INTRODUCTION

The ophthalmology residency training programme of the National Postgraduate Medical College of Nigeria aims at graduating ophthalmologists competent to lead the eye care team and for the effective eye health care delivery in Nigeria. The training is conducted in hospitals accredited for this purpose. The training programme is structured to enable a graduated acquisition of more knowledge and advanced skills as the trainee progresses in training.

TRAINING DURATION – The training is for a minimum of 4 years. The first 2 years is the junior residency leading to Part I examinations. The last 2 years is the senior residency program leading to the Part II (Final) examinations.

COMPETENCIES TO BE ACQUIRED DURING THE TRAINING
The core competencies that must be acquired during the 4 year training include
- Patient care with appropriate bedside manners,
- Medical knowledge of the basic and clinical sciences as applied to ophthalmology
- Practice-based learning
- Communication skills
- Professionalism
- Systems-based practice
- Surgical skills

GENERAL EDUCATION OBJECTIVES
The training aims at equipping candidate to be able to
a. Take full history; perform full physical examination including ocular, neurological, neuro-ophthalmic and use of ophthalmic instruments (ophthalmoscope, contact/non-contact lenses) and to formulate a working diagnosis.
b. Perform and interpret tests relevant to the patient’s condition including ultrasound, visual fields, fundus photography, orthoptics, etc.

c. Request for and interpret other relevant laboratory and radiological tests findings relevant to the patient’s condition.

d. Formulate treatment and follow-up plans for the patient in a manner compatible with evidence-based medicine.

e. Perform surgical procedures for common ophthalmic surgical disorders including cataract, glaucoma, orbital, lid and conjunctival disorders, retinal detachment, endophthalmitis, etc.

f. Recognize, investigate and manage with appropriate specialties, various systemic diseases with ocular involvement including neoplasms

g. Communication clearly with other members of the eye care team as well as patients and the public. This includes ability to teach subordinates on ophthalmic concepts and procedures.

h. Practice with bedside manners consistent with the prevalent ethical principles.

i. Design and conduct epidemiologic and clinical ophthalmic research on prevalent eye diseases.

j. Design, initiative and see to fruition, blindness prevention activities within the community in which he practices.

k. Effectively administer a department or unit of ophthalmology within a hospital setting.

l. Mount advocacy for eye health services, treatment and prevention of blindness.

m. Engage in life long professional development and education.

n. Provide effective leadership of the Eye care team.

The residency training seeks to produce general or comprehensive ophthalmologists. For effective and standardized training, a structured training programme is advocated (Appendix II) for uniformity in the country.

**Primary Fellowship Examination**

To enter the residency training program the candidate must have sat for and passed the Primary Fellowship Examination or must have earned an exemption from the examination by the College.
The goal of Primary Fellowship Examination is to ensure that the candidate has adequate and broad knowledge of the basic sciences as applied to ophthalmology. It therefore tests the candidate’s knowledge of anatomy, physiology, biochemistry, pharmacology, pathology, microbiology, immunology and genetics relevant to ophthalmology. The Primary Fellowship Examination is an entrance examination into the residency training. The Primary phase consists of Self-instructional learning for a minimum of 15 hours [3 hours/day a week] for 48 weeks (24 CREDIT UNITS)

The 1st and 2nd Year Residency Training (Junior Residency)

The goals of the first 2 years of junior residency training leading to the Part I examination emphasize

- recall of information, application of knowledge of basic sciences as well as application of knowledge of pathogenesis and patho-physiology to clinical problems;
- interpretation of clinical findings;
- formulation of diagnosis and differential diagnoses;
- development and implementation of treatment plan;
- acquisition of surgical skills as well as
- anticipation, recognition and treatment of complications.

For the first year of junior residency training the candidate is trained to be able to

a. describe the basic principles of optics and refraction (first 6 months to 1 year)

b. know the indications for as well as prescribe common low vision aids

c. understand the basic principles and practice of ophthalmic surgery; the trainee is required to attend the basic ophthalmic microsurgery course within the first 6 months of training.

d. perform basic anterior and posterior segments ophthalmic exams including refraction, retinoscopy, slit lamp biomicroscopy, ophthalmoscopy, fundus contact and non contact lens exams with 78D; 90D, Goldmann 3 mirror lens, gonioscopy lenses, IOP measurement; fluorescein staining of cornea.

e. Understand and use basic ophthalmic instruments including lensometer, tonometer, Maddox wing, Maddox rod, Jackson cross cylinder, ophthalmoscope, retinoscope, phoropter, color vision test charts, etc.

f. Know how to plot and interpret visual fields.

g. Triage and treat ocular emergencies including penetrating/non-penetrating ocular trauma, chemical burns, acute angle closure glaucoma, endophthalmitis, panophthalmitis, corneal ulcer, EUA.
h. Perform minor external and adnexal surgery including chalazion excision, corneal foreign body removal, corneal scrapping, conjunctival biopsy, side laboratory tests.

i. Understand key exam techniques and management of POAG, Corneal ulcer, dry eye, lid lesion, ptosis, maculopathy, diabetic retinopathy, retinal detachment, optic neuropathy, pupillary abnormalities, ocular motor palsy, etc.

j. Understand the indications, procedure and complications of cataract, and glaucoma surgeries.

k. Describe common genetic ocular disorders including retinal and macular dystrophies.

l. Describe and manage the systemic diseases that affect the eyes.

The competencies, skills and knowledge acquired in the 1st year of training are formally assessed as part of Continuous Assessment of the candidate’s progress. Areas of weakness are identified and steps taken to rectify them.

The 2nd year of junior residency training will build confidence on the skills and knowledge acquired during the year of training.

The candidate now performs the following:

a. more difficult and more complex refraction including higher order aberrations, refractive surgery, post-cataract (IOL) surgery, refraction in children; putting contact lenses fitting and use of Placcido disk.

b. use more advanced low vision aids as well as understand and handle the multiple challenges, including social and economic factors facing the low vision patient and his or her family.

c. more advanced posterior segment exams including depressions; detailed retinal exams with contact/non contact lens; description and drawing retinal lesions; anterior segments exams including gonioscopy; ultrasound exams (B and A scans).

d. comprehensive assessment and treatment of strabismus

e. Diagnosis and treat ocular emergencies as well as also anticipate the short and long term complications of these emergencies.

f. more advance external, adnexal and orbital surgical procedures including ectropion/entropion repair.
g. Examine and manage confidently secondary glaucoma, fungal and other less common keratitis, corneal transplant, ptosis, simple retinal detachment, mild to moderate proliferative and non-proliferative diabetic retinopathy and laser photocoagulation, myasthenia gravis, optic neuropathy, supranuclear palsy and complex visual field defects. The candidate should attend the neuro-ophthalmology/neurology course.

h. Continue to update knowledge and understanding of modern cataract and glaucoma surgical techniques.

i. Recognize and counsel on ocular genetic disorders including retinitis pigmentosa, neurofibromatosis, angiomatic retina, retinoblastoma, albinism, etc.

j. Recognize ophthalmic histopathologic, hematologic and microbiologic laboratory findings.

The conclusion of the 2nd year marks the end of the junior residency training. It should be rounded off with the resident sitting for the Part I Fellowship Examination. A candidate becomes a senior resident (Senior Registrar) when he passes the Part I Fellowship Examination.

The Part One phase [148 CREDIT UNITS] consisting of:

- **Self-instructional learning for a minimum of 10 hours a week [2 hours/day] for 96 weeks [24 months]**
- **Tutorials for 1 hour per week for 96 weeks**
- **Seminars, clinical meetings, journal club, etc., for 1 hour per week for 96 weeks**
- **Clinical (including basic ophthalmic surgery) training for 30 hours per week [5 hours per day for 6 days/week] for 96 weeks**
- **Mandatory Intensive Update Courses (i.e. Clinical Ophthalmology & Optics/Refraction Courses) 30 hours per week [6 hours/day] for 2 weeks for each course**

Minimum surgical experience before the Part I Exam:

- **Cataract:** 10 assisted; 20 performed without assistance
- **Glaucoma:** 10 assisted; 10 performed without assistance
- **Penetrating eye injuries:** 10 performed without assistance

The supervising consultant ophthalmologist should assess and certify these surgical procedures as at when performed. For this purpose the candidates should maintain a Faculty-approved log book.

The 3rd and 4th Year Residency Training (Senior Residency) (72 CREDIT UNITS including the mandatory Community Ophthalmology course & posting)

This involves more advanced training. The candidate build on the knowledge gained during the 1st and 2nd years of training. During this period the candidate is expected to be involved with decision-making in patient management; should write a proposal and commence data gathering for the Part II (Final) Fellowship Examination dissertation; should undergo a 3 month rural/community ophthalmology posting. A candidate who
has the opportunity can also spend 6-12 months in an overseas ophthalmology training institution with a view to acquiring more competencies.

Towards the end of the 4th year the candidate submits a dissertation as part of the requirement for the Part II (Final) Fellowship Examinations.

The specific clinical competencies to be learnt during the period include
a. Perform competently complex refractions including higher order aberrations as well as pre- and post- refractive surgery procedures.

b. Competently and confidently attend to low vision patients and prescribe appropriate aids to them.

c. Perform and interpret in more details clinical exam findings including corneal topographic map; retinal drawing for detachment and other lesions; A and B Scans; gonioscopy, etc.

d. Supervise and guide competently junior residents in the management of ocular emergencies.

e. Hold tutorials for junior residents, medical students and other paramedical personnel in the eye care team.

f. Perform more advanced external and adnexal surgery including lacrimal gland surgery, complex lid laceration, repair with canalicular and lacrimal apparatus involvement.

g. Identify key examination techniques and management of complex though common medical and surgical problems in the subspecialty areas glaucoma, (complicated and post-operative primary and secondary open and closed angle glaucoma); cornea(e.g. unusual or rare types of microbial keratitis; keratoplasty); ophthalmic plastic surgery (lid lesions; recurrent ptosis); retina (e.g. Complex retinal detachment; traction retinal detachment; proliferative vitreo retinopathy) neuro-ophthalmology (e.g. Unusual optic neuropathy; neuro-imaging, supranuclear palsy; etc); interprete plain x-rays, ultrasound, CT, MRI, OCT, etc. of the eye and orbit.

h. Perform and treat complications of cataract and glaucoma surgeries.

i. Acquire competencies in the efficient organization of eye care services and leadership of the eye care team. **Candidate should attend the College-organized health management course.**

j. Acquire competence in epidemiologic and clinical ophthalmic research and publication. Candidate should participate and publish at least 2 journal articles. **Candidate should attend the College-organized research methodology course.**
k. Perform more advanced external and adnexal surgeries including ectropion, entropion, lid lesions and ptosis, strabismus surgery.

l. Master the exam techniques and management of the following secondary (open and closed angle) glaucoma; fungal and other microbial keratitis, keratoplasty, ptosis surgery, Z-plasty; retinal detachment; diabetic retinopathy; laser photocoagulation; supranuclear palsies, myasthenia gravis, nutritional and infective optic neuropathy; headache and migraine, complex visual field defects, neuro-ophthalmic disorders secondary to CNS defects.

m. Master common anterior segment surgical procedures – cataract and glaucoma surgeries as well as manage complications.

n. Recognize microbial, hematologic and histopathologic features of ophthalmic disorders.

**Community Ophthalmology postings:**

Outreach centres and community services are ways of achieving these objectives. Training centers should therefore embark on such community based services. The community ophthalmology posting will endure for a total of 3 months during the senior residency years. At the end of the period the candidate should provide a formal report of the community posting experience to the department which will form part of the candidate’s continuous assessment. _Ideally the trainee should attend the community eye health course before embarking on this posting._

**Minimum surgical experience before the Part II Exam:**

- **Cataract:** additional 30 viz: 15 ECCE/IOL, 10 SICS/IOL and 5 phacoemulsification/IOL procedures
- **Glaucoma:** additional 20 including releasable suture techniques
- **Penetrating eye injuries:** additional 10
- **Laser photocoagulation of posterior segment:** 3
- **Laser capsulotomy:** 3
- **Laser trabeculoplasty:** 3

The supervising consultant ophthalmologist should assess and certify these surgical procedures as at when performed. For this purpose the candidates should maintain a Faculty-approved log book.

**Research Training**

Residents are encouraged to learn the wholesome habit of systematic clinical problem solving, featuring observation, interpretation, deductive reasoning, decision-making, and intervention followed by further observation. This habit which resident doctors are encouraged to acquire during training is itself the basic requirement for competence in research.
Besides, training institutions are obliged to institute a research committee and an ethical committee part of the function of which it is to screen research proposals within the department for appropriateness and scientific content as well as for compliance with ethical requirements.

A monthly departmental research seminar is expected to be the forum in which young researchers present their projects for discussion, and receive the criticism and guidance of their teachers and peers.

**Teaching Skills**

True to the hierarchical organization in medicine, resident doctors have the opportunity of acquiring teaching skills during training through the practice whereby every doctor teaches those junior to him, other members of the health team, as well as counsel his patients and relatives in order to achieve an effective therapeutic alliance.

In addition, resident doctors have the opportunity to attend the educational methodology workshop; management and computer courses held once a year at the College secretariat. Training institutions are encouraged to avail their residents of this opportunity.

**Management Training**

The secretariat of the College, conducts management courses twice a year, which senior resident doctors should be encouraged to attend by their training institutions. Also, second year senior residents should be appointed as chief resident and given effective opportunity to serve in a management post.

**Communication Skills**

It is important that ophthalmologists should be effective communicators, not only in the ordinary running of clinical practice involving medical record documentation, case presentation, case referral and discharge summary writing, but also in the context of scientific journal publication, and indeed examination writing.

Therefore the training programme must provide opportunities for the acquisition and evaluation of various levels of communication skills. (Appendix III)

**Continuing Education (courses, workshops, conferences, etc.)**

The need for continuing medical education especially in the field of ophthalmology and other medical specialties is just as vital as the period of fellowship training. Fellows of the Faculty of Ophthalmology are actively encouraged to continue their ophthalmological training throughout their active practice life. Among other means to achieve this, Fellows and Associate Fellows are encouraged to take active interest in activities of the Faculty and the College. They should be encouraged to take advantage of modern information technology (internet) facilities as well as attend both local and international conferences association meetings where they communicate freely with colleagues, other groups or schools of thought. A resident (Associate Fellow) should attend at least a conference (local or international) each year. A resident should show evidence of having attended at least one national ophthalmological conference to qualify to sit for the Part I examination.
and one additional national ophthalmological conference to qualify to sit for the Part II examination.

The Part Two phase [72 CREDIT UNITS] consisting of
Training in advanced clinical & surgical skills for 30hours per week [5hours per day for 6days /week] for 48 weeks
Seminars, Tutorials, Facilitation of learning junior residents, etc., for 1hour per week for 96 weeks
Mandatory Health Management Workshops, 30 hours per week [6hours/day] for 2 weeks
Mandatory Research Methodology Workshops, 30 hours per week [6hours/day] for 2 weeks
Dissertation; proposal, literature gathering, field work, reporting.
Community ophthalmology course 30 hours per week (6 hours/day) for 4 weeks
Community Ophthalmology posting 30 hours per week (5 hours per day for 6 days /week) for 12 weeks

Training Kit:
To ensure effective training and acquisition of the necessary technical skills each resident should have a training kit containing the following:

- Trial lens box & frame
- Direct ophthalmoscope
- Indirect ophthalmoscope
- Streak retinoscope
- Contact & non-contact lenses: 20, 28, 78, 90D
- Gonio lenses

ASSESSMENTS AND EXAMINATIONS
Continuous (In-course) Assessment
In order to effectively prepare the resident for the various parts of the FMCOph examinations, it is advisable for the teachers to assess their residents by regular in-course assessment exercises. Procedures which are mandatory for each clinical posting are addressed in the resident's portfolio. Once adjudged satisfactory, such procedures are credited to the resident. To be signed off at the end of each posting, the resident must judged to have satisfactorily performed all the mandatory procedures for that posting.

An end of posting test is highly recommended. Each year an annual report on the progress of each resident is required to be sent to the Faculty Secretariat.
CERTIFYING EXAMINATION OF THE COLLEGE

Application for College Certifying Examinations
The Fellowship Examinations are held twice a year in May and November. A call for application is published in at least one of the National Daily newspapers in December and June for the March/May and September/November examinations respectively. Candidates are advised to watch out for, and comply with the examination application requirements as outlined in these advertisements.

Primary Fellowship Examination
Basic Science courses are available which candidates can go through before taking the primary Examination. Details of this examination have been discussed earlier.

Part I Fellowship Examination
To be eligible to sit the Part I Fellowship Examination, candidates should have:
Passed Primary examination
Completed junior residency training
Satisfactorily performed all prescribed surgical procedures relevant to each posting, and been duly signed up in the certificate of training, to that effect. Candidates are eligible to write the examination at least by the 24th month of junior residency training
The Part I Fellowship examination consists of three sections.

1. Three Written papers
   These shall consists of:
   - Paper I: One 2 hour 100 stem multiple choice questions with five branches in all aspects of ophthalmology.
   - 30 questions in medical ophthalmology
   - 30 questions in surgical ophthalmology
   - 20 questions in optics and errors of refraction
   - 20 questions in ocular pathology

   Paper 2: One written paper for 3 hours in optics and errors of refraction.

   Paper 3: One written paper for 3 hours in medical and surgical ophthalmology including ocular pathology and community eye health.

2. Clinical (Long and Short Cases and Refraction) Examination in Ophthalmology.
   Each candidate is presented with one long case and numerous short cases and one refraction case. Candidates are assessed for the quality and thoroughness of:
   - History taking and examination
   - Case presentation
   - Interpretation of clinical findings
   - Patient management.
   Special attention is paid to candidate's ability to foresee and prevent complications associated with his management strategy.
   **The Faculty should replace the long & short cases as well as clinical refraction with the Objective Structured Clinical Examination (OSCE) by May 2012**

3. Practicals/Objective Structured Practical Evaluation (OSPE) – Covers aspects of surgical and clinical examination skills including interpretation of ancillary tests results; patient problem management and handling of ophthalmic diagnostic and surgical instruments.

4. Oral (Viva Voce)
   The purpose of Viva Voce is to cover as wide a field as possible with the candidate. Each candidate is subjected to fifteen to twenty minutes oral examinations dealing with principles of surgery, pre-and post-operative management, surgical pathology, diagnostic modalities and operative surgery.

   **The Part I examination with regard to the Principles of Optics and Refraction will emphasize tests of competencies the following:**

   **Instrument technology**
All trainees must understand and apply knowledge of instrument technology relevant to ophthalmic practice. They must be aware of the limitations of technology and the risks involved in their use. They must be able to maintain an understanding of new developments in relevant technologies.

- Direct and indirect ophthalmoscopes
- Retinoscope
- Focimeter
- Simple magnifying glass (Loupe)
- Lensmeter
- Automated refractor
- Slit-lamp microscope
- Applanation tomography and tonometry
- Keratometer
- Specular microscope
- Operating microscope
- Zoom lens principle
- Corneal pachometer
- Lenses used for fundus biomicroscopy (panfunduscope, gonioscope Goldmann lens, Hruby lens, 90D lens, etc.)
- Fundus camera
- Lasers
- Fields machines (Goldmann, Humphrey)
- Retinal and optic nerve imaging devices (OCT, SLO, GDx)

This assessment will specifically test competence in the following instruments:

- Visual acuity measurement charts (near and distance)
- Duochrome test
- Retinoscope
- Focimeter / lensmeter
- Keratometer
- Stereo tests
- Jackson Cross-cylinder
- Maddox Rod
Maddox Wing
Prism bar
Auto refractor
Colour vision tests

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

Examination Results
In order to pass the examination a candidate must obtain a pass in the combined clinical examination, and must pass refraction and score an aggregate 50% pass overall.

Part II Fellowship Examinations
The Part II Examinations is designed to complete the assessment of professional competence in ophthalmology before the award of the Fellowship Diploma in Ophthalmology.

Registration for Part II FMCOph. Examinations
Not later than 12 months before the date of the examinations in which the candidate proposes to appear and in order to be eligible to appear in the Part II examinations:

1. A candidate should register the names of 2 dissertation supervisors recognized by his/her training centre, one of whom should be a Fellow of the College. Submit written attestations by the supervisors indicating their willingness to supervise the project for the dissertation, i.e. collection of data, analysis of data and general write up of the dissertation.
2. The dissertation proposal should be considered in a departmental seminar and approved by the department before it can be registered for the examination.

3. The relevant institutional review board or ethical approval for the study should be obtained before registration of the dissertation proposal with the College.

The Faculty Secretary would provide a feedback to the candidate on the registration of his dissertation title by the Faculty Board.

The Dissertation
The objective of the dissertation is, among others, to give the candidate a chance to demonstrate that he/she is able to clearly define a research topic, define his/her research objectives, analyze and discuss his results scientifically and objectively. The write up of the dissertation should follow the approved format, namely:
A title page featuring
   - The title of the work
   - "submitted by"
   - The name of the author
   - to
   - "the National Postgraduate Medical College of Nigeria"
   - in part fulfilment of the requirements for the award of the final Fellowship of the Medical College in Ophthalmology (FMCOph)
   - “Date of Examination”

The Declaration Page
In which the candidate declares that the work presented has been done by him/her under the appropriate supervision, and it has not been submitted in part or full for any other examination.

A dedication page which is optional, may be included here.

The Attestation Page
In which the Supervisor(s) himself(Themsehls) attest(s) to the fact that the work had been done, and the dissertation written under his (their) close supervision.
Acknowledgement Page

In which the candidate specifically acknowledges all the assistance he has received in the course of the work, including copying permissions.

The Summary of Abstract

The main work begins with a summary of the dissertation featuring the key features in about 500 words. Nothing should feature in the summary that has not been presented in greater detail in the main body if the work.

The Introduction

The introduction chapter should contain a clear definition of the problems to be studied, including, a justification for the study, a delimitation of the scope of the study.

Review of Literature – review broad body of knowledge on the subject

State objectives of the Study

Patients and Methods or Materials and Method of the study

The Results

The Discussion

Conclusions and Recommendation and finally

References, using the system proposed by the International Committee of Medical Journal Editors ie. According to the Vancouver style: surname(s) of author(s), author(s)' initial(s), title of the article, abridged name of journal as per index medicus, volume of journal, page and year e.g. Br J Ophthalmol 2010; 296:401- 4

For book references, the sequence is as follows:- Title of the book, publisher, town, edition and year of publication. All references should be listed according to their sequence of appearance in the article.
Candidates are advised, not only to acquire a copy of the Handbook, but to attend at least one of the yearly intensive courses in Research Methodology organized by the College.

*When a candidate is appearing for the oral examination on his/her dissertation, he/she is required to bring a copy of the dissertation paged in the same way as the 4 copies previously submitted for the examination (unbound)*

### The Part II Fellowship Examinations

The Part II Fellowship Examinations shall consist of:

a) A comprehensive oral examination on the candidate's dissertation. The "Dissertation orals" shall focus on candidate's accomplishment of those objectives of the dissertation earlier stated in this handbook.

b) Orals on the General Principles and Practice of Ophthalmology which shall focus respectively on:
   - Principles of Ophthalmology
   - Medical, Tropical and Surgical Ophthalmology including pathology.
   - Community Ophthalmology
   - Management Skills

c) Practicals shall include Demonstration of clinical skills

*It is the responsibility of the candidate to retrieve his/her dissertation at the end of the examination.*

### Examination Results

In order to pass the examination, a candidate must:
Have his/her dissertation accepted and
Pass the Viva Voce.

However, a candidate who has his/her dissertation accepted as *P* or *P+* level but fails in the Viva Voce shall be referred in the Viva Voce only, against the next examination.
A candidate whose dissertation needs some significant corrections, i.e. *P-* level pass, but who had passed the Viva Voce shall have a Provisional Pass.
A candidate, having passed the Viva Voce but whose dissertation needs major restructuring, i.e. *P-I* level, shall be referred in the Dissertation.
Provisional Results
Provisional results are pasted on the notice board of the Postgraduate College, usually at the end of the examinations.

Correspondence
The College or the Faculty of Ophthalmology does not normally enter into correspondence or discussion in respect of the details of a candidate's performance in the examination.

DETAILS OF SYLLABUS FOR THE PRIMARY FELLOWSHIP EXAMINATION [24 CREDIT UNITS]

Anatomy
All trainees must understand and apply knowledge of the anatomy of the eye, adnexae, visual pathways and associated aspects of head, neck and neuro anatomy. It extends to applied anatomy relevant to clinical methods of assessment and investigation relevant to ophthalmic practice. They must be able to use this knowledge when interpreting clinical investigations and in the practice of ophthalmic surgery.

The Orbit and adnexae: Osteology, orbital foramina, eyelids, conjunctiva, lacrimal system, extraocular muscles, intraorbital nerves, vessels, orbital fascia
Ocular anatomy: Conjunctiva, cornea, sclera, limbus and anterior chamber angle, iris and pupil, lens and zonule, ciliary body, choroid, retina, vitreous, optic nerve

The Cranial Cavity: Osteology of the skull, meninges, vascular supply, foramina, cranial fossae, pituitary gland and its relations
Central Nervous System: Cerebral hemispheres and cerebellum including microscopic anatomy of visual cortex, cranial nerves, spinal cord, vascular supply, visual pathways, control of eye movement, autonomic regulation of eye.

Head, neck and thorax: Nose, mouth, paranasal sinuses, face and scalp, pharynx, soft palate, larynx, trachea, lungs, major arteries and veins, lymphatic drainage of the head and neck
Cardiovascular system: Gross anatomy of the thorax, heart, and major blood vessels. Microscopic anatomy of arteries, veins and capillaries
Physiology

All trainees must understand and apply knowledge of the physiology of the eye, adnexae and nervous system, including related general physiology. This includes the applied physiology relevant to clinical methods of assessment in ophthalmic practice. They must be able to use this knowledge when interpreting clinical symptoms, signs and investigations and in the practice of ophthalmic medicine and surgery.

General principles including:

- Maintenance 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, muscle

- Blood: Plasma composition and functions, cell types, immune mechanisms, 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

**Ocular physiology including:**

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

**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

**Biochemistry and cell biology**
All trainees must understand and apply knowledge of the basic biochemistry and cell biology. This includes in particular those aspects relevant to common eye diseases. They must be able to use this knowledge when interpreting clinical symptoms, signs and laboratory investigations and in the practice of ophthalmic medicine and surgery.

Biochemistry of the cell: Organelles, plasma membranes, cytoskeleton, nucleus (DNA, RNA), transport mechanisms, cell-cell communications, cell-matrix interactions

Signalling: Growth factors, cytokines, hormones, eicosanoids, receptors, signal transduction, intracellular signalling pathways (e.g. second messengers)

Cellular processes: Cell cycle, protein synthesis (transcription, translation, post-translational modification), nucleic acid synthesis, proliferation, migration, apoptosis, metabolic processes

Connective tissue and extracellular matrix: Extracellular matrix molecules, composition of ocular extracellular matrices, synthesis/degradation, cell-matrix interactions

Biochemical and molecular biological techniques: Examples include: gene cloning, polymerase chain reaction, in-situ hybridisation, immuno-localisation, ELISA assays, Western, Northern and Southern blotting.

Biochemistry and cell biology of ocular tissues: Cornea, sclera, ciliary body, lens, vitreous, retina, choroid.

Active oxygen species: Free radicals and H₂O₂, scavengers, lipid peroxidation, phospholipase A

Pathology

All trainees must understand and apply knowledge of pathology, especially the specialist pathology of the eye, adnexae and visual system. This includes histopathology, microbiology and immunology and other branches of pathology. They must be able to use this knowledge when interpreting clinical symptoms, signs and investigations and in the practice of ophthalmic medicine and surgery.

Acute inflammation: Chemical mediators, cellular mechanisms
Wound healing
Chronic inflammation: Types, granulomata, immune mechanisms, ulceration, specific examples
Immunological mechanisms: Types of hypersensitivity reaction
Graft rejection
Degenerations: Examples: amyloidosis, calcification
Ageing and atrophy
Hypertrophy, hyperplasia and metaplasia
Vascular disorders: Atheroma, thrombosis (and homeostatic clotting mechanisms
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 – including regulation of apoptosis; oncogenes; geographical
and environmental factors; pre-neoplastic conditions; effects of irradiation and cytotoxic
drugs

BASIC OCULAR PATHOLOGY
With an emphasis on:
Cornea endothelial dysfunction and corneal dystrophies
Glaucoma
Cataract
Diabetes
Age Related Macular Degeneration
Retinal vascular occlusion
Ocular neoplasia
Retinal detachment and Proliferative Vitreo-retinopathy

MICROBIOLOGY:
The biological and clinical behaviour of the micro-organisms responsible for infections
Elementary principles of microbial pathogenesis: Concepts of colonisation, invasion, endotoxins, exotoxins, virulence and
pathogenicity etc.
Gram staining and classification
Commensal eye flora
Viruses: Classification, structure and replication, antiviral agents, laboratory methods of viral detection; viral infections of the eye.
Prions
HIV and AIDS
Fungi: Classification, factors which predispose to fungal infection, antifungal agents.
Toxoplasmosis, Chlamydia, Acanthamoeba, helminthic infections
Principles of sterilization: Disinfection and asepsis and the application of these to current practice and practical procedures
Antimicrobials: Spectrum of activity, mode of action, pharmacokinetics and resistance

IMMUNOLOGY

Principles of immunology e.g. non-specific resistance, genetic basis of immunity, cellular and humoral mechanisms
Host defence mechanisms with particular reference to the eye
Mechanisms of immunologically-induced tissue damage with special reference to the eye
Role of soluble mediators (cytokines and chemokines) in regulation of inflammatory responses
MHC antigens, antigen presenting cells and antigen processing
Transplantation immunology (with particular reference to the cornea)
Immunodeficiency and immunosuppression
Tissue regulation (with particular reference to the eye) of inflammatory responses

Growth and senescence

All trainees must understand and apply knowledge of growth, development and senescence, and the anatomical, physiological and developmental changes which occur during embryogenesis, childhood and ageing relevant to ophthalmic practice. They must be able to use this knowledge when interpreting clinical symptoms, signs and investigations and in the practice of ophthalmic medicine and surgery.

Embryology: General embryology especially at early stages; embryology of the eye, orbit, adnexae and visual pathways; the embryological origins of congenital malformations of the eye.

Child development: key milestones in childhood development especially regarding the visual and central nervous systems.

Senescence: the process of ageing and degeneration.

Therapeutics
All trainees must understand and apply knowledge of clinical therapeutics relevant to ophthalmic practice. They must be able to use this knowledge when prescribing for a patient. They must understand the therapeutics used in general medicine and surgery to a basic standard. They must be aware of the possible ocular effects of systemic medications and systemic effects of ocular medications.

PHARMACOLOGY

Pharmacokinetics and pharmacodynamics: General and specific to ocular tissues

Drug-receptor interactions

Mechanisms of drug actions (including receptor pharmacology and biochemical pharmacology)

Mechanisms of drug toxicity

Specific classes of pharmacological agents: Examples include catecholaminergics, cholinergics, serotonergics and histaminergics, eicosanoids

Pharmacology of drugs used in inflammation and immunosppression

Pharmacology of drugs used in glaucoma

Local anaesthetics

Analgesics

Clinical Genetics
All trainees must understand and apply knowledge of clinical genetics relevant to ophthalmic practice. They must be able to use this knowledge when advising patients about patterns of inheritance. They must recognise when it is appropriate to refer a patient for genetic counseling. They must recognise when it is important to offer a consultation with family members.

Organisation of the genome: Genes, chromosomes, regulation of transcription

Mendelian genetics: General principles

Population genetics: General principles

Cytogenetics: Aneuploidy, deletions, translocations, mosaicism, chimerism

Genetic basis of eye conditions: Genes involved in ocular disorders or systemic disorders with an ocular phenotype

Investigative and research techniques: Linkage analysis, candidate genes, twin studies, association studies

Gene therapy: General principles

**Suggested reading list for Primary Fellowship Examination**

*This list is not exhaustive but definitely useful for preparing for the Primary Fellowship Examination.*


Volume 1. Update on general medicine.
Volume 2. Fundamentals and principles of ophthalmology


DETAILS OF THE SYLLABUS FOR JUNIOR & SENIOR RESIDENCY PROGRAMMES

OPTICS

JUNIOR RESIDENCY

A. Cognitive skills

1. To describe the basic optics of the human eye (eg., ametropia, astigmatism, hypermetropia, myopia, presbyopia, aniseikonia, anisometropia, aphakia)

2. To describe the importance of pupil size and its effect on optical resolution.

3. To list the various refractive surfaces.
4. To describe the optical parameters affecting retinal image size

5. To describe a schematic eye and reduced eye.

6. To describe the following terms related to magnification
   a. Linear
   b. Angular
   c. Relative size
   d. Electrons

7. To describe the following terms relative to visual acuity testing
   a. Distance and near acuity measurement
   b. Minimal - LogMAR
      1) Visible
      2) Perceptible
      3) Separable
      4) Legible
   c. Vernier acuity

8. To describe the indications for, interpret basic tests of contrast sensitivity and color vision (eg. Ishihara color plates, Hardy-Rand-Rittler plates, Farnsworth-Munsell testing).

9. To describe the following terms and the clinical application for each
   a. Physical optics
      1. Properties of light
         i) Wave theory of light
      2) Images
      3) Objects as light sources
      4) Laws of refraction
         a) Passage of light from one medium to another
         b) Absolute index of refraction
         c) Total reflection
d) Vergence of light
   i) Diopter
   ii) Convergence
   iii) Divergence
   iv) Vergence formula

e) Real/virtual objects and images

f) Interference and coherence

g) Polarization

h) Diffraction/diffusion

i) Scattering

j) Transmission and absorption

k) Illumination

l) Pinhole imaging

m) Image quality

n) Brightness radiance

o) Light propagation-optical media and refractive index

p) Ray tracings

10. To describe following optical concepts in a clinical context
    a. Geometrical optics
       i) Optical interfaces
       ii) Objects and images at infinity
       iii) Refractive index
       iv) Snell’s Law
       v) Multiple lens systems

    b. Mirrors
       i) Laws of reflection
       ii) Critical angle
       iii) Regular and diffuse reflection
       iv) Image and field of a plane mirror
       v) Focal point and focal length of spherical mirror
       vi) Critical angles
c. Prisms
   i) Types
      a) Plane
      b) Parallel
      c) Plate
         ii) Refraction of light through a prism
         iii) Total internal reflection
         iv) Ophthalmic prisms
         v) Thin prisms
         vi) Prism dioplers
         vii) Minimum deviation
         viii) Prismatic effect of lenses
         ix) Prentice rule
         x) Fresnel’s prisms

d) Lenses
   i) Diopter
   ii) Concave and convex
   iii) Vertex power/lens effectivity
   iv) Sphero-cylinder lenses
   v) Cross cylinders
   vi) Conoid of Sturm
   vii) Transposition: +cylinder versus - cylinder
   viii) Focal points and focal planes
   ix) Principal planes and principal points: Thin versus Thick lens
   x) Focal length
   xi) Reflection and refraction at curved surfaces
   xii) Lens effectivity
   xiii) Simple lens formula

e) Lens aberrations
   i) Spherical aberration
ii) Coma
iii) Astigmatism
iv) Distortion
v) Aberration
vi) Pantoscopic tilt

f) Lens Materials
   i) Lens styles/materials
   ii) Slab off prism
   iii) Aphakic spectacles

G) Instruments
   i) Lensometer
   ii) Slit lamp biomicroscope
   iii) Retinoscope
   iv) Direct ophthalmoscope
   v) Indirect ophthalmoscope

h) Telescope
   i) Galilean
   ii) Keplerian
      - Aniseikonia
      - Knapp’s Rule

B. Technical skills
   1. To perform a basic refraction of simple refractive error.
   2. To perform basic assessment of corneal topography (e.g., Placido disc, keratometry, automated corneal topography).

   3. To perform the following basic refractometric techniques.
      a. Retinoscopy
      b. Objective and subjective refraction (manifest and cycloplegic refraction and post-cycloplegic refractions)
      c. Use of cylinders
      d. Application of cross cylinder technique
4. To describe and apply in a clinical setting the following basic concepts
   a. Snell’s Law
   b. Refraction and axial myopia
   c. Refraction and axial hyperopia
   d. Cylinder lenses and pinhole

5. To describe and to apply in a clinical setting the following concepts on accommodation and convergence.
   a. Amplitude of accommodation
   b. Near point of accommodation
   c. Effects of spectacles and contact lenses
   d. Far point
   e. Near point

Standard Level Goal: PGY-3
SENIOR RESIDENCY
Improve proficiency in Basic Level skills in optics and refraction.

In addition to the standard and basic level goals the trainee should apply the relevant optics information, above, in the following situations:
   1. Refraction and prescribing of spectacles and contact lenses
   2. Intraocular lens calculation
   3. Cataract surgery
   4. Use of prisms for diplopia
   5. Low vision aid prescribing

RETINOSCOPY AND REFRACTION

Overall goals:
1. to identify the principles and indications for retinoscopy;
2. to perform the techniques of retinoscopy;
3. to identify media opacities and other ocular co-morbidities with retinoscopy, and
4. to perform an integrated refraction based upon retinoscopic results.

**Basic Level Goals (Junior Residency)**

1. to describe the major types of refractive errors;
2. to perform elementary refraction techniques (e.g., for myopia, hyperopia, accommodative add);
3. to perform subjective refraction techniques for simple refractive errors;
4. to describe basic ophthalmic optics and optical principles of refraction and retinoscopy;
5. to perform retinoscopy for detecting simple refractive errors;
6. to describe the indications for and to use trial lenses or a phoropter for simple refractive error, and
7. to describe the basic principles of keratometer.

**Standard Level Goals: (Junior residency)**

In addition to Basic Level Goals, the trainee should be able:

1. to describe more complex types of refractive errors, including post-operative refractive errors;
2. to perform more advanced refractive techniques (e.g., astigmatism, complex refractions, asymmetric accommodative add);
3. to perform objective and subjective refraction techniques in more complex refractive errors, including astigmatism and post-operative refractive error;
4. to describe the more advanced ophthalmic optics principles of refraction and retinoscopy (e.g., post-keratoplasty, post-cataract extraction);
5. to perform more advanced techniques of retinoscopy for detecting simple and complex refractive error;
6. to describe and use more advanced techniques using trial lenses or the phoropter for more complex refractive errors, including modification and refinement of subjective manifest refractive error and more complex refractive errors (e.g., advanced and irregular astigmatism, vertex distance), and
7. to use the keratometer for detection of more advanced refractive error.
Advanced Level Goals (Senior Residency)
In addition to Standard Level Goals the trainee should be able:
1. to describe the most complex types of refractive errors, including post-operative refractive errors, post-keratoplasty, and refractive surgery;

2. to perform the most advanced refraction techniques (eg., irregular astigmatism, pre-and post-refractive surgery);

3. to perform objective and subjective refraction techniques in the most complex refractive error, including astigmatism and post-operative refractive error;

4. to describe the most advanced ophthalmic optics and optical principles of refraction and retinoscopy, including higher order aberrations;

5. to utilize the most advanced ophthalmic optics and optical principles of refraction and retinoscopy, including higher order aberrations;

6. to perform the most advanced techniques using trial lenses or the phoropter for more complex refractive errors, including modification and refinement of subjective manifest refraction, and post-cycloplegic refraction, irregular astigmatism, post-keratoplasty, and refractive surgery cases;

7. to use the keratometer for detection of subtle or complex advanced refractive error, and

8. to use more advanced refraction instruments and techniques (eg., distometer, automated refractor, corneal topography).

CATARACT AND LENS

General Goals:

A. to describe the indications, evaluation and management, and intra and post-operative complications of cataract surgery and other anterior segment procedures;
B. to perform the complete pre-operative ophthalmologic examination of cataract patients;

C. to formulate the differential diagnoses of cataract and evaluate the normal and abnormal lens;

D. to perform optimum refraction of the post-cataract surgery patient;

E. to develop and exercise clinical and ethical decision-making in cataract patients;

F. to develop good patient communication techniques regarding cataract surgery;

G. to perform routine and advanced cataract surgery and intraocular lens (IOL) placement;

H. to manage basic and advanced clinical and surgical cataract problems;

I. to effectively diagnose and manage intraoperative and post-operative complications of cataract surgery;

J. to work effectively as a member of the medical care team, and.

K. to develop teaching skills about cataracts for training junior trainees and students.

JUNIOR RESIDENCY YEAR 1

A. Cognitive Skills:

a. to identify the most common causes and types of cataract (e.g., anterior polar, cortical nuclear sclerotic, posterior subcapsular);

b. to list the basic history and examination steps for cataract evaluation pre-operatively;

c. to describe the steps in cataract surgical procedures;

d. to define the elementary refraction or contact lens fitting techniques prior to considering cataract extraction to obtain best corrected vision;
e. To describe the major etiologies of dislocated or subluxated lens (eg., trauma, Marfan's syndrome, homocystinuria, Weill-Marchesani syndrome, syphilis);

f. To be familiar with the techniques of intracapsular cataract extraction, extracapsular cataract extraction, and phacoemulsification;

g. To describe the following:
   a. Basic ophthalmic optics as related to cataracts
   b. Types of IOLs
   c. Types of refractive error in cataract
   d. Retinoscopy techniques for cataracts
   e. Subjective refraction techniques for cataract patients.

h. To identify and describe the mechanisms of the following instruments in the evaluation of cataracts, including:
   a. Lensometer
   b. Autorefractor
   c. Retinoscope
   d. Phoropter
   e. Keratometre
   f. Slit lamp biomicroscope
   g. Glare and contrast testing devices
   h. Potential acuity metre.

B. Technical/surgical skills:

a. To perform basic slit lamp biomicroscopy, retinoscopy, and ophthalmoscopy.

b. To evaluate and classify common types of lens opacities.

c. To perform subjective refraction techniques and retinoscopy in patients with cataracts.

d. To perform direct and indirect ophthalmoscopy pre- and post-cataract surgery.

e. To perform basic steps of cataract surgery (e.g., incision, wound closure) in the practice lab.

f. To assist at cataract surgery and perform patient preparation, sterile draping, anesthesia.
g. To perform the following steps of cataract surgery in the practice lab or under direct supervision, including any or all of the following:
   a. Construction
   b. Anterior capsulotomy/capsulorrhexis
   c. Instillation and removal of viscoelastics
   d. Extracapsular, manual small incision sutureless cataract surgery (SICS) and or phacoemulsification techniques
   e. Irrigation and aspiration
   f. Intraocular (IOL) implantation techniques

JUNIOR RESIDENCY YEAR 2

A. Cognitive Skills:

1. To describe the less common causes of lens abnormalities (eg. spherophakia, lenticous, ectopia lentis).

2. To describe the pre-operative evaluation of the cataract patient, including:
   a. The systemic diseases of interest or relevance to cataract surgery.
   b. The relationship of external and corneal diseases of relevance to cataracts and cataract surgery (e.g., lid abnormalities, dry eye).
   c. The relationships of glaucoma and capsular opacities related to cataract surgery

3. To describe glare analysis testing for cataract surgery.

4. To describe the use of A and B scan ultrasonography in cataract surgery.

5. To describe the instruments and techniques of cataract extraction, including extracapsular surgery and phacoemulsification (e.g., trouble-shooting the phacoemulsification machine, altering the machine parameters).

6. To describe the types, indications and techniques for anesthesia for cataract surgery (eg., topical, local, general).

7. To describe indications, techniques, and complications of surgical procedures, including:
   a. Extracapsular surgery
   b. Manual small incision sutureless cataract surgery (SICS)
   c. Intracapsular surgery
   d. Phacoemulsification
   e. Paracentesis

8. To describe the indications for, principles of, and techniques of YAG laser capsulotomy.
9. To describe history and techniques of basic IOL implantation.

10. To correlate the level of visual acuity with the lens opacities.

11. To describe the common complications of cataract and anterior segment surgery (eg., intraocular pressure elevation, hyphema, endophthalmitis, cystoid macular edema, retinal detachment, intra-ocular lens dislocation, lens-induced glaucoma and uveitis).

B. Technical/surgical Skills:

1. To perform local injections of corticosteroids, antibiotics, and anesthesia.

2. To implement the basic preparatory procedures for cataract surgery (eg, obtaining informed consent, identification of instruments, sterile technique, gloving and gowning, prep and drape, other preoperative preparation).

3. To perform graduated extracapsular surgery in a practice setting (eg, animal or practice lab) and then in the operating room under supervision, including mastery of the following skills:
   a. Wound construction
   b. Anterior capsulotomy/capsulorrhexis
   c. Instillation and removal of viscoelastics
   d. Extracapsular technique
   e. Beginning phacoemulsification techniques
   f. Irrigation and aspiration
   g. IOL implantation techniques

4. To perform paracentesis of the anterior chamber.

5. To use the operating microscope for basic cataract surgery.

6. In addition to performing the appropriate steps in cataract surgery, to assist in cataract surgery and perform more advanced steps in patient preparation and anesthesia.

7. To describe the more advanced applications of visco-elastics in surgery (eg., control of iris prolapse, elevation of dropped nucleus, visco-dissection).

8. To recognize and refer or treat common post-operative complications of cataract surgery (eg., endophthalmitis, elevated intraocular pressure, cystoid macular edema, wound leak, uveitis).
To perform basic post-operative evaluation of the cataract patient.

SENIOR RESIDENCY

A. Cognitive Skills:
1. To define the more complex indications for cataract surgery (e.g. better view of posterior segment), describe the performance of and describe the complications of more advanced anterior segment surgery (e.g., pseudoxfoliation, small pupils, mature cataract, hard nucleus, black cataract, post-traumatic, zonular dehiscence), including more advanced procedures (e.g., secondary IOLs and indications for specialized IOLs, capsular tension rings, iris hooks, use of indocyanine green staining).
2. To describe the indications for, techniques of, and complications of cataract extraction in the context of the subspecialty disciplines of glaucoma (e.g., combined cataract and glaucoma procedures, glaucoma in cataractous eyes, cataract surgery in patients with prior glaucoma surgery), retina (e.g., cataract surgery in patients with scleral buckles or prior vitrectomy), cornea (e.g., cataract extraction in patients with corneal opacities), ophthalmic plastic surgery (e.g., ptosis following cataract surgery), and refractive surgery (e.g., cataract surgery in eyes that have undergone refractive surgery).
3. To independently evaluate complications of cataract and IOL implant surgery (e.g., posterior capsular tears, choroidal effusions).
4. To describe the instruments and techniques of cataract extraction including extracapsular surgery and phacoemulsification (e.g., troubleshooting the phacoemulsification machine, altering the machine parameters)
5. To understand indications for and technique of intracapsular surgery (e.g., rare cases may require this procedure or patients may have had the procedure performed previously).
6. To describe indications for and instrumentation and techniques used to implant foldable and non-foldable IOLs.
7. To describe the evaluation and management of common and uncommon causes of post-operative endophthalmitis.
8. To perform repositioning, removal or exchange of IOLs.
9. To assist in the teaching and supervision of basic and standard level learners (i.e., first and second year residents).
10. To describe the government and hospital regulations that apply to cataract surgery.

B. Technical/surgical Skills:

1. To describe the indications for, mechanics of, and performance of A scan ultrasonography and calculation of IOL power.

2. To perform phacoemulsification in a practice setting (eg, animal or practice lab) and then in the operating room, including mastery of the following skills:
   a. Wound construction
   b. Anterior capsulotomy/capsulorrhexis
   c. Viscoelastics
   d. Intracapsular, extracapsular and phacoemulsification-techniques (eg., sculpting, divide and conquer, phaco-chop, stop and chop)
   e. Instrumentation and techniques of irrigation and aspiration
   f. IOL implantation (eg., anterior and posterior, special IOLs)
   g. IOL repositioning, removal or exchange

3. To perform implantation of foldable and non-foldable IOLS.

4. To perform intraoperative and postoperative management of any event that may occur during or as a result of cataract surgery, including:
   a. Vitreous loss
   b. Capsular rupture
   c. Anterior or posterior segment bleeding
   d. Positive posterior pressure
   e. Choroidal detachments
   f. Expulsive hemorrhage
   g. Elevated intraocular pressure
   h. Use of topical and systemic medications
   i. Astigmatism
   j. Post operative refraction (simple and complex)
   k. Corneal edema
   l. Wound dehiscence
   m. Hyphema
   n. Residual cortex
   o. Dropped nucleus
Contact Lens

JUNIOR RESIDENCY YEAR 1

A. Objectives:
1. To perform a basic contact lens (CL) history and examination, and to be aware of additional basic tests and questions that are required for CL patients with more complex needs.
2. To perform the techniques of retinoscopy, refraction, and over-refraction in the routine CL patient.
3. To describe the optics of the soft contact lens and hard contact lens (e.g., rigid gas permeable CL); base curve changes, the lacrimal lens, and the optic zone.
4. To describe conversion of a spectacle prescription (Rx) to a CL Rx, including method of converting from plus to minus cylinder.
5. To describe basic CL design, using appropriate terminology.
6. To describe techniques for and perform basic CL fitting.
7. To describe selection of CL candidates with non-complex needs.
8. To use auxiliary CL instruments and tests (e.g., trial set, fluorescein testing).
9. To perform CL verification for vision correction, fit, and comfort.
10. To describe contraindications for contact lens use.

B. Cognitive Skills:
1. To describe fundamentals of ophthalmic optics in CL management (e.g., CL choices, techniques for fitting individuals).
2. To list indications for contact lenses in non-complex cases.
3. To describe CL choices and techniques for fitting individuals with non-complex CL needs.
C. Technical Skills:

1. To perform advanced retinoscopy techniques in a CL patient.
2. To perform advanced refraction techniques in a CL patient, including diagnostic fitting.
3. To perform techniques to verify and inspect contact lenses.
4. To utilize appropriate teaching skills to instruct patients in the safe insertion, removal, and care of contact lenses.

SENIOR RESIDENCY I

A. Objectives:

1. To perform a more advanced CL history and examination, employing additional tests and questions appropriate for patients with more complex CL needs (eg., keratoconus, difficult CL fittings).
2. To perform retinoscopy and refraction in the CL patient with more complex needs (eg., keratoconus, post-keratoplasty).
3. To describe the more advanced optics of the soft contact lens (SCL) and hard contact lens (eg., rigid gas permeable CL); base curve changes, the lacrimal lens, and the optic zone.
4. To describe more advanced CL design (eg., special lenses and special CL shapes or materials).
5. To describe and perform more advanced CL fitting (eg., post-keratoplasty).
6. To describe selection of CL candidates with more complex needs (eg., post-surgical).
7. To use auxiliary CL instruments in patients with more complex needs (eg., post-surgical topography).
8. To perform CL verification for vision, fit, and comfort in therapeutic CL care.

B. Cognitive Skills:

1. To describe more advanced concepts of ophthalmic optics in CL.
2. To describe indications for more advanced CL (eg., therapeutic lenses).
C. Technical Skills:

1. To perform more advanced retinoscopy techniques in a CL patient.

2. To perform more advanced refraction techniques in CL patient, including diagnostic fitting.

3. To perform advanced techniques to verify and inspect contact lenses in patients with complex CL needs.

4. To perform more advanced CL fitting in patients with complex needs (eg., keratoconus, CL in children, active corneal disease).

5. To describe and use the CL instruments in more complex cases.

6. To describe the more advanced CL complications (eg. microbial keratitis, sterile corneal infiltrates, preservative toxicity).

7. To perform appropriate CL selection (eg., material selection, CL modification).

8. To perform corneal topography to fit contact lenses.

SENIOR RESIDENCY II
A. Objectives:

1. To perform the most advanced techniques in CL history and examination, and to understand what additional tests and questions are needed during the most complex CL examination (eg., postkeratoplasty, multiple surgery, post-refractive, complex keratoconus fitting, active corneal disease).

2. To perform retinoscopy and refraction in the CL patient with the most complex needs (eg., keratoglobus, keratoconus, following open globe repair (eg., corneal laceration) or multiple keratoplasty).

3. To describe the most advanced optics and applications of soft contact lenses and hard contact lenses (eg., piggyback CL).

4. To describe the most advanced CL design, using appropriate terminology (eg., special fittings, special lenses for difficult-to-fit patients).
5. To describe indications for and to perform the most advanced CL fitting (eg., post-multiple keratoplasty or traumatic corneal repair).

6. To describe indications for and apply the most complex CL in special circumstances or for candidates presenting increased level of difficulty (eg., post surgical patients, children)

7. To use the auxiliary CL instruments in patients with the most complex needs (eg., topography, fluorescein testing, diagnostic lenses).

A. Cognitive Skills:
   1. To describe the differences between CL material choices.
   2. To describe methods of modifying a contact lens to improve comfort, vision, or physiological response.
   3. To evaluate and to manage CL-induced complications.
   4. To perform and interpret corneal topography in CL fitting.

c. Technical Skills:
   1. To perform CL modification in complex cases.
   2. To select the appropriate CL in more complex cases.

Cornea, external disease and refractive surgery

JUNIOR RESIDENCY YEAR I
A. Cognitive skills:

1. To describe the basic anatomy, embryology, physiology, pathology, microbiology, immunology, genetics, epidemiology, and pharmacology of the cornea, conjunctiva, sclera, eyelids, lacrimal apparatus, and ocular adnexa.

2. To describe congenital abnormalities of the cornea, sclera, and globe (eg., Peters' anomaly, microphthalmos, birth trauma, buphthalmos).

3. To describe characteristic corneal and conjunctival degenerations (eg., pterygium, pinguecula, Salzmann, senile plaques of the sclera, keratoconus).

4. To recognize the common corneal dystrophies and degenerations (eg., map-dot-fingerprint dystrophy, Meesman's dystrophy, Reiss-Buckler dystrophy, Francois dystrophy, Schnyder dystrophy, congenital hereditary stromal dystrophy, lattice dystrophy, granular dystrophy, macular dystrophy, congenital hereditary endothelial dystrophy, Fuchs' dystrophy, posterior polymorphous dystrophy, Salzmann's degeneration).

5. To recognize the common corneal inflammations and infections (eg., herpes simplex, syphilis, interstitial keratitis).

6. To understand the fundamentals of corneal optics and refraction (eg., keratoconus).

7. To describe the fundamentals of ocular microbiology and recognize corneal and conjunctival inflammations and infections (eg., Staphylococcal hypersensitivity, simple microbial keratitis, simple conjunctivitis, trachoma, ophthalmia neonatorum, herpes zoster ophthalmicus, herpes simplex keratitis and conjunctivitis).

8. To recognize the basic presentations of ocular allergy (eg.,phlyctenules, seasonal hay fever, vernal conjunctivitis, allergic and atopic conjunctivitis, giant papillary conjunctivitis).

9. To recognize and treat lid margin disease (eg., Staphylococcal blepharitis, meibomian gland dysfunction).

10. To describe the features of, diagnose, and treat (or refer) Vitamin A deficiency (eg., Bitot spots, dry eye, slowed dark adaptation) and neurotrophic corneal disease.

11. To describe the basic differential diagnosis of the acute and chronic conjunctivitis or "red eye" (eg., scleritis, episcleritis, conjunctivitis, orbital cellitis, gonococcal and chlamydial conjunctivitis).

12. To describe the basic mechanisms of traumatic and toxic injury to the anterior segment (eg., alkali burn, lid laceration, orbital fracture, etc.).
13. To understand the mechanisms of ocular immunology and recognize the external manifestations of anterior segment inflammation (e.g., red eye associated with acute and chronic iritis).

14. To describe the basic principles of ocular pharmacology of antiinfective, anti-inflammatory and immune modulating agents (e.g., indications and contraindications for topical corticosteroids and antibiotics).

15. To recognize corneal lacerations (perforating and non-perforating), pterygia that may require surgery, corneal and conjunctival foreign bodies.

16. To diagnose and treat corneal exposure (e.g., lubrication, temporary tarsorrhaphy).

17. To describe the epidemiology, differential diagnosis, evaluation and management of common benign and malignant lid lesions, including pigmented lesions of the conjunctiva and lid (e.g., nevi, melanoma, primary acquired melanosis).

18. To describe the epidemiology, classification, pathology, indications for surgery, and prognosis of common malpositions of the eyelids (e.g., blepharoptosis, trichiasis, distichiasis, essential blepharospasm, entropion, ectropion) and understand their relationship to secondary diseases of the cornea and conjunctiva (e.g., exposure keratopathy).

19. To recognize and describe the treatment for a chemical burn (e.g., types of agents, medical therapy).

20. To recognize and describe the etiologies of hyphema and microhyphema.

21. To describe the etiologies and treatment of superficial punctate keratitis (e.g., dry eye, Thygeson's superficial punctate keratopathy), blepharitis, toxicity, ultraviolet photokeratopathy, contact lens related).

22. To describe the symptoms and signs, testing and evaluation for, and treatment of exposure keratopathy and dry eye (e.g., Schirmer testing).

23. To recognize the anterior segment manifestations of systemic disease (e.g., Wilson's disease) and pharmacologic side effects (e.g., amiodarone vortex keratopathy).

24. To recognize, list the differential diagnosis, and evaluate aniridia and other developmental anterior segment abnormalities (e.g., Axenfeld's, Rieger's, Peters' anomalies and related syndromes).

25. To recognize and treat pyogenic granuloma.

**B. Technical/surgical skills:**

1. To perform external examination (illuminated and magnified) and slit lamp biomicroscopy, including drawing of anterior segment
findings.

2. To administer topical anesthesia, as well as special topical stains of the cornea (eg., fluorescein dye and Rose Bengal).

3. To perform simple tests for dry eye (eg., Schirmer test).

4. To perform punctal occlusion (temporary or permanent) or insert plugs.

5. To perform simple corneal sensation testing (eg., cotton tip swab).

6. To perform tonometry (eg., applanation, tonopen, Schiotz, pneumotonometry).

7. To perform techniques of sampling for viral, bacterial, fungal, and protozoal ocular infections (eg., corneal scraping and appropriate culture techniques).

8. To perform and interpret simple stains of the cornea and conjunctiva (eg., culture techniques, culture media, Gram stain, Giemsa stain, calcofluor white, acid fast).

9. To manage corneal epithelial defects (eg., pressure patching and bandage contact lenses).

10. To perform removal of a conjunctival or corneal foreign body (eg, rust ring).

11. To perform simple pterygium excision.

12. To perform a simple lid laceration repair.

13. To perform a simple corneal laceration repair (eg., linear laceration not extending to limbus).

14. To perform epilation.

15. To perform a lateral tarsorrhaphy.

16. To incise/drain or remove a simple chalazion/stye.

17. To perform a simple incisional or excisional biopsy of a lid lesion.

18. To perform irrigation of chemical burn to the eye.
19. To treat hyphema and microhyphema (eg., complications of increased intraocular pressure and rebleeding).

JUNIOR RESIDENCY YEAR 2
A. Cognitive Skills:

1. To describe the more complex anatomy, embryology, physiology, pathology, microbiology, immunology, genetics, epidemiology, and pharmacology of the cornea, conjunctiva, sclera, eyelids, lacrimal apparatus, and ocular adnexa.

2. To describe the more complex congenital abnormalities of the cornea, sclera, and globe (eg., hamartomas and choristomas).

3. To describe, recognize, evaluate, and treat peripheral corneal thinning (eg., inflammatory, degenerative, dellen-related, infectious, allergic).

4. To recognize the common conjunctival neoplasms (eg., benign, malignant tumors).

5. To recognize and treat less common corneal or conjunctival presentations of degenerations (eg., inflamed or atypical pterygium: band keratopathy).

6. To describe the epidemiology, differential diagnosis, evaluation, and management of Bitot's spots.

7. To describe the epidemiology, differential diagnosis, evaluation, and management of Thygeson's superficial punctate keratopathy.

8. To understand more complex corneal optics and refraction (eg., irregular astigmatism).

9. To correlate the concordance of the visual acuity with the density of media opacity (eg., cataract) and to evaluate the etiology of discordance between acuity and media examination findings.

10. To describe more complex ocular microbiology and describe the differential diagnosis of more complicated corneal and conjunctival infections (eg., complex or atypical bacterial füngal, Acanthamoeba, viral, or parasitic keratitis).

11. To describe differential diagnosis, evaluation, and treatment of interstitial keratitis (eg., syphilis, viral diseases, inflammation).

12. To describe more complex differential diagnosis of the "red eye" (eg., autoimmune and inflammatory disorders causing scleritis, episcleritis, conjunctivitis, orbital cellulitis).
13. To describe key features of trachoma, including epidemiology, clinical features and staging, complications (eg, cicatricization), prevention (eg., facial hygiene), and topical and systemic antibiotic treatment (especially in hyperendemic regions) and surgery (eg., tarsal rotation).

14. To describe more complex mechanisms of traumatic and toxic injury to the anterior segment (eg., long-term sequelae of acid and alkali burn, complex lid laceration involving the lacrimal system, full-thickness laceration).

15. To describe the differential diagnosis and the external manifestations of more complex anterior segment inflammation (eg., acute and chronic iritis).

16. To describe the more complex principles of ocular pharmacology of anti-infective, anti-inflammatory and immune modulating agents (eg., use of topical non-steroidal and steroidal agents, topical cyclosporine).

17. To recognize and treat corneal lacerations (perforating and non-perforating).

18. To recognize and treat large or atypical pterygia that may require surgery.

19. To describe and treat corneal and conjunctival foreign bodies.

20. To diagnose and treat severe corneal exposure (eg., lubrication, temporary tarsorrhaphy)

21. To recognize and treat common and uncommon benign and malignant lid lesions.

22. To recognize and treat common malpositions of the eyelids (eg., entropion, ectropion, and ptosis) as they apply to secondary corneal disease.

23. To recognize and treat recurrent corneal erosions.

24. To recognize and treat foreign body, animal, and plant substance injuries.

25. To recognize and treat more complex hyphemas (eg., surgical indications).
26. To recognize, evaluate, and treat chronic conjunctivitis (eg., chlamydia, trachoma, molluscum contagiosum, Parinaud's oculoglandular syndrome, ocular rosacea).

27. To describe the epidemiology, clinical features, pathology, evaluation, and treatment of ocular cicatricial pemphigoid.

28. To recognize, evaluate, and treat the ocular complications of severe diseases, such as chronic exposure keratopathy, contact dermatitis, and Stevens-Johnson syndrome.

29. To describe the epidemiology, clinical features, pathology, evaluation, and treatment of peripheral corneal thinning or ulceration (eg., Terrien's marginal degeneration, Mooren's ulcer, rheumatoid arthritis-related corneal melt).

B. Technical/surgical Skills:

1. To perform more advanced techniques, including keratometry, keratoscopy, endothelial cell count and evaluation, specular microscopy, and pachymetry.

2. To perform stromal micropuncture.

3. To perform application of corneal glue.

4. To assist in more complex corneal surgery (eg., penetrating keratoplasty and phototherapeutic keratectomy).

5. To perform more advanced tests for dry eye (eg., modified Schirmer tests, assessment of tear break up time, fluorescein dye testing, Rose Bengal dye).

6. To perform a more complex pterygium excision, including conjunctival grafting.

7. To perform a more complex lid laceration repair.

8. To perform manual superficial or lamellar keratectomy.

9. To perform a more complex corneal laceration repair (eg., stellate perforating laceration).

10. To repair simple lacerations of the lacrimal drainage apparatus (eg., perform intubations and simple closure).
SENIOR RESIDENCY
A. Cognitive Skills:
1. To describe the most complex anatomy, embryology, physiology, histopathology, microbiology, immunology, genetics, epidemiology, and pharmacology of the cornea, conjunctiva, sclera, eyelids, lacrimal apparatus, and ocular adnexa.
2. To describe the most complex and less common congenital abnormalities of the cornea, sclera, and globe (eg., cornea plana, kerato-globus).
3. To recognize common and uncommon corneal and conjunctival neoplasms, dystrophies and degenerations (eg., lattice dystrophy).
4. To understand the most complex corneal optics and refraction (eg., post - keratop lasty).
5. To describe less common and rare ocular infections and describe the differential diagnosis of the most complicated corneal and conjunctival infections (eg., amoebas, Leishmaniasis, nematodes).
6. In non-endemic areas, to describe the basic features of onchocerciasis.
7. In endemic areas to define the etiology, vector (eg., black fly), and incidence, diagnostic features (eg., microfiliariae, keratitis, iritis), diagnosis (eg., skin snap test), course and prognosis, treatment (eg., Ivermectin, nodulectomy), and prevention (eg., vector control, environmental and behavioral changes) of oncocerciasis.
8. To describe the most complex differential diagnosis of the "red eye" (eg., pemphigoid, pemphigus, Stevens-Johnson syndrome).
9. To diagnose and treat the most complex traumatic and toxic injuries to the anterior segment (eg., total lid avulsion, severe alkali I burn).
10. To describe the differential diagnosis and the external manifestations of the most complex or uncommon anterior segment inflammations (eg., syphilitic keratouveitis).
11. To describe the most complex principles of ocular pharmacology of anti-infective, anti-inflammatory and immune modulating agents (eg., combination therapies of antiviral and anti-inflammatory agents).
12. To recognize and treat complex corneal lacerations (eg., lacerations extending beyond the limbus).
13. To diagnose and treat the most severe corneal exposure cases (eg., conjunctival flap).
14. To understand ocular surface transplantation, including conjunctival autograft/flap, amniotic membrane transplantation, limbal stem cell transplantation.
15. To understand the surgical indications (eg., Fuchs' dystrophy, aphakic/pseudophakic bullous keratopathy), surgical techniques, and recognition and management of postoperative complications (especially immunologically-mediated rejection) of corneal transplantation (eg, penetrating, lamellar).
16. To understand the preoperative assessment, patient selection, surgical management, and postoperative care of refractive surgical techniques, including keratotomy (radial, astigmatic), photoablation (photorefractive, phototherapeutic, LASIK), corneal wedge resection, thermokeratoplasty, intracorneal rings, phakic intraocular lens and clear lens extraction.

B. Technical/surgical Skills:
1. To perform and interpret the most advanced corneal techniques (eg., pachymetry, endothelial microscopy, computerized corneal topography).

2. To understand and perform specialized and complicated contact lens fitting (eg., post-keratoplasty).

3. To perform more complex corneal surgery (eg., penetrating or lamellar keratoplasty, keratorefractive procedures and phototherapeutic keratectomy).

4. To repair simple entropion and ectropion.

5. To perform a thin conjunctival flap (eg., Gunderson flap).

6. To perform other complex conjunctival surgery (eg., autograft, stem cell transplant).

7. To perform basic non-laser refractive surgery techniques (eg., relaxing keratotomy).

8. To manage and treat more complex neoplasms of the conjunctiva (eg., carcinoma, melanoma).

**GLAUCOMA**

**JUNIOR RESIDENCY YEAR I**
A. Cognitive Skills
1. To describe the epidemiology of primary open angle glaucoma (POAG).
2. To perform evaluation of POAG.
3. To describe the mechanics of aqueous humor dynamics and the anatomy of the anterior chamber and its angle.
4. To describe basic tonometry and to understand the principles of tonography.
5. To describe optic nerve and nerve fiber layer anatomy in glaucoma.
6. To describe fundamentals of perimetry, including kinetic and automated static perimetry.
7. To describe principles, indications, basic techniques of gonioscopy, including normal and abnormal findings.
8. To describe principles of medical management, including indications for and side effects of treatment options (e.g., topical and systemic medications) for simple glaucoma (e.g., POAG, primary angle closure glaucoma).
9. To describe and recognize normal tension glaucoma (“low tension glaucoma”).
10. To describe features of and recognize primary and secondary angle closure glaucoma and aqueous misdirection.
11. To describe the clinical features of and to recognize hypotony (e.g., Seidel test of transconjunctival leakage).
12. To list the main results of the major clinical trials in glaucoma (e.g., Glaucoma Laser Trial, Normal Tension Glaucoma Study, and Advanced Glaucoma Intervention Study [see Appendix I]).

B. Technical Skills:
1. To perform basic tonometry (e.g., applanation, Schiotz – if applicable – tonopen, airpuff) and recognize the pitfalls and artificial of the testing.
2. To perform basic gonioscopy (e.g., recognize angle structures, identify angle closure).
3. To perform stereo examination of the optic nerve, using 90 diopter or other lens.

4. To interpret manual (eg., Goldmann) and automated (eg., Humphery, Octopus) visual fields in routine glaucoma.

JUNIOR RESIDENCY YEAR 2
A. Cognitive skills:
1. To describe the epidemiology and perform screening for routine and more advanced primary and secondary open angle glaucoma.

2. To describe the treatment of disturbances of aqueous humor dynamics.

3. To describe the more complex etiology for, evaluation of, and treatment of glaucoma (eg., recession, inflammatory, steroid-induced, pigmentary, pseudoexfoliative, phacolytic, neovascular, post-operative, malignant, lens particle glaucomas; plateau iris; glaucomatocyclitic crisis; iridocorneal endothelial syndromes; aqueous misdirection).

4. To describe more advanced tonometric and tonographic (if applicable) methods (eg., diurnal curve).

5. To describe more advanced optic nerve and nerve fiber layer anatomy in primary and secondary glaucoma and recognize typical and atypical features associated with glaucomatous cupping (eg., rim pallor, rapid progression, central acuity loss, hemianopic or other non-glaucomatous types of visual field loss).

6. To describe more advanced forms of perimetry (eg., kinetic and automated static visual fields) and perimetry strategies (eg., threshold testing, supra-threshold, special algorithms).

7. To describe the principles, indications, and more advanced anatomic findings and gonioscopic features of primary, and secondary glaucomas (eg., plateau iris, appositional closure).

8. To describe the principles of medical management or more advanced glaucomas (eg., advanced POAG, secondary open angle and closed angle glaucomas, normal tension glaucoma).

9. To describe the features of, recognize, and treat primary angle closure glaucoma and aqueous misdirection.

10. To describe the clinical features of, recognize, and treat less common etiologies of ocular hypotony.
11. To describe the results and apply the conclusions to clinical practice of the major clinical trials in glaucoma (e.g., Glaucoma Laser Trial, Normal Tension Glaucoma Study, and Advanced Glaucoma Intervention Study; see more complete list of clinical trials in Appendix I).

12. To recognize and treat the various adult secondary glaucoma.

13. To describe the features of primary infantile and juvenile glaucomas.

14. To describe and apply specific medical treatments of more advanced glaucoma.

15. To describe the principles of laser treatments of glaucoma (e.g., indications, techniques, and complications, use of various types of laser energy, spot size, laser wavelengths).

16. To describe the surgical treatment of glaucoma: (e.g., trabeculectomy, combined cataract and trabeculectomy, setons, and cyclodestructive procedures, including indications, techniques, and complications).

B. Technical/surgical skills:
1. To perform YAG laser posterior capsulotomy for uncomplicated posterior capsule opacity.

2. To perform argon or YAG laser peripheral iridotomy for routine angle closure glaucoma.

3. To perform argon laser trabeculoplasty for uncomplicated glaucoma.

4. To perform cyclophotocoagulation.

5. To perform routine first trabeculotomy with or without animetabolities.

6. To describe and manage a flat anterior chamber.

7. To perform routine revision of filtering blebs.

Senior Residency
A. **Cognitive Skills:**
1. To describe the features of the most complex, and most advanced forms of primary and secondary open angle glaucoma.

2. To describe the mechanics of aqueous humor dynamics in the most advanced and complex etiologies of glaucoma (eg., angle recession, combined or multifactorial glaucoma, traumatic or inflammatory glaucoma, pigmentary dispersion glaucoma).

3. To apply in clinical practice tonomteric and tonographic methods (eg., diurnal curve)) in complicated or atypical cases of glaucoma.

4. To apply the most advanced knowledge of ooptic nerve and nerve fiber layer anatomy and describe techniques, methods, and tools for analyzing the nerve fiber layer.

5. To recognize and evaluate atypical or multifactorial glaucomaou cupping (eg., rim pallor).

6. To describe, interpret, and apply the results of the most complex and advanced forms of perimetry, including, special kinetic and automated static peirmetry strategies (eg., special alorithims) in atypical or multifactorial glaucoma.

7. To describe the principles and indications, and apply to clinical practice the findings of gonioscopy in the complex primary and secondary glauomas.

8. To describe the principles of medical management of the advanced and complex glaucoma (eg., advanced POAG previously treated with medicine, laser or surgery; secondary glaucomas).

9. To describer, recognize, and treat the most advanced cases of primary open angle glaucoma (eg., monocular patients, repeat surgical cases), normal tension glaucoma, and secondary glaucomas (eg., inflammatory glaucoma, angle recession).

10. To describe the features of, recognize, and treat the most advanced cases of primary angle closure glaucoma and complex glaucomas (eg., post-operative cases, secondary angle closure,aqueous misdirection).

11. To describe the clinical features of, recognize and treat common and uncommon etiologies of ocular hypotony (eg., choroidal detachment, leaking trabeculectomy bleb).
12. To describe the results, apply the conclusions, and critically analyze the major clinical trials in glaucoma (eg., Glaucoma Laser Trial, Normal Tension Glaucoma Study, and Advanced Glaucoma Intervention Study), as well as describe and use other publications in the management of glaucoma patients (see Appendix I).

13. To recognize and treat uncommon adult secondary glaucomas.

14. To describe the features of and treat or refer the primary infantile and juvenile glaucomas.

15. To describe and apply specific medical treatments in the most complex and most advanced glaucoma cases (eg., refractory glaucoma, monocular patients, non-complaints patients).

16. To describe the principles, indications, and complications of laser treatment of more advanced complex glaucoma (repeat procedures).

17. To describe the more advanced surgical treatment of glaucoma: (eg., trabeculectomy, combined cataract and trabeculectomy, setons; and cyclodestructive procedures, including indications, techniques, and complications).

B. Technical/surgical Skills:

1. To perform YAG or argon laser procedures in glaucoma patients (e.g., monocular patient, repeat laser, vitreous lysis, suture lysis).

2. To perform laser peripheral iridotomy more advanced glaucoma (e.g., monocular patient, acute angle closure, hazy cornea).

3. To perform laser treatment (e.g., argon laser trabecuoplasty, iridoplasty) for more advanced glaucoma cases (repeat treatments, monocular patient).

4. To perform cyclophotocoagulation for more advanced cases (e.g., monocular).

5. To perform routine and repeat trabeclectomy with or without antimetabolites.

6. To describe, manage, and treat surgically, if necessary, a flat anterior chamber.

7. To perform more advanced techniques for the revision of filtering blebs (e.g., failing bleb, leaking bleb).
To recognize and treat glaucoma surgery bleb complications.

**NEURO-OPTHALMOLOGY**

**JUNIOR RESIDENCY YEAR 1**

A. **Cognitive Skills:**
   1. To describe the neuro-anatomy of the visual pathways.

   2. To describe the neuro-anatomy of the cranial

   3. To describe the pupillary and accommodative neuro-anatomy.

   4. To describe ocular motility and related neuronal pathways.

   5. To describe the typical features, evaluation, and management of the most common optic neuropathy (arteritic and non-arteritic), toxic or nutritional optic neuropathy, Leber’s hereditary optic neuropathy, ethambutol toxicity, neuroretinitis, and compressive, inflammatory, infiltrative and traumatic optic neuropathies).
6. To describe the typical features, evaluation, and management of the most common ocular motor neuropathies (eg., third, fourth, sixth nerve palsy).

7. To describe the typical features of cavernous sinus and superior orbital fissure syndromes (eg., infectious, vascular, neoplastic, inflammatory etiologies).

8. To describe the typical features, evaluation, and management of the most common causes of nystagmus (eg., congenital motor and sensory, downbeat, upbeat, gaze-evoked, drug-induced).

9. To describe the typical features, evaluation, and management of the most common papillary abnormalities (eg., relative afferent papillary defect, anisocoria, Horner syndrome, third nerve palsy, Adie’s tonic pupil).

10. To describe the typical features, evaluation, and management of the most common visual field defects (eg., optic nerve, optic chiasm, optic radiation, occipital cortex).

11. To describe the epidemiology, clinical features, evaluation, and management of ocular myasthenia gravis.

12. To describe the epidemiology, clinical features, evaluation, and management of carotid-cavernous fistula.

13. To describe the epidemiology, differential diagnosis, evaluation and management of congenital optic nerve abnormalities (eg., optic pit, disc coloboma, papillo-renal syndrome, morning glory syndrome, tilted disc, optic nerve hypoplasia, myelinated nerve fiber layer, melanocytoma, disc drusen, Bergmeister’s papilla).

B. Technical Skills:

1. To perform a basic papillary examination
   a. To describe the indications for and perform basic pharmacologic papillary testing for Horner syndrome, pharmacologic dilation, and Adie’s pupil.

   b. To list the differential diagnosis of anisocoria (eg., sympathetic or parasympathethic lesion, “physiologic”).

   c. To describe, detect, and quantitate a relative afferent papillary defect.

   d. To list the causes for light-near dissociation (eg., Argyll Robertson pupils, diabetic neuropathy, tonic pupil).
2. To perform a basic ocular motility examination
   a. To assess ocular alignment using simple techniques (eg., Hirschberg, Krimsky).
   b. To describe and perform basic cover/uncover testing for topia.
   c. To describe and perform alternate cover testing for phoria.
   d. To perform simultaneous prism and cover testing.
   e. To perform measurement of deviations with prisms.
   f. To describe the indications for and apply fresnel and grindin prisms.
   g. To describe the indications for and to perform forced duction and forced generation testing.
   h. To perform an assessment of saccade accuracy and pursuit and optokinetic testing.
   i. To perform a measurement of eyelid function (eg., levator function, lid positon).

3. To describe the indications for visual field testing and to perform and interpret perimetry studies
   a. To perform confrontational field testing (static and kinetic, central and peripheral, red and white targets).
   b. To perform and interpret a tangent screen test.
   c. To describe the indications for and perform basic Goldmann perimetry, and interpret results.
   d. To describe the indications for and perform automated perimetry, and interpret results.

4. To perform basic direct, indirect, and magnified ophthalmoscopic examination of the optic disc (eg., recognize optic disc swelling, optic atrophy, neuroretinitis).
5. To describe the anatomy and indications for, order appropriately, and interpret basic radiology studies of the brain and orbits, demonstrating the ability to communicate with radiologists in order to maximize both choice of proper diagnostic test and accuracy of interpretation.

6. To describe the indications for and interpret basic echography of orbits.

**JUNIOR RESIDENCY YEAR 2**

A. **Cognitive Skills:**

1. To describe typical and atypical features, evaluation, and management of the most common optic neuropathies (eg., papilledema, optic neuritis, ischemic, inflammatory, infectious, infiltrative, compressive, and hereditary optic neuropathies).

2. To describe typical and atypical features, evaluation, and management of the more complex supranuclear and internuclear palsies and less common ocular motor neuropathies (eg., progressive supranuclear palsy and internuclear ophthalmoplegia).

3. To describe typical and atypical features, evaluation, and management of the more complex and less common forms of nystagmus (eg., rebound, convergence, retraction).

4. To describe typical and atypical features, evaluation, management of the more complex and less common papillary abnormalities (eg., light near dissociation, pharmacologic miosis).

5. To describe typical and atypical features, evaluation, and management of the more complex and less common visual field defects (eg., lateral geniculae, monocular temporal crescent).

6. To describe more advanced aspects of visual field indications, selection, and implementation (eg., artifacts of automated perimetry, testing and thresholding strategies).

7. To describe neuro-ophthalmic aspects of common systemic diseases (eg. Hypertension, diabetes, thyroid disease, myasthenia gravis, temporal arteritis, systemic infections and inflammation).

8. To describe neuro-ophthalmologic findings in trauma (eg., traumatic optic neuropathy, traumatic brain injury).

9. To describe typical features of inherited neuro-ophthalmologic diseases (eg., Leber’s hereditary optic neuropathy, autosomal dominant optic atrophy, spinocerebellar degenerations).
10. To recognize, evaluate, and treat ocular myasthenia gravis.

B. Technical Skills:

1. To describe the indications for, administer, and interpret the results of intravenous edrophonium (Tensilon) and prostigmine tests for myasthenia gravis.

2. To perform a detailed cranial nerve evaluation (eg., testing of trigeminal and facial nerves functions).

3. To describe the more advanced interpretation of neuro-radiologic images (eg. Indications and interpretation of orbital tumors, thyroid eye disease, pituitary adenoma, optic nerve glioma, optic nerve sheath meningioma).

4. To describe the evaluation, management, and specific testing (eg., stereopsis, mirror test, red-green testing) of patients with “functional” visual loss (eg., recognize non-organic spiral or tunnel visual fields).

5. To describe the indications for, to perform, and list the complications of temporal artery biopsy.

SENIOR RESIDENCY
A. Cognitive Skills:

1. To describe typical and atypical features, evaluation, and management of the most advanced and least common optic neuropathies (eg., chronic or recurrent optic neuritis, and posterior ischemic, autoimmune, toxic/nutritional).

2. To describe typical and atypical features, evaluation, and management of the most complex and least common ocular motor neuropathies and their mimics (eg., progressive supranuclear palsy).

3. To describe typical and atypical features, evaluation, and management of the most complex and least common forms of nystagmus (eg., surgical treatment options, using the null point in either prism or surgical therapy).

4. To describe typical and atypical features, evaluation, and management of the most advanced and least common papillary abnormalities (eg., pupil findings in coma, transient papillary phenomenon).
5. To describe typical and atypical features, evaluation, and management of the most complex and least common visual field defects (eg., combination or bilateral lesions, cortical visual impairment).

6. To describe the most advanced aspects of visual field indications, selection, and interpretation (eg., variability in automated perimetry, application of specific testing and thresholding strategies for different patient populations with different neuro-ophthalmic conditions, different testing abilities (eg., young or old age, mental status, hand-eye coordination, reaction time).

7. To describe, evaluate, and treat the neuro-ophthalmic aspects if systemic diseases (eg., malignant hypertension, diabetic papillopathy, toxicity of systemic medications, pseudotumor cerebri).

8. To describe, evaluate, and treat the neuro-ophthalmologic manifestations of trauma (eg., corticosteroid or surgical therapy in traumatic optic neuropathy).

9. To describe, evaluate, and provide appropriate genetic counseling for neuro-ophthalmologic diseases (Leber’s hereditary optic neuropathy, chronic progressive external ophthalmoplegia, von Hippel-Lindau syndrome).

10. To recognize, evaluate, and treat (or refer more complex forms of nystagmus).

11. To recognize, evaluate, treat (or refer) transient monocular or binocular visual loss.

**B. Technical Skills:**

1. To perform and interpret the results of the intravenous edrophonium (Tension) and prostigmine tests for myasthenia gravis, and to recognize and treat the complications of the procedures.

2. To perform and interpret the complete cranial nerve evaluation (eg., testing of and facial nerve function) and basic neurologic exam in the context of neuro-ophthalmic localization and disease.

3. To interpret neuro-radiologic images in neuro-ophthalmology (eg., interpretation of orbital imaging for orbital pseudotumor and tumors, thyroid eye disease, intracranial imaging modalities and strategies for tumors, aneurysms, infection, inflammation, and ischemia), and to appropriately discuss, in advance of testing, the localizing clinico-radiologic features, with the neuroradiologist in order to obtain the best study and interpretation of the results.
4. To recognize patients with “functional” visual loss (non-organic visual loss) and provide appropriate counseling and follow-up.

**Ophthalmic Histopathology**

**JUNIOR RESIDENCY YEAR 1**

**A. Cognitive Skills:**

1. To perform a basic papillary examination.

2. To describe basic ocular anatomy and to identify the history of the major structures of the eye (e.g., conjunctiva, sclera, cornea, anterior chamber angle, iris, ciliary body, lens, vitreous, retina, retinal pigment epithelium, choroids, optic nerve).

3. To describe basic pathophysiology of the common disease process of the eye and to identify the major histologic findings of each (e.g., infection, inflammation, neoplasm).

4. To identify the histology of important intraocular and adnexal diseases (e.g., endophthalmitis, retinoblastoma, choroidal melanoma, microbial keratitis).

**B. Technical skills:** (for an ocular pathology laboratory, as available)

1. To describe appropriate steps in the basic handling and processing of gross specimens in the ocular pathology laboratory (e.g., basic preparation of the specimen) and to demonstrate proficiency in these steps in the laboratory.

2. To describe appropriate information necessary for communication with the pathologist regarding special handling of specimens for specials stains or studies.

3. To describe indications for frozen sections in ocular pathology.

4. To perform cutting and gross examination of whole globes.
5. To participate under supervision in the microscopic examination of ophthalmology specimens from active cases.

JUNIOR RESIDENCY YEAR 2
A. Cognitive skills

1. To describe more advanced ocular anatomy and to identify the histology of the major and minor structures of the eye (e.g., conjunctival glands, normal pigment, common variants).

2. To describe more advanced pathophysiology of the disease processes of the eye and to identify the major histologic findings of each (e.g., fungal keratitis, skin and adnexal neoplasm, and less common intraocular tumors).

3. To identify histology of the less common but potentially vision-or life threatening intraocular and adnexal diseases (e.g., temporal arteritis, fungal keratitis extraocular spread of intraocular tumor, metastatic disease to the eye).

4. To describe more advanced techniques in ocular histopathology (e.g., electron microscopy, immunohistochemistry, flow cytometry, tumor free margins).

B. Technical Skills:

1. To describe appropriate steps in the more advanced handling and special processing of gross specimens in the ocular pathology laboratory.

2. To describe specific indications for special handling and to communicate to the pathologist the necessity for special handling of specimens for special stains or studies (e.g., electron microscopy, immunohistochemistry, flow cytometry).

3. To describe indications and to perform and prepare a biopsy specimen for frozen section in ocular pathology.

4. To perform preparation of a basic histologic specimen for review by the pathologist.
5. To participate as an “at-the-elbow” observer during microscopic examination of active ophthalmology cases and to perform microscopic examination of a specimen with and without direct supervision.

SENIOR RESIDENCY

A. Cognitive Skills:

1. To describe the most advanced ocular anatomy and to identify histology of the major and minor structures of the eye and their less common variants (e.g., pars planacysts, iris heterochromia, cobblestone degeneration of the retina).

2. To describe the most advanced, less common or more complex path physiology of the disease process of the eye and to identify major histologic findings of each (e.g., inflammatory pseudotumor, lymphoma, artifacts of processing).

3. To identify the histology of the common but potentially vision – or life-threatening intraocular and adnexal diseases (e.g., healed giant cell arteritis, uncommon benign and malignant neoplasms).

B. Technical skills:

1. To describe and to perform appropriate steps for handling gross specimens in the ocular pathology laboratory.

2. To describe specific indications for special handling and to communicate to the pathologist the necessity for special handling of specimens for special stains or studies (e.g., electron microscopy, immunohistochemistry, flotometry).

3. To describe indications and to perform and prepare a biopsy specimen for frozen section in ocular pathology.

4. To perform preparation of a basic histologic specimen for review by the pathologist.

5. To participate as an “at-the-elbow” observer during microscopic examination of active ophthalmology cases and to perform microscopic examination of a specimen with and without direct supervision.

SENIOR RESIDENCY
A. Cognitive Skills:

1. To describe the most advanced ocular anatomy and to identify histology of the major and minor structures of the eye and their less common variants (eg., pars plana cysts, iris heterochromia, cobblestone degeneration of the retina).

2. To describe the most advanced, less common, or more complex pathophysiology of the disease processes of the eye and to identify major histologic findings of each (eg., inflammatory pseudotumor, lymphoma, artifacts of processing).

3. To identify the histology of the least common but potentially vision - or life-threatening intraocular and adnexal diseases (eg., healed giant cell arteritis, mimics and masqueraders of inflammation or neoplasm, uncommon benign and malignant neoplasms).

B. Technical Skills:

1. To describe and to perform appropriate steps for handling gross specimens in the ocular pathology laboratory.

2. To perform pre-operative, intra-operative, and post-operative consultation with the pathologist, regarding specific indications for special stains or processing (eg., orientation of specimen, special handling).

3. To perform and interpret the pathologic report of frozen section in ocular pathology.

4. To perform the preparation of a basic and more advanced histologic specimens for review by the pathologist (eg., simple special stains or fixation methods).

5. To participate as an "at-the-elbow" observer during the microscopic examination of active ophthalmology cases.

6. To perform microscopic examination of a specimen with and without direct supervision and to provide a relevant differential diagnosis.

Oculoplastic Surgery and Orbit

JUNIOR RESIDENCY YEAR 1

A. Cognitive Skills:
1. To describe basic eyelid, lacrimal, and orbital anatomy and physiology (eg., eyelid, orbicularis, orbital structures, meibomian glands, lacrimal glands, glands of Zeiss, Whitnall's ligament, Muller's muscle, Lockwood's ligament, canaliculi, puncta, orbital bones, orbital foramina, paranasal sinuses, annulus of Zinn, arterial and venous vascular supply, lymphatics, nerves, extraocular muscles).

2. To describe basic mechanisms and indications for treatment of eyelid, orbital, and lacrimal trauma.

3. To describe epidemiology, clinical features, evaluation, and management of fetal alcohol syndrome.

4. To perform pre-operative and post-operative assessment of patients with common oculoplastic disorders.

5. To recognize simple orbital trauma (eg., orbital foreign body, retrobulbar hemorrhage).

6. To recognize and treat floppy eyelid syndrome.

7. To recognize and treat simple trichiasis.

8. To recognize blepharospasm and hemifacial spasm.


10. To describe the differential diagnosis of lacrimal gland mass (eg., inflammatory, neoplastic, congenital, infectious).

11. To identify normal orbital anatomy on imaging studies (eg, magnetic resonance imaging, computed tomography, ultrasound). 12. To describe the differential diagnosis of proptosis in children and adults.

12. To describe techniques and complications of minor operating room procedures (eg., incision and drainage of chalazia, excision of small eyelid lesions).

13. To describe typical features of orbital cellulitis.

**B. Technical/surgical Skills:**

1. To describe indications for and to perform the basic office examination techniques for the most common oculoplastic and orbital abnormalities.
2. To identify indications for and to perform the basic assessment of the eyelids (eg., eversion, double eversion) and eyebrows (eg., margin to reflex distance, lid crease, levator function, eyelid/brow malpositions).

3. To identify indications for and to perform the basic lacrimal assessment (eg., dye testing, punctal dilation, lacrimal probing, canalicular probing, lacrimal irrigation).

4. To identify indications for and to perform the basic assessment of the orbit (eg., Hertel exophthalmometry, inspection, palpation, auscultation).

5. To identify indications for and to perform the basic socket assessment (eg., types of implants, socket health).

6. To perform minor lid procedures (eg., removal of benign eyelid skin lesions, chalazion curettage or excision, conjunctival biopsy).

7. To treat complications of minor operating room procedures (eg. incision and drainage of chalazia, excision of small eyelid lesions).

8. To perform punctal plug insertion or removal.

9. To recognize and treat trichiasis (eg., epilation, cryotherapy, surgical therapy).

10. To perform a simple enucleation or evisceration under supervision.

**JUNIOR RESIDENCY YEAR 2**

**A. Cognitive Skills:**

1. To describe more advanced eyelid, lacrimal, and orbital anatomy and physiology (eg., lacrimal apparatus, orbital vascular anatomy).

2. To describe the genetics (where known), clinical features, evaluation, and treatment of congenital eyelid deformities (eg., coloboma, distichiasis, epicanthus, telecanthus, blepharophimosis, ankyloblepharon, epiblepharon, euryblepharon, and Goldenhar, Treacher-Collins, Waardenburg syndromes).

3. To describe the clinical features, evaluation and management of congenital orbital deformities (eg., synophthalmia, anophthalmia, microphthalmia, cryptophthalmia, hypertelorism, hypotelorism).

4. To describe the genetics, clinical features, evaluation, and management of common craniosynostoses and other congenital malformations (eg., Crouzon, Apert).
5. To treat (or refer for treatment) congenital eyelid abnormalities (see Basic Level, above).

6. To perform pre-operative and post-operative assessment of patients with simple and more serious oculoplastic disorders (eg., multidisciplinary procedures).

7. To describe the mechanisms and indications for treatment of more advanced eyelid, orbital, and lacrimal trauma (eg., full thickness lid laceration, chemical burns to the face).

8. To describe features of, recognize, evaluate, and treat more complicated cases of nasolacrimal duct obstruction, canaliculitis, dacryocystitis, acute and chronic dacrooadenitis, preseptal cellulitis, and orbital cellulitis.

9. To recognize, evaluate and treat thyroid ophthalmopathy (eg., epidemiology, symptoms and signs, orbital imaging, differential diagnosis, surgical, medical, and radiation indications, side effects of treatment).

10. To recognize, evaluate and treat orbital inflammatory pseudotumor (eg., epidemiology, symptoms and signs, orbital imaging, differential diagnosis, biopsy indications, choice of treatments).

11. To recognize, treat, or refer blepharospasm or hemifacial spasm.

12. To recognize less common orbital tumors (eg., metastatic lesions).

C. Technical/surgical Skills:

1. To describe indications for and to perform more advanced examination techniques for less common oculoplastic and orbital abnormalities (eg, measurement of levator function, orbital ultrasoundinterpretation).

2. To identify indications for and to perform more advanced assessment of eyelids and eyebrows (eg., hypo globus, facial asymmetry, brow ptosis).

3. To identify indications for and to perform more advanced lacrimal assessment (eg., interpretation of dye testing, canalicular probing in trauma).

4. To identify indications for and to perform more advanced assessment of the orbit (eg., enophthalmus, interpretation of orbital ultrasound in common conditions).
5. To identify indications for and to perform more advanced socket assessment (e.g., extrusion of implants, anophthalmic socket complications).

6. To perform more complicated minor lid procedures (e.g., larger benign skin lesions) or surgery (e.g., recurrent or multiple chalazion).

7. To recognize the indications and complications and to perform more complex minor operating room or limited operating room procedures (e.g., incision and drainage of recurrent or larger chalazia, excision of moderate sized benign eyelid lesions).

8. To recognize and treat orbital trauma (e.g., intraorbital foreign body, retrobulbar hemorrhage, fracture).

9. To identify common orbital pathology (e.g., orbital fractures, orbital tumors) on imaging studies (e.g., magnetic resonance imaging, computed tomography, ultrasound).

10. To treat common presentations of preseptal or orbital cellulitis.

11. To describe, recognize the indications and complications, and to perform the basic lacrimal procedures below:
   a. Lacrimal drainage testing (irrigation, dye disappearance test)
   b. Lacrimal intubation
   c. Dacryocystorhinostomy (external)

SENIOR RESIDENCY
A. Cognitive Skills:
   1. To describe the most advanced eyelid, lacrimal, and orbital anatomy and physiology.
2. To evaluate and to treat simple and more advanced eyelid, orbital, and lacrimal trauma (eg., full thickness lid laceration, chemical burns to the face).

3. To perform pre-operative and post-operative assessment and coordination of care of patients with more advanced or complex oculoplastic disorders (eg., systemically ill patient, multi-disciplinary procedures).

4. To describe the etiology, evaluation, and medical and surgical treatment of the following eyelid diseases
   a. Complex ectropion (eg., congenital, paralytic, involutional, cicatricial, mechanical, allergic).
   b. Complex entropion (eg., involutional, cicatricial, spastic, congenital).
   c. Complex myogenic ptosis (eg., chronic progressive external ophthalmoplegia).
   d. Complex differential diagnosis for dermatochalasis (eg., blepharochalasis).
   e. Benign, pre-malignant, or malignant eyelid tumors (eg., papilloma, keratoacanthoma, seborrheic keratosis, epidermal inclusion cyst, molluscum contagiosum, verruca vulgaris, actinic keratosis, basal cell carcinoma, squamous cell carcinoma, sebaceous cell carcinoma, melanoma).
   f. Single or recurrent inflammatory lesions (eg., recurrent chalazion or its mimics).
   g. Facial dystonia (eg., blepharospam, hemifacial spasm). Facial nerve palsy with exposure keratopathy (eg., tarsorrhaphy, gold weights).
   h. Facial dystonia (eg., blepharospam, hemifacial spasm).
   i. Complex lid and orbital trauma cases.

B. Technical/surgical Skills:

1. To describe the indications for and to perform more complicated and advanced "in office" examination techniques for the less common but important oculoplastic and orbital abnormalities.

2. To perform preoperative and intraoperative assessment of the eyelids and eyebrows (eg., intraoperative adjustments).
3. To perform more advanced lacrimal assessment (eg., intraoperative and postoperative testing, more complex trauma to lacrimal system).
4. To recognize and treat more complex or difficult socket-related problems and complications (eg., extrusion of implants, anophthalmic socket complications).
5. To perform more complicated lid procedures (eg., larger benign, recurrent, or multiple skin lesions).
6. To describe management of and treat lacrimal system abnormalities, including
   a. More complex congenital disorders (eg., canalicular stenosis)
   b. More complex acquired disorders and their treatment (eg., conjunctivo-dacryocystorhinostomy with Jones tube)
   c. Complex moderate trauma (eg., requiring lacrimal intubation)
7. To recognize typical and atypical features and to describe the differential diagnosis, clinical features, and treatment of more complicated orbital disease, including
   a. More complex orbital infections (eg., preseptal and orbital cellulitis, mucormycosis, Aspergillosis)
   b. Congenital tumors (eg., dermoid)
   c. Fibro-osseous disorders and tumors (eg., fibrous dysplasia, osteoma, chondrosarcoma, osteosarcoma, Paget's disease)
   d. Vascular tumors (eg., capillary hemangioma, cavernous hemangioma, hemangiopericytoma, lymphangioma, Kaposi's sarcoma)
   e. Xanthomatous tumors (eg., xanthelasma, juvenile xanthogranuloma)
   f. Lacrimal gland tumors (eg., benign mixed tumor, adenoid cystic carcinoma, malignant mixed tumor, lymphoma)
   g. Neural tumors (eg., optic nerve glioma/meningioma, neurofibromatosis, neuroblastoma)
   h. Rhabdomyosarcoma
i. Orbital pseudo tumor

j. Lymphoid lesions (eg., lymphoid hyperplasia, lymphoma, leukemia)

k. Thyroid-related orbitopathy

l. Metastatic tumors (eg., from breast, lung, prostate, colon, melanoma)

m. Trauma (eg., orbital fractures, traumatic optic neuropathy)

n. Anophthalmic socket - implant exposure, volume augmentation

8. To describe, recognize the indications and complications, and to perform the eyelid procedures listed below

a. Basic biopsy techniques
b. Lateral tarsal strip
c. Specialized lid suture procedures (eg., Quickert sutures)
d. Medial spindle
e. Retractor reinsertion
f. Levator advancement
g. Eyelid laceration/margin repair
h. Tarsorrhaphy
i. Lateral canthoplasty (canthotomy and cantholysis)
j. Blepharoplasty
k. Facial nerve palsy - gold weight placement in the lid
l. Simple eyelid reconstruction
m. Orbital approaches and incisions (eg., Kronlein, Caldwell Luc, transconjunctival, transnasal)

9. To describe, recognize the indications and complications, and perform basic orbital skills and procedures
a. Anterior orbitotomy for tumor biopsy/excision
b. Orbital floor fracture repair

10. To describe the indications for and to interpret CT and MRI scans (eg., orbital trauma, orbital lesions and tumors).

11. To perform simple botulinum toxin injections (eg., blepharospasm).

12. To identify more advanced orbital pathology (eg., complex orbital fractures, orbital tumors) on imaging studies (eg, magnetic resonance imaging, computed tomography, ultrasound).

**Pediatric Ophthalmology and Strabismus**

**JUNIOR RESIDENCY YEAR 1**

A. Cognitive Skills:

1. To describe basic examination techniques for strabismus (eg., ductions and versions, cover and uncover testing, alternate cover testing, prism cover testing).

2. To describe basic visual development and visual assessment of the pediatric ophthalmology patient (eg., central, steady, maintained fixation; illiterate E, Allen cards, Landolt C rings).

3. To describe basic anatomy and physiology of strabismus (eg., innervation of extraocular muscles, primary actions, comitant and incomitant deviations, overaction and underaction, restrictive and paretic, saccades and pursuit movements).

4. To describe basic sensory adaptations for binocular vision (eg., normal and anomalous retinal correspondence, suppression, horopter, Panum's area, fusion, stereopsis).

5. To describe and recognize pseudostrabismus.

6. To describe different etiologies of amblyopia (eg., deprivation, ametropic, strabismic, anisometropic, organic).
7. To describe etiologies of esotropia (eg., congenital, comitant and incomitant, accommodative and non-accommodative, decompensated, sensory, neurogenic, myogenic, neuromuscular junction, restrictive, nystagmus blockage syndrome, spasm of the near, monofixation syndrome, consecutive).

8. To describe etiologies of exotropia (eg., congenital, comitant and incomitant, decompensated, sensory, neurogenic, myogenic, neuromuscular junction, restrictive, basic, divergence excess, exophoria, convergence insufficiency).

9. To describe various strabismus patterns (eg., A or V pattern).

10. To describe etiologies, evaluation, and management of vertical strabismus (eg., neurogenic, myogenic, neuromuscular junction, oblique overaction, dissociated vertical deviation, restrictive).

11. To describe non-surgical treatment of strabismus.

12. To describe different forms of childhood nystagmus.

13. To describe features, classification, and treatment indications for retinopathy of prematurity.

14. To describe etiologies and types of pediatric cataracts.

15. To describe and recognize ocular findings in child abuse (eg., retinal hemorrhages) and appropriately refer to child protective services or other authorities.

16. To describe common hereditary or congenital ocular motility or lid syndromes (eg., Duane syndrome, Marcus Gunn jaw winking, Brown syndrome).

17. To describe typical features of retinoblastoma.

18. To describe basic features of dyslexia.

19. To describe basic evaluation of decreased vision in infants and children (eg., retinopathy of prematurity, hereditary retinal disorders, congenital glaucoma, measles, Vitamin A deficiency).

20. To describe identifiable congenital ocular anomalies (eg., microphthalmia, persistent fetal vasculature).

21. To describe ocular findings in inherited, metabolic disorders

b. Lipidoses (eg., Tay-Sachs disease, Sandhoff, Niemann-Pick, Krabbe's, Gaucher's, Fabry's, metachromatic leukodystrophy).

c. Aminoacidurias (eg., homocystinuria, cystinosis, Lowe, Zellweger).

22. To describe ocular findings in chromosomal abnormalities (eg., Trisomy 21, Trisomy 13, Trisomy 18, Short arm 11 deletion, Long arm 13 deletion, Cri du Chat, Turner).

**B. Technical Skills:**

1. To perform an extraocular muscle examination based on knowledge of the anatomy and physiology of ocular motility.

2. To assess ocular motility using ductions and versions testing.

3. To apply Hering's and Sherrington’s laws.

4. To perform basic measurement of strabismus (eg., Hirschberg, Krimsky, cover testing, prism cover testing, simultaneous prism cover test, alternate cover testing, Parks-Bielschowsky three-step test, Lancaster red-green test, Maddox rod testing, double Maddox rod testing).

5. To perform assessment of vision in the neonate, infant, and child.

6. To recognize and apply in a clinical setting the following skills in the ocular motility examination (simple, advanced)
   a. Stereoacuity testing
   b. Accommodative convergence/accommodation ratio (eg., heterophoria method, gradient method)
   c. Tests of binocularity and retinal correspondence
   d. Cycloplegic refraction (retinoscopy)
   e. Anterior and posterior segment examination
   f. Basic and advanced measurement of strabismus
   g. Cover test measurement
   h. Assessment of vision
      i) Teller acuity cards
      ii) Fixation preference test
      iii) Standard subjective visual acuity tests
      iv) Induced tropia test

7. To assist a primary surgeon in performing extraocular muscle surgery including:
   a. Recession
b. Resection  
c. Muscle weakening (eg., tenotomy) and strengthening (eg., tuck) procedures  
d. Transposition  
e. Use of adjustable sutures

JUNIOR RESIDENCY YEAR 2
A. Cognitive Skills:
1. To describe basic and more advanced strabismus examination techniques (eg., combined vertical and horizontal prism cover testing, double Maddox rod testing).
2. To describe basic and more advanced visual development and visual assessment of the pediatric ophthalmology patient (eg., blink, measures of fixation and following behavior, objective measures of visual acuity).
3. To describe more advanced anatomy and physiology of strabismus (e.g., torsion, tertiary actions, consecutive deviations).
4. To describe more advanced sensory adaptations (eg., anomalous head position).
5. To describe basics of binocular sensory testing (eg., Titmus stereotesting, Randot stereo testing, Worth 4-dot, Bagolini lenses, after image testing).
6. To describe and to recognize different etiologies of amblyopia.
7. To describe and recognize etiologies of esotropia.
8. To describe and recognize etiologies of exotropia.
9. To describe and recognize various strabismus patterns (eg., A or V pattern).
10. To describe and recognize the etiologies of vertical strabismus.
11. To describe and utilize the non-surgical treatment of strabismus and amblyopia (eg., patching, atropine penalization, Fresnel and grind-in prism therapy).
12. To describe and recognize the different forms of childhood nystagmus (eg., sensory, motor, congenital, acquired).
13. To describe and recognize retinopathy of prematurity (eg., stages, treatment indications).
14. To describe and recognize etiologies and types of pediatric cataracts (eg., congenital, traumatic, hereditary, idiopathic).

15. To describe and recognize less common hereditary or malformative ocular anomalies and syndromes (eg., Mobius, Goldenhar syndrome).

16. To describe and recognize typical features of retinoblastoma (eg., differential diagnosis, evaluation, treatment indications).

17. To describe the main features of dyslexia and its relationship to vision.

18. To describe basic evaluation and differential diagnosis of decreased vision in infants and children (eg., retinal and optic nerve etiologies, amblyopia).

19. To describe recognizable causes of blindness in infants (eg., albinism, optic nerve hypoplasia, achromatopsia, Leber's congenital amaurosis, retinal dystrophy, congenital optic atrophy).

20. To describe etiology, evaluation, and management of congenital infections (eg., toxoplasmosis, rubella, cytomegalovirus, syphilis, herpes).

21. To describe and recognize the common causes of pediatric uveitis.

B. Technical Skills:
1. To perform a more advanced extraocular muscle examination based on knowledge of the anatomy and physiology of ocular motility.

2. To assess more advanced ocular motility problems (eg., bilateral or multiple cranial neuropathy, myasthenia gravis, thyroid eye disease).

4. To apply Hering's and Sherrington's laws in more advanced cases (eg., pseudoparesis of the contralateral antagonist, enhancement of ptosis in myasthenia gravis)

5. To perform more advanced measurements of strabismus (eg., double Maddox rod testing, Lancaster red green testing, synoptophore or amblyoscope).

6. To perform assessment of vision in more difficult strabismus patients (eg., uncooperative child, mentally impaired, nonverbal or preverbal).

7. To perform basic extraocular muscle surgery
   a. To exercise surgical judgement for the indications and contraindications for strabismus surgery
b. To perform pre-operative assessment, intraoperative techniques and to describe intraoperative and post-operative complications of strabismus surgery

c. To perform the following strabismus surgeries
i) Recession
ii) Resection
iii) Muscle weakening (eg., tenotomy) and strengthening (eg., tuck) procedures
iv) Transposition
v) Use of adjustable sutures
d. To manage the complications of strabismus surgery (eg., slipped muscle, anterior segment ischemia).

SENIOR RESIDENCY
A. Cognitive Skills:

1. To describe and perform the most advanced strabismus examination techniques (eg., complicated prism cover testing in multiple cranial neuropathy, patients with nystagmus, dissociated vertical deviation, double Maddox rod testing).

2. To perform the most advanced techniques for assessment of visual development in complicated or non-cooperative pediatric ophthalmology patients (eg., less common objective measures of visual acuity, electrophysiologic testing).

3. To apply the most advanced knowledge of strabismus anatomy and physiology (eg., spiral of Tillaux, secondary and tertiary actions, spread of comitance) in evaluation of patients.

4. To describe clinical application of the most advanced sensory adaptations (eg., anomalous head position, anomalous retinal correspondence).

5. To recognize and treat the most complicated etiologies of amblyopia (eg., refraction non-compliance, patching failures, pharmacologic penalization).

6. To recognize and treat the most complex etiologies of esotropia (eg., optical, prism-induced, post-surgical/consecutive).

7. To recognize and treat the most complex etiologies of exotropia (eg., supranuclear, paralytic pontine exotropia, consecutive).
8. To recognize and treat the most complex strabismus patterns (e.g., aberrant regeneration, post-surgical, thyroid ophthalmopathy and myasthenia gravis).

9. To recognize and treat the most complex etiologies of vertical strabismus (e.g., skew deviation, post-surgical, restrictive).

10. To apply non-surgical treatment (e.g., patching, atropine penalization) of more complicated forms of amblyopia (e.g., non-compliant, patching failures).

11. To recognize, evaluate, and treat the most complex forms of childhood nystagmus (e.g., sensory, spasmus nutans, associated with neurologic or systemic disease).

12. To recognize and treat (or refer for treatment) complex retinopathy of prematurity (e.g., stages, treatment indications, retinal detachment).

13. To recognize and treat (or refer for treatment) uncommon etiologies and types of pediatric cataracts (e.g., congenital, traumatic).

14. To recognize and appropriately evaluate the more complex hereditary ocular syndromes (e.g., bilateral Duane syndrome, Mobius syndrome).

15. To recognize and treat (or refer for treatment) patients with complicated retinoblastoma (e.g., bilateral cases, monocular patient, treatment failure, pineal involvement).

16. To recognize and evaluate the less common congenital ocular anomalies (e.g., unusual genetic syndromes).

17. To apply the most advanced principles of binocular vision and amblyopia (e.g., physiology of binocular vision, diplopia, confusion and suppression, normal and abnormal retinal correspondence, classification and characteristics of amblyopia).

18. To recognize and treat complex pediatric retinal disease (e.g., inherited retinopathies, retinopathy of prematurity).

19. To recognize and treat complex pediatric glaucoma.

20. To recognize and treat complex pediatric cataracts and anterior segment abnormalities (including surgical implications, techniques, and complications).
21. To recognize and treat complex pediatric eyelid disorders (eg., lid lacerations, lid tumors).

22. To recognize and treat (or refer) pediatric orbital disease (eg., orbital tumors, orbital fractures, rhabdomyosarcoma, severe congenital orbital malformations).

B. Technical/surgical Skills:

1. To perform more complex extraocular muscle surgery (eg., vertical and horizontal muscle surgery; re-operations).

2. To describe indications and contraindications for more complex strabismus surgery.

3. To describe and perform the pre-operative assessment, intraoperative techniques and to describe postoperative complications for more complicated strabismus surgery (eg., re-operations, slipped muscle).

4. To describe indications for and to perform adjustable sutures in more complicated cases (eg., thyroid ophthalmopathy).

5. To describe and manage more complex complications of strabismus surgery (eg., globe perforation, endophthalmitis, overcorrection).

Vitreo-Retinal Disease

JUNIOR RESIDENCY YEAR 1

A. Cognitive Skills:

1. To describe basic principles of retinal anatomy and physiology (layers of the retina, retinal physiology).

2. To describe fundamentals and demonstrate basic understanding of fluorescein angiography as applied to retinal vascular disease (eg., phases of the angiogram, indications).

3. To describe etiologies and mechanisms of retinal detachment.
4. To describe macular anatomy and function and to describe typical features of common macular disease (eg., age-related macular degeneration, macular hole, macular dystrophies).

5. To describe basic principles of laser photocoagulation.

6. To describe and recognize features of commotio retinae, traumatic choroidal rupture, and Purtscher's retinopathy.

7. To describe common forms of retinal vascular disease (eg., branch, hemi- or central retinal vein and artery occlusion).

8. To describe typical features of retinitis pigmentosa.

9. To describe features of, recognize, and evaluate posterior vitreous detachments

B. Technical Skills:

1. To perform direct ophthalmoscopy.

2. To perform indirect ophthalmoscopy.

3. To perform slit lamp biomicroscopy with the Hruby, +78, +90 lenses, and 3-mirror contact lens.

4. To interpret basic fluorescein angiography in common retinal disorders (eg., diabetic retinopathy, cystoid macular edema).

JUNIOR RESIDENCY YEAR 2
A. Cognitive Skills:

1. To describe more advanced retinal anatomy and physiology.

2. To describe more advanced concepts of fluorescein-lucocyanine green (ICG) angiography as applied to retinal vascular and other diseases (eg., phases of the angiogram, indications).

3. To describe principles of retinal detachment recognition, various types of retinal detachment (eg., exudative, rhegmatogenous, tractional), and their evaluation, management and repair (eg., identify retinal break).
4. To describe and recognize typical features of less common macular disease (eg., parafoveal telangiectasias, cone dystrophies, toxic maculopathies).

5. To describe indications for and complications of laser photocoagulation.

6. To describe the findings of major studies in retinal diseases, including the following:
   a. Diabetic Retinopathy Study (DRS)
   b. Diabetic Vitrectomy Study (DVS)
   c. Early Treatment of Diabetic Retinopathy Study (ETDRS)
   d. Macular Photocoagulation Study (MPS)
   e. Diabetes Control and Complications Trial (DCCT)
   f. Branch Vein Occlusion Study (BVOS)
   g. Central Vein Occlusion Study (CVOS)
   h. United Kingdom Prospective Diabetes Study (UKPDS)
   i. Age-Related Eye Disease Study (AREDS)
   j. Verteporfin in Photodynamic Therapy Study (VIP)
   k. Treatment of Age-Related Macular Degeneration with Photodynamic Therapy Study (TAP)

7. To describe the fundamentals of, evaluate, and treat (or refer) peripheral retinal disease and vitreous pathology (eg., vitreous hemorrhage, retinal breaks).

8. To describe, evaluate, and treat choroidal detachments.

9. To identify and evaluate retinoschisis (eg., juvenile, senile).

10. To diagnose, treat, and recognize the complications of retinopathy of prematurity (eg., retinal detachment).

11. To diagnose, evaluate, and treat the following retinal vascular diseases
   a. Arterial and venous obstructions
   b. Diabetic retinopathy
   c. Hypertensive retinopathy
   d. Peripheral retinal vascular occlusive disease
   e. Acquired retinal vascular diseases
   f. Ocular ischemic syndrome
   g. Sickle cell retinopathy

12. To describe and recognize common and uncommon macular disorders
   a. Age-related macular degeneration (ARMD)
b. Choroidal neovascularization (eg., ARMD, histoplasmosis)
c. High myopia
d. Macular dystrophies
e. Macular pucker (eg., epireftinal membrane)
f. Macular holes
h. Cystoid macular edema
i. Central serous choroidopathy (retinopathy)
j. Optic pit and secondary serous detachment

13. To describe the fundamentals of retinal electrophysiology.

14. To describe, recognize, and evaluate hereditary retinal and choroidal diseases (eg., gyrate atrophy, choroideremia, retinitis pigmentosa, cone dystrophies, Stargardt's disease, Best’s disease, congenital stationary night blindness).

15. To recognize, evaluate, and treat (or refer) retinal and choroidal toxicity (eg., phenothiazine, hydrox ychlooroquine/chloroquine toxicity, tamoxifen).

16. To describe the techniques for retinal detachment repair (eg., pneumatic retinopexy, scleral buckling, vitrectomy).

17. To describe the basics of surgical vitrectomy (eg., mechanics, instruments, indications, and technique).

18. To describe the indications for and perform basic laser treatment for diabetic retinopathy (eg. pan-retinal photocoagulation; macular grid).

19. To describe the fundamentals of special vitreoretinal techniques
   a. Macular hole repair
   b. Epiretinal membrane peeling
   c. Complex vitrectomy for proliferative vitreoretinopathy
   d. Use of heavy liquids and intraocular gases (eg., perfluorocarbons)

20. To describe posterior uveitis syndromes and endophthalmitis.

B. Technical Skills:
   1. To perform indirect ophthalmoscopy with scleral indentation.

   2. To perform ophthalmoscopic examination with contact lenses, including pan-funduscopic lenses.
3. To interpret fluorescein and ICG angiography.

4. To describe the indications for and interpret retinal imaging technology (eg., ocular coherence tomography, retinal thickness analysis).

5. To perform posterior segment photocoagulation.


7. To perform peripheral scatter photocoagulation (pametinal).

8. To perform laser retinopexy (demarcation) for simple retinal breaks.

9. To describe the indications for and interpret basic electrophysiological tests (eg., electroretinogram [ERG], electro-oculogram [EGG], visual evoked potential (VEP), dark adaptation).

10. To interpret basic ocular imaging techniques (eg., B-scan echography, nerve fiber layer analysis).

11. To perform fundus drawings of the retina, showing complex vitreoretinal relationships and findings.

12. To perform cryotherapy of retinal holes and other pathology.

13. To perform scleral buckling.

14. To describe indications, techniques, and complications of pars plana vitrectomy and to assist in a retinal surgery or perform the procedure under supervision.

**SENIOR RESIDENCY**

A. Cognitive Skills:
1. To apply in clinical practice the most advanced knowledge of retinal anatomy and physiology (e.g., surgical anatomy).

2. To apply in clinical practice the most advanced concepts of fluorescein/ICG angiography in complex retinal vascular and other diseases (e.g., occult choroidal neovascular membranes, recurrent neovascularization, vascular tumors, diseases of choroid and retinal pigment epithelium).

3. To evaluate, treat or refer the most complex retinal detachments (e.g., recurrent retinal detachment, proliferative vitreoretinopathy).

4. To evaluate, treat or refer the most complex macular disease (e.g., recurrent neovascular membranes).

5. To describe the indications for laser photocoagulation, including photodynamic therapy for the most complex retinal pathology (e.g., subfoveal neovascular membranes).
6. To describe the findings of the major studies in retinal diseases and describe the indications and exceptions for application to individual patients
   a. Diabetic Retinopathy Study (DRS) 
   b. Diabetic Vitrectomy Study (DVS) 
   c. Early Treatment of Diabetic Retinopathy Study (ETDRS) 
   d. Macular Photocoagulation Study (MPS) 
   e. Diabetes Control and Complications Trial (DCCT) 
   f. Branch Vein Occlusion Study (BVOS) 
   g. Central Vein Occlusion Study (CVOS) 
   h. United Kingdom Prospective Diabetes Study (UKPDS) 
   i. Treatment of Age-related Macular Degeneration with Photodynamic Therapy (TAP; VIP)

7. To apply in clinical practice understanding of the most complex peripheral retinal disease and vitreous pathology (e.g., Goldmann-Favre disease, incontinentia pigmenti, familial exudative vitreoretinopathy).

8. To evaluate and treat complications of retinal photocoagulation (e.g., vitreous hemorrhage, chorioretinal anastomoses).

9. To recognize and treat complex retinal detachments (e.g., giant tear).
10. To evaluate, treat or refer the more complex cases of retinopathy of prematurity (e.g., tractional retinal detachment).

11. To evaluate, treat or refer the most complex forms of retinal vascular disease
   a. Combined arterial and venous obstructions
   b. Advanced diabetic retinopathy
   c. Advanced hypertensive retinopathy
   d. Peripheral retinal vascular occlusive disease
   e. Acquired retinal vascular diseases

12. To evaluate and treat or refer the uncommon manifestations or presentations of the following macular diseases
   a. Age-related macular degeneration (ARMD)/choroidal neovascularization, (e.g., recurrent subfoveal neovascularization).
   b. Uncommon macular dystrophies
   c. Refractory cystoid macular edema
   d. Recurrent central serous choroidopathy (retinopathy)

13. To apply in clinical practice the more complex retinal electrophysiology (e.g., multi focal electroretinography).

14. To apply in clinical practice the more complex techniques for retinal detachment repair
   a. Repeat scleral buckling
   b. Pars plana vitrectomy (e.g., diagnostic tap; core vitrectomy)

15. To apply in clinical practice the more complex principles of surgical management of diabetic retinopathy (e.g., vitrectomy, membrane release).

16. To apply in clinical practice complex vitreoretinal techniques
   a. Macular hole repair
   b. Epiretinal membrane peeling
   c. Complex vitrectomy for proliferative vitreoretinopathy
d. Use of heavy liquids

17. To evaluate and treat or refer the etiologically more complex or uncommon cases of posterior uveitis (eg., sympathetic ophthalmitis) and endophthalmitis (eg., endogenous).

B. Technical/surgical Skills:

1. To perform indirect ophthalmoscopy with scleral indentation in complex retinal cases (eg., multiple holes, documented with retinal drawing).

2. To perform ophthalmoscopic examination with pan-fundusscopic or other lenses in complex retinal conditions (eg., giant retinal tears, proliferative vitreoretinopathy).

3. To interpret and apply in clinical practice the results of fluorescein and ICG angiography in complex retinal or choroidal pathology (eg., occult subretinal neovascular membrane).

4. To perform posterior segment photocoagulation in more complicated retinal cases
   a. Diabetic focal/grid macular treatment (eg., monocular patient, repeat treatment)
   b. Repeat peripheral scatter photocoagulation (panetinal)
   c. Laser retinopexy (demarcation) of large breaks; cryotherapy

5. To interpret and apply in clinical practice electrophysiology (eg., ERG, EOG, VEP, dark adaptation) in more complicated retinal pathology.

6. To interpret and apply in clinical practice ocular imaging techniques (eg., B-scan echography) in more complex cases (eg, choroidal osteoma).

7. To perform fundus drawings of the retina with vitreoretinal relationships in the most complex retinal cases (eg, recurrent retinal detachment, retinoschisis with and without retinal detachment).

8. To perform laser therapy or cryotherapy of retinal holes and other more complex retinal pathology.

9. To perform scleral buckling in complex retinal detachment.

10. To perform advanced pars plana vitrectomy.
Uveitis
JUNIOR RESIDENCY YEAR 1
A. Cognitive Skills:

1. To describe basic principles of history taking and examination of patients with uveitis.

2. To list signs and symptoms of anterior and posterior uveitis (e.g., red eye, blurred vision, anterior segment cell and flare, vitreous opacities, pars planitis, retinal or choroidal infiltrates).

3. To describe the different types of uveitis (e.g., acute and chronic uveitis, granulomatous and non-granulomatous uveitis, anterior, intermediate, and posterior uveitis).

4. To describe typical features and differential diagnosis of anterior uveitis, including infectious (e.g., bacterial, viral, protozoal, parasite), inflammatory (e.g., sarcoid, HLA-B27-associated, Behcet's disease, collagen vascular disease), neoplastic (masquerade syndromes), post-surgical, post-traumatic, Fuchs' heterochromic uveitis.

5. To describe typical features and differential diagnosis of the following posterior segment uveitis:
   a. Toxoplasmosis
   b. Sarcoidosis
   c. Pars planitis
   d. Acute retinal necrosis
   e. Vogt-Koyanagi-Harada syndrome
   f. Large cell lymphoma
   g. Post-operative uveitis
   h. Endophthalmitis (e.g., post-operative, traumatic, endogenous, fungal, phacoanaphylactic, sympathetic ophthalmia)
i. Unusual infectious etiologies for uveitis (eg., human immunodeficiency virus, herpes simplex virus, herpes zoster virus, pneumocystis carinii)

j. Acquired and congenital ocular syphilis

k. Cytomegalovirus retinitis

B. Technical Skills:

1. To perform an examination of the anterior and posterior segment for uveitis (eg., slit lamp biomicroscopy, scleral depression, magnified posterior segment exam, vitreous evaluation for cells, retinal, choroidal, and pars plana evaluations).

2. To describe indications for ancillary testing in the evaluation of uveitis (eg., fluorescein angiography, ultrasound, laboratory testing, radiologic testing).

JUNIOR RESIDENCY YEAR 2

A. Cognitive Skills:

1. To describe more advanced principles of history taking and examination of patients with uveitis (eg., review of systems for Wegener's granulomatosis, polyarteritis nodosa, evaluation of skin, cardiac, respiratory, renal, pulmonary, musculoskeletal systems)

2. To list less common signs and symptoms of anterior and posterior uveitis.

3. To list differentiating signs of less common forms of uveitis (eg., iris nodules, conjunctival ulcer or granuloma).

4. To describe the differential diagnosis of less common forms of uveitis (eg., chronic uveitis, intermediate uveitis (eg" pars planitis), and infectious (eg., Whipple disease, syphilis) or inflammatory posterior uveitis.

5. To evaluate and treat common causes of anterior and posterior uveitis.
B. Technical Skills:

1. To perform a directed examination of the anterior and posterior segment for uveitis (eg., slit lamp biomicroscopy, scleral depression, magnified posterior segment exam, vitreous evaluation for cells).
2. To perform ancillary testing in the evaluation of uveitis (eg., fluorescein angiography, ultrasound, laboratory testing, radiologic testing).

SENIOR RESIDENCY

A. Cognitive Skills:

1. To recognize, evaluate and treat uveitis associated with immunosuppressed individuals (eg., active and recovered acquired immune deficiency syndrome, pharmacologic immunosuppression).
2. To recognize, evaluate and treat acquired and congenital ocular syphilis.
3. To recognize, evaluate and treat (or refer) less common, rare, or tropical conditions associated with uveitis (eg., Leishmaniasis).
4. To describe indications and contraindications for corticosteroid treatment of uveitis (eg., topical, local, systemic), including risks and benefits of therapy.
5. To describe indications and contraindications for immunosuppressive therapy in uveitis.

B. Technical Skills:

1. To administer steroids in the treatment of uveitis by various routes.
2. To administer immunosuppressive agents in uveitis (or refer for administration).
3. To evaluate and treat the complications of uveitis therapy (eg., cataracts, glaucoma).
4. To biopsy, when indicated, the vitreous or uveal tract.
5. To insert intravitreal implants containing antiviral or corticosteroid medications.
6. To perform, when indicated, vitrectomy or scleral buckling procedures.

Ocular Oncology

JUNIOR RESIDENCY YEAR 1

A. Cognitive Skills:

1. To describe the basic categorization of common extra- and intraocular tumors.

2. To describe the differential diagnosis, epidemiology, evaluation, and management of leucocoria (eg., inflammatory, infectious, neoplastic, congenital, persistent fetal vasculature, cataract, Coats’ disease, vitreous hemorrhage, retinal detachment).

3. To describe major diagnostic features of major intraocular tumor types (eg., retinoblastoma, choroidal melanoma, metastatic lesions) and to describe the differentiating features of similar lesions.

B. Technical Skills:

1. To perform slit lamp, ophthalmoscopic and ocular transillumination examination of patients with intraocular tumors (eg., choroidal melanoma).

2. To recognize an ocular tumor and refer appropriately.
JUNIOR RESIDENCY YEAR 2

A. Cognitive Skills:

1. To describe management options for different intraocular tumors.
2. To describe the findings of the Collaborative Ocular Melanoma Study (COMS).
3. To describe the classification of retinoblastoma.
4. To describe basic histopathology of intraocular tumors.
5. To list the differential diagnoses for tumors of the iris, ciliary body, choroid, retina and optic disc (e.g., melanoma, retinoblastoma, hemangioma, melanocytoma).
6. To describe diagnostic techniques for common intraocular tumors (e.g., physical examination, imaging, laboratory, oncology referral).
7. To describe the prognostic significance of different types of ocular tumors and to be able to guide evaluation for systemic involvement.

B. Technical Skills:

1. To perform indirect ophthalmoscopy in the diagnosis and localization of intraocular tumors.
2. To perform transillumination for intraocular tumor.
3. To describe indications for an examination under anesthesia for pediatric intraocular tumors.
4. To describe indications for A and B-scan echography of intraocular mass lesions.
5. To describe indications for fluorescein angiography of intraocular tumors.
6. To describe indications for destruction or excision of conjunctival, corneal and intraocular tumors.
7. To describe indications for laser photocoagulation for intraocular tumors.
8. To describe indications for and techniques of transpupillary thermal therapy for intraocular tumors.
9. To recognize major histopathologic appearance of common intraocular tumors.

10. To describe the indications for surgical or other therapeutic procedures and their complications, and for referral, if necessary, for:
   a. Plaque or other radiotherapy
   b. Iridectomy and iridocyclectomy
   c. Resection of conjunctival tumors

11. To perform an enucleation.

12. To describe indications for and techniques and complications of radiation therapy for ocular tumors (eg., radioactive plaque localization, external beam radiation).

13. To discuss various treatment options with patients and their families in a detailed, ethical, and compassionate manner.

SENIOR RESIDENCY
A. Cognitive Skills:

1. To describe management options for unusual intraocular tumors (eg., choroidal metastasis, choroidal osteoma).

2. To apply the findings of the Collaborative Ocular Melanoma Study (COMS).

3. To recognize, evaluate, and treat all forms of extra- and intraocular tumors.

B. Technical Skills:

1. To perform indirect ophthalmoscopy in the diagnosis and localization of intraocular tumors prior to treatment.

2. To describe indications for and to perform an examination under anesthesia for pediatric intraocular tumors (eg., retinoblastoma).

3. To describe indications for and to interpret A and B-scan echography of intraocular mass lesions.
4. To describe indications for and to interpret of fluorescein angiography of intraocular tumors.
5. To describe indications for and to perform excision or other treatment of conjunctival, corneal, and intraocular tumors.
6. To describe indications for and to perform laser photocoagulation for intraocular tumors.
7. To recognize major histopathologic appearance of common and less common intraocular tumors.
8. To describe indications for surgical procedures and their complications and be able to perform or to refer for:
   a. Plaque radiotherapy
   b. External beam radiotherapy
   c. Iridectomy and iridocyclectomy
   d. Resection or cryotherapy of conjunctival tumors, or use of antimetabolite eye drops
   e. Transpupillary thermal therapy
9. To perform a complicated enucleation (eg., complicated by hemorrhaging, small orbit, scar tissue) or exenteration.

**Low Vision Rehabilitation**

**JUNIOR RESIDENCY YEAR 1**

A. Cognitive Skills:

1. To describe low vision assessment techniques, (eg., Early Treatment of Diabetic Retinopathy Study charts, Sloane charts).
2. To describe significant co-morbidities that impact low vision rehabilitation.
3. To describe various low vision aids.
4. To describe the optics of low vision devices.
5. To be sensitive to psychological and emotional aspects of visual impairment.
6. To describe challenges commonly encountered by individuals with visual impairments.
7. To prescribe simple but appropriate rehabilitative therapies and optical devices to help the patient meet his/her goals, (eg., magnification, illumination).

8. To describe functional implications of various visual system pathologies and diseases.

9. To describe visual field enhancing techniques for hemianopic field loss.

10. To describe the difference between visual acuity testing at both distance and near and contrast sensitivity testing.

11. To describe the evaluation of and rationale for licensing automobile drivers who are visually impaired.

12. To describe evaluation of visual acuity and visual field for disability determination.

**JUNIOR RESIDENCY YEAR 2**

**A. Cognitive Skills:**

1. To recognize significant co-morbidities that impact low vision rehabilitation.

2. To recognize and describe clinical applications, indications, and limitations of the various low vision aids (eg., closed circuit television, magnification, large print, Braille, computers with artificial speech).

3. To describe the more advanced optics of low vision devices.

**B. Technical Skills:**

1. To prescribe more complex rehabilitative therapies and optical devices to help the patient meet his/her goals.

2. To apply and prescribe visual field enhancing techniques for hemianopic field loss.

3. To perform evaluation of vision assessment in licensing drivers who are visually impaired.

4. To evaluate visual acuity and visual field fix disability determination.

5. To demonstrate low vision devices and educate low vision patients on the uses and limitations of these devices.

**SENIOR RESIDENCY**
A. Cognitive Skills:

1. To treat significant co-morbidities that impact low vision rehabilitation.
2. To describe indications for the most complex low vision aids.
3. To apply more complex principles of optics of low vision devices.

B. Technical Skills:

1. To prescribe the most complex rehabilitative therapies and optical devices to help the patient meet his/her goals.
2. To apply and prescribe the most complex visual field enhancing techniques for hemianopic field loss.

Ophthalmic Practice Management

JUNIOR RESIDENCY

1. To describe the fundamentals and principles of medical ethics in ophthalmology (eg., patient care decision-making, informed consent, competency issues, ethics of inter-collegial relations, risk management, privacy issues).
2. To describe the basics of ophthalmic practice management (eg., "contractual negotiations, hiring and supervising employees, financial management, working with associates, billing/collecting).
3. To describe the basics of the health care system and insurance reimbursement in Nigeria.

SENIOR RESIDENCY I

1. To describe and apply more advanced principles of medical ethics (eg., life and death patient care decision-making, ethics of optometric and non-physician relations, documentation requirements, claims in risk management).
2. To describe and apply more advanced aspects of practice management (eg., business models, documentation requirements and coding, privacy requirements, dealing with patients or employees with disabilities).
3. To describe and apply more advanced aspects of health care reimbursement (eg. physicians' role in managed care organizations, administrative role, third party reimbursement, capitated programs).
SENIOR RESIDENCY II

1. To demonstrate proficiency in more advanced principles of medical ethics (eg. informed consent in children, the mentally ill or disabled, or the demented patient; physician and industry relationships; acceptance and disclosure of gifts or consultation fees).

2. To utilize in clinical practice the principles of practice management (eg. starting a practice, economics of starting a practice, licensing and credentialling applications).

3. To utilize in clinical practice more advanced aspects of health care reimbursement (eg. denials of claims, hospital contracting, electronic billing).
APPENDIX I

Literature and Studies for Review:

General References (Books)
- 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)
Selected Review Articles.

APPENDIX II:
STRUCTURED RESIDENCY TRAINING PROGRAMME
<table>
<thead>
<tr>
<th>Duration / Year</th>
<th>Q1 Jan-Mar</th>
<th>Q2 Apr-Jun</th>
<th>Q3 Jul-Sept</th>
<th>Q4 Oct-Dec</th>
<th>Monitoring/Evaluation</th>
<th>Assessment</th>
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<td>2</td>
<td>Neuro-ophthalmology/ Oculoplastics Biostatistics/epidemiology Optics/refraction revision course</td>
<td>Pediatric ophthalmology Clinical ophthalmology revision course</td>
<td>Vitreo-retina: retinal detachment Clinical investigations: use of lasers, ultrasound Literature review Approach to Dissertation writing</td>
<td>Introduction to Community/Public Health ophthalmology Dissertation topic selection Data collection techniques</td>
<td>Review of records of surgical skills, refraction, &amp; clinical investigations Logbook assessment</td>
<td>Continuous assessment tests each quarter; mock exam; Part I Exam; ICO Part I exam</td>
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<td>3</td>
<td>Advanced neuro-ophthalmology: MRI, CT scan interpretation Advanced vitreo-retina: fluorescein angio, ICG, OCT, etc Laser: PRP, focal, grid, etc.</td>
<td>Advanced vitreo-retina: fluorescein angio, ICG, OCT, etc Laser: PRP, focal, grid, etc.</td>
<td>Advanced oculoplastics Difficult cataract cases</td>
<td>Advanced glaucoma/cataract: SICS, PHACO</td>
<td>Advanced cornea/external disease: keratoplasty, refractive surgery etc</td>
<td>ICO exam; Continuous assessment tests each quarter</td>
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<tr>
<td>4</td>
<td>Community Ophthalmology course/posting Advanced pediatric ophthalmology</td>
<td>Advanced pediatric ophthalmology</td>
<td>Oncology; Difficult glaucoma cases</td>
<td>Dissertation review/submission</td>
<td>Revision Review log book</td>
<td>Mock exam Part II Final exam</td>
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</tbody>
</table>
APPENDIX III

" TRAINERS RIGHTS

• Trainer has the right to determine how and when residents are sent for postings.
• Trainer has the right to accept or refuse training of a resident
• Trainer has the right to objectively evaluate the effort of residents’
• Trainer has the right to sign up residents for examinations
• Trainer has the right to reprimand erring residents within the Hospital's disciplinary measures
• Trainer has the right to expect respect and honour from residents (Hippocratic Oath)

TRAINERS RESPONSIBILITIES

 Trainer is responsible for organizing:

• Outpatient clinic training sessions
• *Consultants teaching ward rounds
• Journal sessions
• Clinical evaluation sessions
• Outside postings.
• * Grand rounds for residents

Chief residents status can assist the trainer in achieving some of these responsibilities.

♦ Trainer has the responsibility of signing residents for examinations

♦ Trainer has the passive responsibility of training residents such that they pass examinations in record time.

♦ Trainer has the responsibility to discipline residents but not abuse residents. (Discipline becomes abuse when threats are used and there is donkey use of residents for duties not linked to training)

♦ How to discipline - Delay postings, refuse to sign up the resident if adjudged not ready for exams, issue queries for tardiness and shirking of duties.
**MOTIVATION BY TRAINERS**

- Informal sessions with residents to find out their difficulties
- One on one counseling of residents with problems
- Above all motivation by showing good example. Leadership by example

**RESIDENTS RIGHTS**

- Resident has the right to expect structured training program
- Resident has the right to expect clinical teaching sessions
- Resident has the right to expect surgical training sessions
- Resident has the right to expect objective evaluation by trainer
- Resident has the right to expect leadership by example from the trainer
- Resident has the right to expect informed directives from trainers concerning residency curriculum. (Trainers must be familiar with NPMC handbook for residents and trainers)

**RESPONSIBILITIES OF RESIDENT**

- The resident has the responsibility of making sure postings are completed before exams
- Residents have the responsibility of attending all clinical rounds, ward rounds, surgical sessions, grand rounds, and teaching rounds structured to train them adequately.
- Residents have the responsibility of working hard to meet examination requirements and pass exams in record time.
- Residents have the responsibility of giving respect and honour to their trainers
- Residents have the responsibility of making sure log books are duly filled with trainers signatures for procedures performed.
- Residents have the responsibility to finance their examinations and conduct themselves properly during the examination.
- Residents have the responsibility of working in accordance with Nigerian Medical and Dental Counsel's medical code of ethics i.e. Don’t get involved in private practice without supervision - i.e. cataract surgery (Avoid malpractice).
# APPENDIX IV
## FACULTY OF OPHTHALMOLOGY
### NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA

FORM A: COGNITIVE DOMAIN : QUARTER (Q)/YEAR........../...........
CONTINUOUS ASSESSMENT RECORD FOR RESIDENCY TRAINING NPGMCN

NAME OF CANDIDATE........................................... YEARS IN TRAINING.....................
PLEASE FILL ALL SPACES

<table>
<thead>
<tr>
<th>ACTIVITIES (See keys)</th>
<th>*NP</th>
<th>GRADE (Please enter scores ONLY in the spaces provided)</th>
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*NP – Number Performed,
- See Remarks.

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<td>E</td>
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Sign: Consultant.................... OTC..................... HOD......................
**FORM B: PSYCHOMOTOR**

**CONTINUOUS ASSESSMENT RECORD FOR RESIDENCY TRAINING NPGMCN**

**NAME OF CANDIDATE.......................................................... YEARS IN TRAINING...............................**

**PLEASE FILL ALL SPACES**

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Total Scores

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Sign: Consultant.................... OTC.......................... HOD............................
### FORM C: AFFECTIVE DOMAIN : QUARTER (Q)/YEAR........../.........
CONTINUOUS ASSESSMENT RECORD FOR RESIDENCY TRAINING  NPGMCN

NAME OF CANDIDATE........................................ YEARS IN TRAINING......................

PLEASE FILL ALL SPACES

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**Total Scores**

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**Keys:**

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### SCORES

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Average

Comments:………………………………………………

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Recommendations:………………………………………………

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APPENDIX V-Log Book

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<th>Suture bite</th>
<th>Radiality</th>
<th>Knot placement (5-7)</th>
<th>Knot tension/ optimal wound closure</th>
<th>Paste sutured foam here with name &amp; institution</th>
<th>Signature of Supervisor</th>
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Surgical Steps performed (Tick all that apply in 1st box) and Proficiency Score (in second box)

Proficiency Scores: Novice (score =2); Beginner (3); Advanced Beginner (4); Competent (5)
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<th>Surgical Steps performed (Tick all that apply in 1st box) and Proficiency Score (in second box)</th>
<th>Proficiency Scores: Novice (score =2);  Beginner (3);  Advanced Beginner (4);  Competent (5)</th>
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<td>Age</td>
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### GLAUCOMA Procedures
- (Tick all that apply in 1st box) and Proficiency Score (second box):

| Proficiency Scores: | Novice (score =2); Beginner (3); Advanced Beginner (4); Competent (5) |

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<thead>
<tr>
<th>S/No</th>
<th>Date</th>
<th>HOSP NO NAME</th>
<th>AGE/SEX</th>
<th>IOP</th>
<th>SLE</th>
<th>GONIOSCOPY</th>
<th>CVF</th>
<th>OCT</th>
<th>Visual acuity</th>
<th>Diagnosis</th>
<th>Treatment plans</th>
<th>COMMENTS</th>
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- R.E
- LE
- Pupil
- Lens
- R.E
- LE
- R.E
- LE
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- R.E
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- R.E
- LE
- R.E
- LE
### NPMCN, FACULTY OF OPHTHALMOLOGY - LOGBOOK

**WETLAB-GLAUCOMA TRABECULECTOMY**

Surgical Steps performed (Tick all that apply in 1st box) and Proficiency Score (in second box)

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<th>Serial Number</th>
<th>Date</th>
<th>Surgical Steps performed</th>
<th>Signature of Supervisor</th>
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<td>Superficial Scleral Flap</td>
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<td>Paracentesis</td>
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<td>Deep corneoscleral block</td>
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<td></td>
<td>Peripheral Iridectomy</td>
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<td>Suturing of scleral flap</td>
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Proficiency Scores: Novice (score =2); Beginner (3); Advanced Beginner (4); Competent (5)
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<th>Date</th>
<th>HOSP NO</th>
<th>NAME</th>
<th>AGE/SEX</th>
<th>PRE-OP IOP</th>
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<th>Scleral Flap</th>
<th>Paracentesis</th>
<th>Deep Corneoscleral block</th>
<th>Peripheral Iridectomy</th>
<th>Suturing of conjunctival flap</th>
<th>VA RE LE</th>
<th>1ST DPO</th>
<th>IOP RE LE</th>
<th>1MONTH</th>
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GLAUCOMA SURGERY: Non-Trabeculectomy - Surgical Steps performed (Tick all that apply in 1st box) and Proficiency Score (in second box):

A-Trabeculotomy, B-LASER trabeculoplasty, C-SLT, D-Cyclophotocoagulation

Proficiency Scores: Novice (score = 2); Beginner (3); Advanced Beginner (4); Competent (5)

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## CORNEAL PATHOLOGIES: Microbial Keratitis (10) Non-microbial Keratitis (15) e.g. Chemical injuries, Mooren’s ulcer, Ectatic corneal disorders, Corneal Dystrophies, Severe Vernal keratoconjunctivitis.

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<th>Sex</th>
<th>VA</th>
<th>RE</th>
<th>LE</th>
<th>Diagnosis</th>
<th>Dimension of scar, epithelial defect, infiltrate hypopyon (mm) use appropriate color coding and shading</th>
<th>Microbiology outcome of the corneal scrapings in microbial keratitis</th>
<th>Outcome VA</th>
<th>RE</th>
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<th>Complications</th>
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<td>Treatment</td>
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# NPMCN, FACULTY OF OPHTHALMOLOGY- LOGBOOK

## DIABETIC RETINOPATHY

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APPENDIX VI

RESOURCES FOR RESIDENCY TRAINING IN OPHTHALMOLOGY: RECOMMENDED TEXTBOOKS

The American Academy of Ophthalmology’s Basic Clinical and Science Course texts serve as the standard textbooks for the structured training programme.

Other recommended reference texts include:

BASIC SCIENCES

Anatomy:

1. Eugene Wolff’s Anatomy of the Eye and Orbit.
   by Bron AI, Tripathi R

2. Last’s Anatomy: Regional and Applied
   by McMion R.M.

3. Gray’s Anatomy
   by William PL, Warwick R

Physiology:

1. Adler’s Physiology of the Eye
   by Kaufman PL, Alm A

4. Review of Medical Physiology
   by Gannong W.F.

Pathology:

1. Ocular Pathology
   by Greer

2. Ocular Pathology
   by Yanoff M and Fine BS

3. Ophthalmic Pathology:
   An Atlas and Texts.
   by Spencer WH
4. General Pathology
   by Walter JB, Isreal MS

CLINICAL SCIENCES


2. Clinical ophthalmology: A systematic Approach
   by Kanski JJ

3. Principles and Practice of Ophthalmology
   by Peyman, Goldberg and Sanders

4. Practical Ophthalmology
   by Wilson F M II ed.

5. Duke Elders Practice of Refraction Practice
   by Abrams

6. Duane Clinical Ophthalmology
   by Tasman W, Jaeger EA

7. Ophthalmic Epidemiology for the ophthalmologist
   by Alfred-Sommer