

- Neutralisation
- Focimeter
- Geneva lens measure

4.2.7 **Aberrations of lenses**

- Correction of aberrations relevant to the eye
- Duochrome test

4.3 **CLINICAL OPTICS**

4.3.1 **Optics of the eye**

- Transmittance of light by the optic media
- Schematic and reduced eye
- Pupillary response and its effect on the resolution of the optical system (Stiles-Crawford Effect)
- Visual acuity
- Contrast sensitivity
- Catoptric images
- Emmetropia
- Accommodation
- Purkinje shift
- Pinhole

4.3.2 **Ametropia**

- Myopia
- Hypermetropia
- Astigmatism
- Anisometropia
- Aniseikonia
- Aphakia

4.3.3 **Accommodative problems**

- Insufficiency

- Excess
- AC/A ratio

4.3.4 **Refractive errors**

- Prevalence
- Inheritance
- Changes with age
- Surgically induced

4.3.5 **Correction of ametropia**

- Spectacle lenses
- Contact lenses
- Intraocular lenses
- Principles of refractive surgery

4.3.6 **Problems of spectacles in aphakia**

- Effect of spectacles and contact lens correction on accommodation and convergence
- Effective power of lenses
- Back vertex distance
- Spectacle magnification
- Calculation of intraocular lens power
- Presbyopia

4.3.7 **Low visual aids**

- High reading addition
- Magnifying lenses
- Telescopic aids - Galilean telescope

4.4 **CLINICAL REFRACTION**

- Retinoscopy
- Subjective refraction

- Measurement of BVD
- Muscle balance tests
- Accommodative power
- Measurement of IPD
- Decentration of lenses and prismatic effect
- Best form lens
- Prescribing multifocal lenses
- Prescribing for children
- Cycloplegic refraction

4.5 INSTRUMENTS

- Direct ophthalmoscope
- Indirect ophthalmoscope
- Retinoscope
- Focimeter
- Simple magnifying glass (Loupe)
- Lensmeter
- Automated refractor
- Slit-lamp microscope - including methods of examination
- Stereo-tests
- Keratometer
- Applanation tonometer
- Specular microscope
- Operating microscope
- Zoom lens principle
- Corneal pachometer
- Lees screen/Hess chart
- Synoptophore

- Goldman perimeter
- Humphrey perimeter
- Lenses used for fundus biomicroscopy (panfunduscope, Goldmann lens, Hruby lens, 90D lens, etc.) Fundus camera Gonioscope

5 Objectively structured Clinical Examination (OSCE)

Focimetry

Lens identification

Lens transposition

Calculations - focal length lens decentration

Ray diagrams

Prescribing for children

Contact lens fitting

Interpupillary distance

Fluorescein angiography

CT/MRI scans, plain X-rays etc

Ultrasound scans (A and B scans)

Electrodiagnosis

Hess charts/orthoptic reports

Interpretation of laboratory reports

Corneal topography

Biometry

Colour vision

Visual fields

Interpretation of Goldmann or Humphrey field testing Pupil reactions

Visual field testing/interpretation **

Ocular motility (including ptosis, nystagmus, cover test + prisms)

Exophthalmometry

Ophthalmoscopy - direct and indirect

Use of slit lamp and lenses

Retinoscopy (model eye)

** Candidates should note they may be asked to perform either a Goldmann or Humphrey visual fields and should also be prepared to interpret visual fields from this equipment.

NOTE: Although this syllabus is reasonably exhaustive, candidates may be asked about topics of relevance to optics and refraction and to clinical methods of examination which are not listed.

6 ACCIDENT AND EMERGENCY OPHTHALMOLOGY

6.1 Essential topics/experience:

To have become familiar with the following:

- *Superficial ocular trauma*: including assessment and treatment of foreign bodies, abrasions and minor lid lacerations.
- *Severe blunt ocular injury*: management of hyphaema; recognition and initial management of more severe injury.
- *Severe orbital injury*: recognition and initial management of blow-out fracture, optic nerve compression.
- *Penetrating ocular injury*: recognition and initial care of corneal and scleral wounds; recognition of aqueous leakage and tissue prolapse.
- *Retained intraocular foreign body*: anticipation from history; confirmation by X-Ray and CT scan.
- *International classification of ocular trauma*: ocular traumas must be adequately classified at the initial evaluation and prognosis given.
- *Sudden painless loss of vision*: recognition of retinal arterial occlusion, central retinal vein occlusion, acute ischaemic optic neuropathy, optic neuritis; urgency of treatment.
- *Severe intraocular infection*: recognition and initial investigation and management of hypopyon.
- *Acute angle closure glaucoma*: recognition and acute reduction of intraocular pressure.
- *Liaison*: with radiological department, microbiologists, ENT, faciomaxillary surgeons.

6.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Removal of superficial foreign bodies.
- Corneal epithelial debridement.
- Repair of minor conjunctival/lid lacerations.
- YAG iridotomy.

6.3 Background theory/principles:

To have gained an awareness of the following:

- Eye protection and prevention of injury.

- Lateral canthotomy and inferior cantholysis for retrobulbar haemorrhage.
- Chemical/alkali burns of the conjunctiva and cornea.
- Drug penetration into the eye and vitreous.
- Use of intravitreal antibiotics, including dosage and potential complications.

7 DISORDERS OF THE LIDS, LACRIMAL DRAINAGE APPARATUS, ADNEXAE AND ORBIT

7.1 Essential topics/experience:

To have become familiar with the following:

- *Abnormal lid position*: including assessment of ectropion, entropion, ptosis, trichiasis, lagophthalmos and exposure.
- *Abnormal lid swelling*: including chalazion, stye, retention cysts, papilloma and basal cell carcinoma.

7.2 Background theory/principles:

To have gained an awareness of the following:

- Sebaceous carcinoma of lid and squamous cell carcinoma.
- Cicatricial malposition of the lids.
- Management of ptosis and blepharospasm.
- Canaliculus repair.
- Dacryocystorhinostomy.
- Orbital and lacrimal tumours and their treatment.
- Inflammatory orbital and lacrimal diseases and their treatment.
- Paranasal sinus disease.
- Use of radiographs, MRI, CT scan.
- Enucleation, evisceration and fitting of prosthesis.
- Exenteration

8 EXTERNAL EYE DISEASE, SCLERA, CORNEA AND ANTERIOR UVEA

8.1 Essential topics/experience:

To have become familiar with the following:

- *Infectious external disease*: including viral, bacterial and chlamydial conjunctivitis.
- *The dry eye*: including symptoms, assessment of reduced tear production and tear film stability, and treatment.
- *Allergic and atopic eye disease*: recognition and management.
- *Corneal ulceration*: from viral and bacterial disease; marginal keratitis.
- *Complications of contact lens wear*.
- *Corneal oedema, opacity and ectasia*: indications for corneal transplantation; standards of care in donor eye procurement; signs of corneal graft rejection and other complications.
- *Episcleritis*: recognition and management.
- *Anterior uveitis*: including classification, differential diagnosis, systemic associations, investigation and treatment.
- *Liaison*: with microbiology, immunology.

8.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Conjunctival sampling and corneal scraping for microbiological investigation.
- Pachymetry for corneal thickness.
- Keratometry and Placido's disc.
- Removal of corneal sutures.
- Retrieval of donor eyes for transplantation [5].

8.3 Background theory/principles:

To have gained an awareness of the following:

- Acanthamoeba keratitis and fungal keratitis.
- Cicatricial conjunctival disease.
- Punctal occlusion.
- Corneal topography and specular microscopy.

- Corneal stromal dystrophies, interstitial keratitis.
- Corneal biopsy: indications.
- Chemical injury of the cornea and conjunctiva.
- Therapeutic contact lenses and their complications.
- Corneal transplantation: immunology of rejection.
- Limbal stem cell transplantation.
- Autoimmune corneal and scleral disease including peripheral ulcerative keratitis.
- Use of immunosuppressive therapies.
- Management of pterygium.
- Conjunctival and uveal tumours.
- Aniridia and other dysgenesis.
- Fuch's heterochromic cyclitis.

9 DISORDERS OF REFRACTION, THE CRYSTALLINE LENS AND ZONULES

9.1 Essential topics/experience:

To have become familiar with the following:

- *Ametropia*: including hypermetropia, myopia, astigmatism and their complications.
- *Accommodation problems*: including spasm and presbyopia.
- *Lens opacification*: including types of cataract, relationship of opacity to symptoms, contribution to visual loss in co-morbidities; systemic associations; cataract surgery and its complications.
- *Pseudoexfoliation of the lens capsule*: including its recognition and significance.
- *Calculation of intraocular lens power*: according to the patient's needs.
- *Liaison*: with contact lens service.

9.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Retinoscopy with trial lenses and subjective refraction.
- Correction of refractive error by spherical, cylindrical and multi-focal lenses.

- Lens neutralisation and use of focimeter.
- Biometry and keratometry for intraocular lens calculation
- Surgery for routine cataract, including extracapsular extraction and phacoemulsification with intraocular lens insertion; management of intra-operative complications [50 cataract or other intraocular procedures].
- Yag laser posterior capsulotomy [20].

9.3 Background theory/principles:

To have gained an awareness of the following:

- Basis of spectacle intolerance from poor dispensing or defective prescription.
- Use of logMAR charts in assessment of acuity.
- Alternatives to capsular IOL fixation.
- Combined cataract and glaucoma/corneal transplantation surgery.
- Ectopia lentis and Marfan syndrome.
- Contact lenses and refractive surgery.
- Therapeutic contact lenses.
- Fluidics and ultrasonics.
- Intraocular lens design and biomaterials.

10 DISORDERS OF AQUEOUS PRODUCTION AND DRAINAGE

10.1 Essential topics/experience:

To have become familiar with the following:

- *Glaucomatous optic neuropathy*: recognition and investigation.
- *Glaucoma suspects*: including ocular hypertension.
- *Rubeotic glaucoma*: recognition, differential diagnosis and management.
- *Hypotensive agents*: topical and systemic drugs affecting intraocular pressure and their complications.
- *Glaucoma drainage surgery*: indications, complications and their treatment.
- *Hypotony*: including its causes and consequences.

- *Liaison*: with glaucoma shared care schemes.

10.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Applanation tonometry.
- Assessment of peripheral and central anterior chamber depth including pachymetry.
- Assessment of irido-corneal angle structures by gonioscopy.
- Methods of optic disc cup measurement.
- Visual field testing, including Goldmann/kinetic perimetry and automated/static perimetry.

10.3 Background theory/principles:

To have gained an awareness of the following:

- Risk factors for primary open-angle and normal-tension glaucoma.
- Other secondary glaucomas, including phacolytic, pigmentary, erythroclastic, pseudo-exfoliative and silicone-oil glaucomas.
- Posner Schlossman syndrome.
- Chronic closed angle glaucoma.
- Malignant glaucoma.
- Tonopen, Perkins and non-contact tonometry.
- Scanning laser ophthalmoscopy and nerve fibre layer analysis.
- Argon laser trabeculoplasty.
- Prevention of glaucoma bleb failure e.g. using anti-metabolites
- Drainage tubes and stents.
- Cycloablation.

11 VITREORETINAL DISORDERS

11.1 Essential topics/experience:

To have become familiar with the following:

- *Flashes and floaters*: complications of posterior vitreous detachment and recognition of retinal tears.

- *Vitreous haemorrhage*: from retinal tears or neovascularisation; initial management.
- *Retinal detachment*: classification, predisposition, recognition and urgency of treatment; recognition of proliferative vitreoretinopathy.
- *Senile/acquired retinoschisis*: recognition.
- *Liaison*: with low vision services.

11.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Scleral indentation with indirect ophthalmoscopy.
- Retinal drawing.
- Cryopexy and laser (via slit-lamp and indirect ophthalmoscope delivery systems) for retinal tear.

11.3 Background theory/principles:

To have gained an awareness of the following:

- B-Scan ultrasound for opaque media.
- Vitreoretinal surgery: including closed intraocular microsurgery, scleral buckling and internal tamponade.
- Intraocular foreign body: complications and management.
- Other vasoproliferative vitreoretinopathies including sickle cell retinopathy, retinopathy of prematurity, Eales' disease.
- Genetic vitreoretinal disease: Stickler syndrome. X-linked retinoschisis.
- Asteroid hyalosis.
- Choroido-retinal coloboma.

12 MEDICAL RETINAL AND CHOROIDAL DISORDERS

12.1 Essential topics/experience:

To have become familiar with the following:

- *Diabetic retinopathy*: classification, screening strategies, management.
- *Hypertensive and arteriosclerotic retinopathy*: including macroaneurysms and branch retinal vein occlusion.

- *Retinal vascular occlusions*: recognition of ischaemic and exudative responses; rubeosis
- *Macular diseases*: including recognition of age-related maculopathy, subretinal neovascularisation, cystoid macular odema, macular hole; related symptomatology and urgency of treatment.
- *Fluorescein angiography*: indications, complications and interpretation.
- *Liaison*: with diabetologists, vascular surgeons, low vision services.

12.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Assessment of macular function (Amsler Chart, Watske Allen slit beam test).
- Scatter laser photocoagulation of the peripheral retina [20].

12.3 Background theory/principles:

To have gained awareness of the following:

- Fundus imaging including scanning laser ophthalmoscopy.
- Indocyanine green angiography.
- Electrodiagnostic tests and dark adaptation.
- Genetic retinal disease: retinal dystrophies, retinoblastoma.
- Differential diagnosis and treatment of malignant melanoma.
- Macular laser photocoagulation: principles and laser safety.
- Toxic maculopathy and central serous retinopathy.
- Intraocular lymphoma.
- Intermediate and posterior uveitis: toxoplasmosis, toxocara and sympathetic ophthalmia; retinal vasculitis.
- Coats' disease, other telangiectasis and the retinal phakomatoses.
- AIDS-related opportunistic infections and anti-AIDS treatment.
- Low vision aids, including optical principles and fitting.

13 DISORDERS OF THE OPTIC DISC AND VISUAL PATHWAY

13.1 Essential topics/experience:

To have become familiar with the following:

- *Swollen optic disc*: differential diagnosis, recognition and evaluation of papilloedema, ischaemic optic neuropathy (arteritic and non-arteritic), acute optic neuritis and congenital optic disc anomalies.
- *The atrophic optic disc*: recognition and differential diagnosis; clinical evaluation of optic nerve function.
- *Visual pathway disorders*: identification of site and nature of lesion from history, examination and investigations; transient ischaemic attacks.
- *Liaison*: with neurologists, neurosurgeons, endocrinologists and vascular surgeons.

13.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Goldmann visual fields.
- Examination of the cranial nerves.
- Temporal artery biopsy.

13.3 Background theory/principles:

To have gained an awareness of the following:

- Benign intracranial hypertension.
- Compressive optic neuropathy.
- Optic nerve glioma.
- Chiasmal lesions.
- Visual evoked responses.
- Neuro-imaging including CT, MRI and carotid doppler.
- Carotid endarterectomy.
- Multiple sclerosis and its ophthalmic manifestations.
- Higher cortical dysfunction, including the visual agnosias.

14 OCULAR MOTILITY, STRABISMUS, AMBLYOPIA AND DIPLOPIA

14.1 Essential topics/experience:

To have become familiar with the following:

- *Concomitant strabismus*: screening strategies; epicanthus; accommodative aspects; interpretation of orthoptic report; indications for surgery.
- *Amblyopia*: anisometropic, stimulus-deprivation, strabismic; prevention and treatment using occlusion.
- *Incomitant strabismus*: cranial nerve palsies including diabetic mononeuropathies; significance of painful third nerve palsy and of pupil sparing; prediction of post-operative diplopia.
- *Liaison*: with neurologists, orthoptists.

14.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Eye movement evaluation.
- Cover test (including alternate and prism).
- Stereo tests.
- Cycloplegic refraction.
- Horizontal muscle surgery.

14.4 Background theory/principles:

To have gained an awareness of the following:

- Nystagmus.
- Ocular motility syndromes (Duane's, Brown's).
- Use of botulinum toxin.
- Ocular myopathies and the neuromuscular junction.
- Supranuclear eye movement disorders.
- Fresnel prisms.
- Oblique muscle, vertical muscle and adjustable suture surgery.
- Electromyography.

15 DISORDERS OF THE EYE AND VISUAL SYSTEM AFFECTING CHILDREN

15.1 Essential topics/experience:

To have become familiar with the following:

- *The approach:* to infants, children and their parents.
- *Ophthalmia neonatorum:* diagnosis and management.
- *Congenital nasolacrimal obstruction:* recognition and management.
- *Ametropia in children:* significance and treatment.
- *The apparently blind infant:* normal and delayed visual maturation.
- *Liaison:* with paediatricians, geneticists.

15.2 Practical skills:

To have undertaken (under supervision until proficient) the following:

- Assessment of vision in children: fixation, preferential looking, single and linear optotype tests.
- Cycloplegic refraction and prescribing for children.
- Fundoscopy in children.

15.3 Background theory/principles:

To have gained an awareness of the following:

- Congenital nystagmus.
- Ocular albinism.
- Congenital glaucoma: diagnosis and management.
- Congenital cataract: diagnosis and management including prevention of amblyopia.
- Leucocoria: differential diagnosis including retinoblastoma.
- Retinopathy of prematurity: screening and treatment.
- Genetic and developmental disorders: Leber's amaurosis, X-linked schisis, Coats' disease.
- Paediatric neurological diseases.
- Presentation of raised intracranial pressure in infancy and childhood.
- Ophthalmic signs of child abuse.

- Orbital cellulitis presenting in children.
- Orbital tumours in children, including rhabdomyosarcoma.
- Services for and rehabilitation of the visually disabled child.
- *The watering eye*: including the distinction between excessive lacrimation and epiphora; blepharitis; recognition and investigation of nasolacrimal obstruction.
- *Orbital swelling*: including dysthyroid eye disease, distinguishing intraconal from extraconal space-occupying lesions, orbital cellulitis, recognition of compressive optic neuropathy.
- *Liaison*: with neurosurgeons, ENT, endocrinologists, prosthetic service.

Practical skills:

To have undertaken (under supervision until proficient) the following:

- Use of exophthalmometer.
- Syringing and probing.
- Incision and curettage for chalazion.
- Wedge biopsy and removal of papilloma etc.
- Tarsorrhaphy.
- Electrolysis/cryotherapy for trichiasis.
- Surgery for involutional ectropion/entropion.

MINIMUM REQUIREMENT FOR TRAINING CENTRES

1. Staffing Levels
 - Consultant Staff-minimum of 3
 - Optometrists, Orthoptists, Ophthalmic Nurses
2. Facilities for:
 - Key investigations and procedures such as photography, angiography, and visual fields, biometry, YAG laser and photocoagulation and ultrasonography.
 - b. Routine radiological investigations
3. Adequately equipped and staffed eye theatre
4. Library with regular subscription to key Ophthalmic Journals

REQUIREMENTS FOR COMPLETION THE LOG BOOKS (See Log Book)

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Curricula of the following were consulted in the preparation of this Curriculum:

1. West Africa College of Surgeons (WASC), Faculty of Ophthalmology
2. International Council of Ophthalmology (ICO)
3. Royal College of Ophthalmologists (RCOphth)
4. Accreditation Council for Graduate Medical Education (ACGME) www.acgme.org