GUIDELINES & CURRICULUM FOR SUBSPECIALTY PROGRAMS IN OPHTHALMOLOGY (COLLEGIUM OF AIOS)
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- Dr. Mahesh Kumar, Member
We congratulate the collegium of the All India Ophthalmological Society for having completed this mammoth task of creation of guidelines and curricula for Subspecialty Education in Ophthalmology. This is an unprecedented initiative which does us proud. We greatly appreciate the zeal and effort of Dr. A. K. Grover, President of the collegium of the AIOS, in having initiated, pursued and carried this task to its logical conclusion, with his hard work and quality of perseverance. I am thankful to all the subcommittee teams and the AIOS team for their efforts in this task.

We are sure that this exercise will go a long way in promotion and standardization of subspecialty education in the country. This will have a great impact on the quality of eye care, practice of evidence based medicine, promotion of training of Ophthalmology and give a boost to research in the country.

We wish the collegium all success in its venture.

Dr. Debasish Bhattacharya
President, AIOS
(2015-16)

Dr. Barun K. Nayak
Hony. General Secretary
AIOS
The guidelines and curriculum for subspecialty programs by the Collegium of the All India Ophthalmological Society (AIOS) is an effort to standardise subspecialty Education in the Country. This I believe is the first such comprehensive exercise in the world covering all principal Subspecialties of Ophthalmology.

The document has only been possible due to an extensive effort from the members of the Collegium of the AIOS, Office Bearers, officials of AIOS, Members of the Subspecialty Committees and the various reviewers of the curricula. I must acknowledge the contribution from all of them in this gigantic endeavour.

The Collegiums must also express its gratitude to the International Council of Ophthalmology (ICO) for the Curricula for residents and Subspecialty fellowships from which we have drawn extensively in the creation of these curricula. I must acknowledge the vision of Prof. Rajvardhan Azad, President Emeritus, who founded the Collegium. The institutions of excellence in private and Government sector involved in subspecialty training programs have contributed a great deal of inputs for the creation of the guidelines.

The endeavour must only be taken as an initial effort with shortcomings. Guidelines and curricula are dynamic documents and will need continuous inputs and modifications as we gain experience with running of the subspecialty programmes. I look forward to feedbacks and suggestions.

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SUB SPECIALTY FELLOWSHIPS OF THE COLLEGIUM OF ALL INDIA OPHTHALMOLOGICAL SOCIETY (AIOS)
1. **Objective**

The Collegium of the All India Ophthalmological Society has been constituted with the following objectives:

1. The Standardisation and promotion of Ophthalmic Education with a special emphasis on subspecialty education in the Country by developing curricula for training and assessment.

2. Accreditation of Ophthalmic Institutions for training to promote improvement of education and achieving uniformity in standards

3. Award Fellowships for training in subspecialty education as there is no mechanism for assessment of trainees at present

4. Promote training of teachers and help with Education Programmes for the trainees in Ophthalmology at various levels

5. Promotion of high quality of subspecialty training will improve the training of ophthalmic manpower, promote rational and evidence based patient care and advance research

2. **Sub-specialties for AIOS Fellowship Programs**

1. Cataract (1½ Years).

2. Cataract and Refractive Surgery (1 ½ Years)

3. Cornea, Contact Lens & External Diseases (1½ Years)

4. Cornea ,Contact Lens, External Diseases and Refractive Surgery ( 1 ½ Years)

5. Glaucoma ( 1½ years)

6. Neuro Ophthalmology ( 1 ½ Years)

7. Oculoplastic, Orbital and Lacrimal Surgery ( 1 1/2 Years)
8. Pediatric Ophthalmology & Strabismus (1½ Years)
9. Medical Retina & Uvea (1½ Years)
10. Retina Vitreous & Uvea (1½ Years)
11. Comprehensive Ophthalmology (2 Years)

Duration of the Fellowship Programs in each sub-specialty

As mentioned against the name of each specialty earlier

3. Subspecialty Program Guidelines and Criteria for Accreditation and evaluation of Fellowship Programs

I. INTRODUCTION

A. Definition and Scope

Fellowship training requires more in-depth education about the pathophysiology and management of ophthalmic diseases than can usually be obtained in residency (registrar or equivalent) training in ophthalmology. Fellowships include a continuous period of intense and focused training in developing and maintaining knowledge, skills, scholarship, and professionalism.

B. Duration and Scope of Education

1. Any fellow entering a program should be able to fully comply with the clinical requirements of the program and have completed an appropriate residency program for that subspecialty fellowship (D.O / DNB/ MS). Post Diploma (D.O.) candidates are required to spend one extra year in the institution where they are slected for fellowship as a comprehensive ophthalmology fellow.

2. A minimum of 18 / 24 months of clinical training is highly recommended, including appropriate short periods for vacation or special assignments. In special circumstances, the training does not have to be continuous as long as the aggregate training is equal to the recommended total.

3. Prior to entry in the program, each fellow should be notified of the length of the program, policies for vacation, duties, stipends, other forms of support, and any restrictions associated with the training.
II. INSTITUTIONAL ORGANIZATION

A. The number of fellowship positions offered will depend on the adequacy of clinical volume, number of faculty, and other resources. The clinical load required to admit fellows may be specified by the subspecialty Committees.

B. Where applicable, the fellowship program should complement, support, and enhance the residency program. Where applicable, the department chair, fellowship program director, and residency program director should work together and periodically meet to assure that the presence of the subspecialty fellowship does not unduly draw cases, learning opportunities, or funding from the residency program.

III. FACULTY QUALIFICATIONS AND RESPONSIBILITIES

A. Fellowship Program Director

There should be a single program director responsible for the fellowship program.

1. Recommended qualifications of the fellowship program director:
   a. Have at least 8 years of clinical subspecialty experience following his/her training, of which a significant part is dedicated to the subspeciality
   b. Engage in ongoing academic endeavors in the area of subspecialty training, as demonstrated by regular publications in major peer-reviewed journals, presentation of research material at national meetings, appointments to national or international committees in the recognized specialty; and should be a recognized expert in the field.
   c. Have a clinical practice, of which a significant part is dedicated to the subspecialty.
   d. Be licensed to practice medicine in the country where the program is located.

2. Responsibilities of the fellowship program director:
   a. Develop the educational goals of the program with respect to knowledge, skills, and other attributes for each major rotation or other program assignment.
   b. Develop and maintain documentation of the fellows’ selection process, patient care statistics, evaluations of faculty and the program, and assessment of the fellows’ performance.
c. Designate and supervise the faculty through explicit descriptions of supervisory lines of responsibility for the care of patients, as well as the skill requirements for the fellows.

d. Ensure the implementation of fair procedures and due process regarding academic discipline and fellows’ complaints or grievances.

e. Monitor fellow stress, including mental or emotional conditions inhibiting performance or learning, and drug or alcohol-related dysfunction.

f. Ensure there is health coverage and malpractice insurance for the fellow.

B. Faculty

While the fellowship director will be the principal preceptor, 1 or more additional clinical faculty is highly recommended. Ideally, 1 additional faculty member should have completed 1 year of fellowship training or equivalent, and have at least 2 years of practice experience in that specialty.

Faculty members should:

1. Possess appropriate clinical and teaching skills, either by subspecialty training or subspecialty oriented clinical practice.

2. Demonstrate a strong interest in the education of fellows; possess sound clinical, research, and/or teaching abilities; support the goals and objectives of the program; participate in scholarly activities; and be committed to their own continuing medical education.

3. Have regularly scheduled (at least annually) documented meetings in order to review the program’s goals and objectives, as well as the program’s effectiveness in achieving its goals and objectives.

C. Other Program Personnel

Programs should be provided with the additional professional, technical, and clerical personnel needed to support the administrative and educational activities of the program.

IV. FACILITIES AND RESOURCES

A. Outpatient Examination Facilities

The outpatient area of each participating program should have a minimum of 1 fully
equipped examination lane for each fellow. There should be access to current diagnostic equipment.

B. Inpatient Facilities

Inpatient facilities may, where possible, be available with sufficient space and beds for good patient care.

C. Community / Outreach

There should be facility for candidate to work in community / outreach activities.

D. Operating Facilities

There must be adequate operating facilities, including Operating Microscopes.

E. Library or Academic Resources

Fellows should have ready access to a major medical library and/or facilities for electronic retrieval of information from medical databases.

F. Didactic Components

The fellow should exhibit scholarly activity by participating in research and clinical conferences, or their equivalent, for at least the minimum number of hours needed per year to demonstrate competence in the subject. Scholarly activity should consist of:

1. Didactic instruction, seminars, lectures, basic science courses, and hands-on skill courses.

2. Completion of at least 1 research project during the fellowship year or be lead author of 1 peer-reviewed publication or presentation at a nationally recognized meeting in the subspecialty within 1 year of fellowship completion.

When applicable, subspecialty fellows will participate in the teaching programs of the subspecialty service and of the institution, if the fellowship is affiliated with a teaching institution or that may be obtained in an exchange program.

1. Attendance at weekly grand rounds or similar venue. The fellow is to actively participate in case presentations and discussions of patients with the subspecialty.
2. Attendance at monthly morbidity, pathology, and complications conferences where available.

3. Attendance at lectures on subspecialty topics given by the faculty during the resident teaching program. These should include at least 6 lecture hours per year. The fellow must prepare and present at least 1 of these lectures.

4. The fellow should actively participate, along with the faculty, in a journal club at least quarterly. The fellow and faculty should present and critically discuss selections from the current literature.

5. The fellow should attend local and regional conferences relevant to his specialty.

G. Supervision

1. Faculty should be available to supervise fellows as they examine and treat outpatients and inpatients. They should be available for consultation, assistance, and review of the patients. The supervision should be direct for the majority of encounters. Direct faculty supervision occurs when the faculty reviews the findings with the fellow prior to the patient leaving the clinic or being discharged from the hospital.

2. The faculty should participate as primary surgeon or assistant surgeon to the fellow in a sufficient number of surgical procedures to confirm the fellow’s surgical judgment and skill.

3. It is recommended that fellows perform a sufficient number of procedures to achieve competence. Individual programs utilizing these guidelines should determine what the minimum numbers should be, based on local need and resources available.

He should maintain a surgical log of the type of case and clearly differentiate between being primary surgeon or assisting surgeon.

4. The faculty should make a determination that the fellow uses sound clinical judgment in making recommendations for surgery that is in patients’ best interests. The faculty is responsible in determining that the fellow has sufficient surgical skill to practice independently.

H. Duty Hours and Conditions of Work

Duty hours and night and weekend call for fellows should reflect the concept of
responsibility for patients and provide for adequate patient care. Salary is left up to the discretion of the program. However, it should at least be equivalent to the basic salary of the residents in Ophthalmology in that State. A minimum of 1-week vacation and 1-week of approved conference time should be allotted. A signed agreement between the fellowship director (or institution, practice, or department) and the fellow should be in place outlining the salary and benefits prior to any formal patient contact. The fellow must be made aware of any restrictive covenant prior to accepting the fellowship.

I. Academic Activity

The fellowship should take place in an academic atmosphere where resources are available that allow the fellow to participate in academic activities. Fellows should participate in the development of new knowledge and evaluate research findings. The responsibility for establishing and maintaining an environment of inquiry and scholarship rests with the faculty. While not all members of the faculty must be involved in research, the staff as a whole should demonstrate broad involvement in scholarly activity. This activity should include:

1. Active participation of the faculty in clinical discussions, rounds, and conferences in a manner that promotes a spirit of inquiry and scholarship. Scholarship implies an in-depth understanding of basic mechanisms of normal and abnormal states and the application of current knowledge to practice.

2. Active participation in regional or national professional and scientific societies, particularly through presentations at their meetings and publications in peer-reviewed journals.

3. Participation in research leading to peer-review publications or presentations at regional and national scientific meetings.


J. Fellow Research Activities

The fellow should be exposed to opportunities to develop research skills. A specific block of time may be set aside for clinical or laboratory research. When the research component exceeds 20% of the total time it may be necessary that the fellowship be extended.
VI. EVALUATION

A questionnaire will be prepared on the basis of the criteria laid out above, which will form the basis for accreditation of the institutions to the Collegium of the AIOS. A mechanism for evaluation including inspection may be created in due course. A reaccreditation of the fellowship program will be necessary every 3 years.

A. Program and Faculty Evaluation

The educational effectiveness of a program should be evaluated in a systematic manner. In particular, the quality of the curriculum, and the extent to which the educational goals have been met by fellows, should be assessed. Teaching faculty should also be evaluated on a regular basis.

B. Fellow Evaluation

There should be regular evaluation of the fellow’s knowledge, skills, and overall performance, including the development of professional attitudes consistent with being a physician.

The program director, with the participation of members of the faculty, shall:

1. At least quarterly review the surgical log and evaluate the knowledge, skills, and professional growth of the fellow.
2. Communicate each evaluation to the fellow in a timely manner.
3. Advance each fellow to positions of higher responsibility on the basis of evidence of their progressive development of knowledge, skills, and professionalism.
4. Maintain a permanent record of evaluation for each fellow.

C. The program director should maintain a written, final evaluation for each fellow who completes the program. The evaluation should include a review of the fellow’s performance during the period of training and should verify that the fellow has demonstrated sufficient professional ability to practice competently and independently. This final evaluation should be part of the fellow’s permanent record maintained by the fellowship director.

VII. Professionalism and Ethics
Development of professionalism and ethics must be an integral part of training. The curriculum in annexure 4, will be a part of each of the fellowship curricula.

VIII. POST FELLOWSHIP RECOMMENDATIONS

It will be desirable to maintain an affiliation with the fellows and their Institutions to assist in creation of infrastructure and capacity development where required.

4. Admission Criteria and procedure.

Eligibility Criteria:- (Fellowship (FAICO) by examination)

- Basic Post Graduate Qualification in Ophthalmology recognized by Govt. of India (D.O / DNB / MD / MS/ any recognized foreign qualification)

Note: (Additional 1 year of time to be spent in the Instituion by Candidates who are Post D.O.) as a Comprehensive Ophthalmology fellow

- Life Membership of AIOS
- Fellowship from Accredited Institutions of the Collegium.

Or

- 3 years work in the specialty in an Institution with a record of practice the subspecialty and a log book certified by the Supervisor.

The admission will be done by each Institution independently Institution accredited by the Collegium of All India Ophthalmological Society will admit the number of candidates they consider appropriate but commensurate with the infrastructure and patient load.

They may carry out a MCQ Exam and / or an interview for the process of selection of candidates.

Honorary Fellowship (FAICO)

1. By Conferment -(Maximum 2 Per year)
   a. Member of AIOS of over 20 years standing
   b. To topmost professionals in based on their contribution to development of the subspecialty nationally and internationally
c. No fellowship Fee

2. By Selection (Maximum 5 per year)
   a. Members of AIOS of over 20 years standing
   b. On the basis of contribution to subspecialty / education / research / Community work
   c. Based on evaluation of CV
   d. One time fellowship contribution of Rs. 10,000/-

5. Content of Curriculum (theory, Skill, Surgery) for each subspecialty

Annexure - I

6. Assessment
   • Formative Assessment:
     1. Clinical and Theory Examination at the end of 1 Year in 1 ½ years fellowships and 1 year 4 Months in 2 years fellowships including on basic, paraclinical aspects and diagnostic skills. 10 Marks
     2. Assessment of Log books (to be maintained to include )20 Marks
       1. Diagnostic procedures
       2. Therapeutic procedures
       3. Surgery – where applicable
     3. Based on rubrics Rubrics to evaluate surgical / clinical skills (the rubrics to be used to help refine surgical skills as well) -10 marks
       i. Research experience / publications / presentations at State / National / subspecialty / International Meetings (to be documented) - 5 Marks
       ii. Evaluation of professionalism, ethics and communication skills – 5 Marks
   • Summative Assessment
Exit exam conducted by Collegium – comprehensive exam, including all aspects

Stage – I

1. MCQ (Online exam) - 100 Marks
   100 Questions (Pass – marks 70%)

The questionnaire to be modified and validated in line with the ICO examination

Stage –II (Pass marks 50%)

1. Objectively structured Clinical Examination (OSCE) - 20 Stations
   Or 4 short cases — 100 Marks

2. Viva Voce - 50 marks

3. Formative assessment from institution (only for candidates from affiliated Institution) - 50 Marks

7. Creation of Subspecialty Committee

A committee of specialists will be created in each of the subspecialties (Tenure of 3 years) for periodic evaluation and renewal of curricula. The Committee will be sent the curricula by e-mail for interaction with each other and finalization within 1 month. The curricula must be reassessed every 3 year for renewal.

The Committee will comprise

1. Chairperson : 1

3. Members : 3

The Chairperson will retire after 1 term of 3 years, collegium will designate one of the members as the new chairperson and a new member will be added by the Collegium.

8. The Structure of AIOS Collegium - the Roles of the Collegium and affiliated institutions and mode for continued interaction between the two.

a. Collegium will lay down the curriculum for subspecialties and carry out summative assessment
b. Collegium will seek inputs from the Institutions on continued evolution of the curriculum and assessment.

c. The Collegium will create subspecialty boards for continued evolution of curricula.

d. All affiliated Institutions will contribute to the question bank of the Collegium in the prescribed format (25 questions for each specialty every year) and serve as an examination centre for the OSCE and Viva Voce.

e. The Collegium will hold a meeting at the Annual meeting of the AIOS where all Affiliated Institutions will participate to serve as a platform for interaction and exchange of ideas.

f. One member of the affiliated Institutions will be members of the Governing Board.

g. The board will comprise President and President Emeritus. Three other members of the Collegium will be appointed by the President of the Collegium in consultation with the president + Hony. General Secretary, AIOS.

h. The Governing Board will have the following office bearers of the AIOS as ex Officio Members.

i. President

ii. President Elect

iii. Hony. General Secretary (Member Secretary)

iv. Chairman, Scientific Committee

v. Chairman - ARC

9. Continuing education for fellows of Collegium

1. The Institutions should nurture a relationship with their alumni for their continuing professional development.

2. The Collegium will organize a meeting at the Annual Conferences of the AIOS which will include an oration by a FAICO Alumnus (30 Min) followed by a social get together.

3. Collegium will develop an online questionnaire to assess the impact of the FAICO programme in the clinical practice development of the alumnus and seek their inputs annually.
CURRICULUM GUIDELINES
FOR
SUBSPECIALTY PROGRAMS IN
OPHTHALMOLOGY
CURRICULUM GUIDELINES
FOR
SUBSPECIALTY PROGRAMS in OPHTHALMOLOGY

Preamble:

The purpose of this programme is to standardize fellowship training at the Post doctoral level throughout the country so that it will benefit in achieving uniformity in subspecialty training as well as create subspecialty with appropriate expertise.

This document should be considered a “work in progress” and be revised and modified to from time to time as well as respond to expanding knowledge and technology.

Practice based learning and Improvement

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

- Analyze practice experience and perform practice-based improvement activities using a systematic methodology;
- Locate, appraise, and assimilate evidence from scientific studies related to their patients’ health problems;
- Obtain and use information about their own population of patients and the larger population from which their patients are drawn; They should be aware of the community problems specific to their geographic location (Country, State, Region) and sensitive to the community needs.
- Apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness;
- Use information technology to manage information, access on-line medical information; and support their own education; and facilitate the learning of students and other health care professionals.
- Develop presentaton skills and the skills to be an effective public speaker.

* The curriculum has been adapted from the residency and subspecialty curricula of the International Council of Opththalmaology
Interpersonal and Communication Skills

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

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

Professionalism

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

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

Systems - based Practice

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

- Understand how their patient care and other professional practices affect other health care professionals, the health care organization and the larger society, and how these elements of the system affect their own practice;
● Know how types of medical practice and delivery systems differ from one another, including methods of controlling health care costs and allocating resources; practice cost-effective health care and resource allocation that do not compromise quality of care;

● Advocate for high quality patient care and assist patients in dealing with system complexities; and

● Know how to partner with health care managers and health care providers to assess, coordinate, and improve health care and know how these activities can affect system performance.

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

● Humane (reflecting compassion in providing bad news, if necessary; the management of the visually impaired; and recognition of the impact of visual impairment on the patient and society);

● Reflective (including recognition of the limits of their knowledge, skills and understanding);

● Ethical;

● Integrative (including involvement in an inter-disciplinary team for the eye care of children, the handicapped, the systemically ill, and the elderly); and

● Scientific (including critical appraisal of the scientific literature, evidence-based practice, and use of information technology and statistics).

**SUBJECT SPECIFIC LEARNING OBJECTIVES**

*Programme Objectives*

A candidate upon successfully qualifying in the FAICO should be able to:

a) Offer to the community, the current quality of ‘standard of care’ in subspecialty diagnosis as well as therapeutics, medical or surgical, in most of the common situations encountered at the level of health services.

b) Periodically self assess his or her performance and keep abreast with ongoing
advances in the field and apply the same in his/her practice.

c) Be aware of his/her own limitations to the application of the specialty in situations, which warrant referral to more qualified centers or individuals.

d) Apply research and epidemiological methods during his/her practice. The candidate should be able to present or publish work done by him/her.

e) Contribute as an individual/group towards the fulfillment of national objectives with regard to prevention of blindness.

f) Effectively communicate with patients or relatives so as to educate them sufficiently and give them the full benefit of informed consent to treatment and ensure compliance.

**Annexures:**

I to IV shall be a part of all Subspeciality curricula

Annexure-I: Rubrics for assessment of Surgical Skill

Annexure-II: Assessment of academic presentations

Annexure-III: Ophthalmic Clinical Evaluation exercises

Annexure-IV: Goals for Ethics and Professionalism in Ophthalmology
CATARACT
Cataract

General Educational Objectives

1. Describe the diagnosis, evaluation, and management of intraoperative and postoperative complications of cataract and intraocular lens (IOL) surgery, including planned extracapsular extraction (ECCE) and phacoemulsification.

2. Perform the complete preoperative ophthalmologic examination of cataract patients, including the consent for the procedure.

3. Formulate the differential diagnoses for cataract and related lens conditions.

4. Perform routine and advanced cataract surgery with IOL placement.

5. Perform the complete postoperative examinations following cataract surgery, including refraction.

6. Manage intraoperative and postoperative complications of cataract surgery.

7. Develop and exercise clinical and ethical decision making in cataract patients.

8. Develop good patient communication techniques regarding cataract surgery.

9. Work effectively as a member of the medical care team.

10. Develop teaching skills about cataract for instructing junior trainees and students.

Basic Level Goals:

A. Cognitive Skills

1. Describe the lens anatomy, physiology, and accommodation.

2. Identify the most common causes and types of cataract (eg, anterior polar, cortical, nuclear sclerotic, posterior subcapsular, posterior polar, mature lenses such as the Morgagnian cataract).

3. Describe the relationship between the lens and systemic disease (eg, diabetes, myotonic dystrophy).
4. List ocular conditions that are associated with cataract (eg, uveitis, Wilson disease, ocular ischemia, ocular tumors, including treatment for tumors such as radiotherapy).

5. List systemic and topical medicine that can cause pathologic changes in the lens (eg, oral and topical corticosteroid use).

6. List the basic history and examination steps for preoperative cataract and posterior capsular opacification evaluation.

7. Identify and describe the principles and mechanisms of the following instruments in the evaluation of cataract:
   a. Lensometer
   b. Autorefractor
   c. Retinoscope
   d. Phoropter or loose lenses
   e. Keratometer
   f. Slit-lamp biomicroscope
   g. Glare and contrast testing devices
   h. Potential acuity meter

8. Describe the basics of IOL power estimation, including:
   a. Linear regression formulas (eg, Sanders-Retzlaff-Kraff [SRK] and SRKII)
   b. Theoretical eye model prediction formulas (eg, SRKT, Holladay, and Haigis)

9. Describe the methods to estimate axial eye length, including:
   a. Contact ultrasound
   b. Immersion ultrasound
   c. IOLMaster, LENSTAR, or equivalent, even if equipment is unavailable
10. List the steps of routine intracapsular cataract extraction (ICCE), ECCE, and phacoemulsification.

11. Define the elementary refraction techniques to obtain best-corrected vision prior to considering cataract extraction.

12. Describe the major etiologies of dislocated or subluxated lens (eg, pseudoexfoliation syndrome, trauma, Marfan syndrome, homocystinuria, Weill-Marchesani syndrome, syphilis).

13. Describe the following:
   a. Basic ophthalmic optics as related to cataract
   b. Types of refractive error in cataract
   c. Retinoscopy techniques for cataract
   d. Subjective refraction techniques for cataract patients

14. Describe methods to decrease postoperative infection, including presurgical preparation, intraoperative antibiotics, and postoperative antibiotic techniques.

15. Describe postoperative medications used for cataract surgery, including antibiotics, nonsteroidal anti-inflammatory drugs, and corticosteroid therapy.

16. Describe the risk factors for intraoperative floppy iris syndrome (IFIS) and intraoperative techniques to limit the risk of this syndrome (eg, alpha blockers, use of rings, hooks)

17. Describe the special considerations when dealing with a unilateral cataract (trauma, history of uveitis, history of topical steroid use, past surgeries)

B. Technical/Surgical Skills

1. Perform basic slit-lamp biomicroscopy, retinoscopy, and ophthalmoscopy.

2. Evaluate and classify common types of lens opacities.

3. Perform subjective refraction techniques and retinoscopy in patients with cataract.

4. Perform and document laser capsulotomy on routine cases of posterior capsule
opacification.

5. Perform direct and indirect ophthalmoscopy prior to and following cataract surgery.

6. Perform the basic steps of cataract surgery (eg, incision, wound closure) in the practice lab, if available.

7. Assist with cataract surgery and perform patient preparation, sterile draping, and anesthesia.

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

9. Use the operating microscope for basic cataract surgery.

10. Perform some of the steps of cataract surgery under direct supervision, including any or all of the following:
    a. Wound construction
    b. Anterior capsulotomy/capsulorhexis
    c. Instillation and removal of viscoelastics
    d. Hydrodissection and hydrodelineation
    e. Extracapsular and phacoemulsification techniques
    f. Irrigation and aspiration
    g. Cortical cleanup
    h. IOL implantation (eg, anterior and posterior)
    i. Removal of viscoelastic
    j. Suturing of the wound
    k. Wound hydration
Standard Level Goals:

A. Cognitive Skills

1. Describe the less common causes of lens abnormalities (eg, spherophakia, lenticonus, ectopia lentis, coloboma).

2. Describe the preoperative evaluation of the cataract patient, including:
   a. Systemic diseases of interest or relevance to cataract surgery
   b. Systemic medication of relevance to cataract surgery (eg, alpha 1 adrenergic blocking agent, blood thinning agents, corticosteroids)
   c. Relationship of external and corneal diseases of relevance to cataract and cataract surgery (eg, lid abnormalities, dry eye)
   d. Management of uveitis prior to and following cataract surgery
   e. Management of glaucoma prior to and following cataract surgery, including options for postoperative intraocular pressure (IOP) control

3. Describe glare analysis testing for cataract surgery.

4. Describe the use of A-scan and B-scan contact and immersion ultrasonography and optical coherence techniques in cataract surgery to measure axial eye length.

5. Describe the instruments and techniques of cataract extraction, including extracapsular surgery and phacoemulsification.

6. Describe the important parameters of the phacoemulsification machine and how to alter them for particular conditions of surgery.

7. Describe the types, indications, and techniques of anesthesia for cataract surgery (eg, topical, local, general).

8. Describe indications, techniques, and complications of surgical procedures, including: ECCE, ICCE, phacoemulsification, paracentesis, and IOL placement.

9. Describe the pathogenesis and strategies for prevention of posterior capsular opacification.
10. Describe history and techniques of basic IOL implantation.

11. Correlate the level of visual acuity with the lens or capsular opacities.

12. Describe the pathogenesis, clinical presentation, differential diagnosis, evaluation, clinical course, treatment, and outcome of the common complications of cataract and anterior segment surgery (e.g., intraoperative floppy iris syndrome, corneal edema, IOP elevation, hyphema, endophthalmitis, toxic anterior segment syndrome (TASS), cystoid macular edema (CME), retinal detachment, IOL dislocation, lens-induced glaucoma, uveitis).

13. Describe the indications for, principles of, and techniques of yttrium aluminium garnet (YAG) laser capsulotomy, and understand the proper timing of YAG laser capsulotomy.

14. Describe advanced IOL power calculation (e.g., after radial keratotomy [RK], myopic laser-assisted in situ keratomileusis [LASIK]/photorefractive keratectomy [PRK], hyperopic LASIK/PRK).

15. Describe the properties of different ophthalmic viscoelastic devices (OVDs) (e.g., dispersive, cohesive, adaptive) and the advantages and disadvantages for certain phases of surgery.

16. Describe the fluid dynamics in phacoemulsification, including the difference between peristaltic and venture pump types.

17. Recognize and treat common postoperative complications of cataract surgery (e.g., endophthalmitis, toxic anterior segment syndrome, elevated IOP, CME, wound leak, uveitis, capsular block syndrome).

18. Define the more complex indications for cataract surgery (e.g., better view of posterior segment, lens-induced glaucoma).

19. Describe the techniques to manage a small pupil, including mechanical manipulation, management of iris membrane, iris hooks, viscoelastic, and phaco techniques.

20. Describe techniques to diagnose and operate on patients with posterior polar cataract.

21. Describe the preoperative preparations for surgery and special intraoperative considerations for patients with uveitis.
22. Describe techniques for prevention of capsular opacification and phimosis (before, during, after surgery), including the use of capsular tension rings and IOL factors.

B. Technical/Surgical Skills

1. Perform local injections of corticosteroids, antibiotics, and anesthetics, including retrobulbar and subtenons.

2. Perform extracapsular surgery in a practice setting (eg, animal or practice lab).

3. Practice surgery in the operating room under supervision, including mastery of the following skills:
   a. Wound construction
   b. Anterior capsulotomy/capsulorhexis
   c. Instillation and removal of viscoelastics
   d. Hydrodissection and hydrodelineation
   e. Extracapsular technique
   f. Beginning phacoemulsification techniques (eg, sculpting, divide and conquer, phaco chop)
   g. Irrigation and aspiration
   h. Cortical cleanup
   i. IOL implantation (eg, anterior and posterior, special IOLs)
   j. Wound suturing
   k. Wound hydration

4. Perform paracentesis of the anterior chamber.

5. Implement advanced applications of viscoelastics in surgery (eg, control of iris prolapse, elevation of dropped nucleus, viscodissection, aspiration of residual/retained viscoelastic, soft shell technique).
Advanced Level Goals:

A. Cognitive Skills

1. Describe the principles, indications for, mechanics of, and performance of contact and immersion A-scan ultrasonography and calculation of IOL power.

2. Describe the performance of and describe the complications of more advanced anterior segment surgery (eg, pseudoexfoliation, small pupils, intraoperative floppy iris syndrome, mature cataract, hard nucleus, posttraumatic, zonular dehiscence, cataract surgery after pars plana vitrectomy, short eye, corneal endothelial diseases).

3. Describe the use of special devices for cataract surgery in complex situations such as specialized IOLs, capsular tension rings and segments, iris hooks, Malyugin ring, use of indocyanine green/trypan blue staining of the anterior capsule.

4. Describe IOL fixation options in the lack of capsular support for in the bag fixation (anterior chamber [AC] IOL, sulcus fixation +/- optic capture, iris fixation, scleral fixation).

5. Describe the indications for, techniques of, and complications of cataract extraction in the context of the subspecialty disciplines of the following:
   
a. Glaucoma (eg, combined cataract and glaucoma procedures, glaucoma in cataractous eyes, cataract surgery in patients with prior glaucoma surgery)
   
b. Retina (eg, cataract surgery in patients with scleral buckles or prior vitrectomy)
   
c. Cornea (eg, cataract extraction in patients with corneal opacities) and the use of fiber optic for better visualization
   
d. Ophthalmic plastic surgery (eg, ptosis following cataract surgery)
   
e. Refractive surgery (eg, cataract surgery in eyes that have undergone refractive surgery)

6. Independently evaluate and establish a management plan for complications of cataract and IOL implant surgery (eg, posterior capsular tears, vitreous prolapse, intravitreal dislocation of cataractous fragments, corneal wound burn, expulsive hemorrhage, choroidal effusions, damage to the iris tissue).
7. List indications for and techniques of intracapsular surgery (eg, rare cases may require this procedure, or patients may have had the procedure performed previously).

8. Describe instrumentation and techniques used to implant foldable and nonfoldable IOLs.

9. Describe the evaluation and management of common and uncommon causes of postoperative endophthalmitis and TASS.

10. Describe the causes and indication for performing, repositioning, removal, or exchange of IOLs.

12. Describe the government and hospital regulations that apply to cataract surgery.

13. Describe the indication and option for astigmatism management during cataract surgery (eg, on axis incision, limbal relaxing incisions [LRI], opposite clear corneal incision [OCCI], toric IOL).

14. Describe the use of corneal topography and wavefront analysis to help select the best type of IOL for a patient especially following keratorefractive surgery.

15. Describe the option for presbyopic correction solutions during cataract surgery (eg, monovision, multifocal IOLs, accommodative IOLs, dual optic IOLs).

16. Describe the mechanisms of actions, indications, contraindications, advantages, and disadvantages of premium IOLs (eg, multifocal, accommodative, toric, aspheric, blue blocker, intraocular miniature telescope).

17. Describe evaluation and management of IOL complications (eg, intraoperative damage to IOL, postoperative IOL opacification, dislocation, sublocation).

18. Describe the advantages and disadvantages of the materials used for IOL fabrication (eg, poly-methylmethacrylate [PMMA], silicone, hydrophobic acrylic, hydrophilic acrylic).

19. Describe lens/IOL surgery solutions for myopia and hyperopia (eg, refractive lens exchange, phakic IOLs).

B. Technical/Surgical Skills

1. Assist in the teaching and supervision of basic and standard level learners.
2. Perform phacoemulsification in a practice setting (eg, animal or practice lab) and then in the operating room, ideally 50-100 cases of a combination of phacoemulsification and ECCE, including mastery of the following skills:
   a. Wound construction
   b. Anterior capsulotomy/capsulorhexis
   c. Viscoelastics
   d. Intracapsular, extracapsular, and phacoemulsification techniques (eg, sculpting, divide and conquer, stop and chop, phaco chop)
   e. Instrumentation and techniques of irrigation and aspiration
   f. IOL implantation (eg, anterior and posterior, foldable and nonfoldable)
   g. IOL repositioning, removal, or exchange

3. 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. Loss of anesthesia
   h. Elevated intraocular pressure
   i. Use of topical and systemic medications
   j. Astigmatism
   k. Postoperative refraction (simple and complex)
l. Corneal edema  
m. Wound dehiscence  
n. Hyphema  
o. Residual cortex  
p. Dropped nucleus  
q. Uveitis  
r. CME  
s. Elevated intraocular pressure and glaucoma  
t. Postoperative early and late intraocular infection  
u. Corneal burn  
v. Intraoperative floppy iris syndrome  

Very Advanced Level:  

A. Cognitive Skills  

1. Describe the issues of pediatric cataract surgery, including the indications for surgery (posterior capsulotomy +/- anterior vitrectomy), IOL implantation, unilateral and bilateral congenital cataract, and IOL calculation in young children.  

2. Describe the management of cataract associated with aniridia.  

3. Describe the treatment options for “dropped IOL” and indications for referral to a vitreoretinal surgeon.  

4. Describe the advantages and strategies for advanced phacoemulsification techniques such as torsional or transversal ultrasound, small incision and microincision cataract surgery (MICS), biaxial MICS cataract surgery.  

5. Describe the parameters, power, and fluidics in MICS.  

6. List the indications for triple procedures or combined surgeries (eg, phaco plus trabeculectomy, keratoplasty, silicone-oil removal).
7. List the Indications for “premium” IOLs (eg, multifocal, accommodating, toric).

8. Describe the surgical difficulties of hypermature (Morgagnian) cataract.

9. Describe the treatment options for eyes with shallow anterior chamber and cataract including high-degree hyperopic eyes and piggyback IOL implantation.

10. Describe the treatment of cataract in patients with an intraocular tumor (eg, melanoma, retinoblastoma).

11. Describe the methods to determine typical surgically induced astigmatism and surgeon specific A-constant.

12. Describe the etiology and management of unexpected postoperative refractive errors, including hyperopic and myopic shifts (eg, capsular phimosis, capsular block, upside down IOL).

13. Describe the management strategies to reposition of decentered, tilted, subluxated, and dislocated IOLs.

B. Technical/Surgical Skills

1. Perform surgery on congenital cataract, including IOL power calculation.

2. Perform and teach small incision and MICS, torsional, or transversal ultrasound.

3. Perform and teach triple procedures or combined surgeries (eg, phaco and trabeculectomy, keratoplasty, silicone-oil removal).

4. Implant “premium” IOLs (eg, multifocal, accommodating, toric) and counsel patients preoperatively and postoperatively.

5. Perform surgery on patients with complex lens issues, including:
   a. Aniridia, iris coloboma, iris dialysis
   b. Hypermature (Morgagnian) cataract
   c. Eyes with shallow anterior chamber
   d. High-degree myopic eyes

6. Perform reposition of malpositioned IOLs and late subluxation of IOL/capsule.
A. Minimum Number of Diagnostic and therapeutic Procedure required by the Candidate (Minimum numbers)

- Immersion A scan & Laser interference biometry: 100 each
- Yag Capsulotomy: 25
- ECCE / SICS : 50
- Phaco with PMMA / Foldable IOL : 100
B. Minimum requirement for accreditation of Institutions for subspecialty fellowship

Equipments
- Slit lamp
- Applanation tonometer, Gonioscope, indirect ophthalmoscopes
- Immersion A scan
- Laser interference biometry: IOL master or Lenstar or equivalent.
- Yag laser
- Specular microscope
- Phaco machines
- High quality Operating microscope with assistant microscope
- Anterior vitrectomy facility
- Vitreo retinal backup to handle complications
CORNEA CONTACT LENS & EXTERNAL DISEASES
Cornea Contact Lens & External Diseases

Cornea

Basic Level Goals:

A. Cognitive Skills

1. 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. Understand the fundamentals of corneal optics and refraction (eg, astigmatism, keratoconus).

3. Describe congenital abnormalities of the cornea, sclera, and globe (eg, Peter anomaly, microphthalmos, birth trauma, buphthalmos).

4. Describe characteristic corneal and conjunctival degenerations (eg, pterygium, pinguecula, Salzmann nodular degeneration, senile plaques of the sclera).

5. Recognize the classic corneal dystrophies (eg, map-dot-fingerprint dystrophy, lattice dystrophy, granular dystrophy, macular dystrophy, Fuchs dystrophy).

6. Describe the fundamentals of ocular microbiology and recognize corneal and conjunctival inflammations and infections (eg, staphylococcal hypersensitivity, simple microbial keratitis, fungal corneal ulcers, trachoma, ophthalmianeconatorum, herpes zoster ophthalmicus, herpes simplex keratitis, adenovirus keratoconjunctivitis and conjunctivitis).

7. Describe the basic principles of ocular pharmacology of anti-infective, anti-inflammatory, and immune modulating agents (eg, indications and contraindications for topical corticosteroids, nonsteroidal anti-inflammatory agents, and antibiotics).

8. Recognize and treat lid margin disease (eg, staphylococcal blepharitis, meibomian gland dysfunction).

9. Describe the basic differential diagnosis of acute and chronic conjunctivitis or red eye (eg, scleritis, episcleritis, conjunctivitis, orbital cellulitis, gonococcal and chlamydial conjunctivitis).
10. Recognize and treat pyogenic granuloma.

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

12. Understand the mechanisms of ocular immunology and recognize the external manifestations of anterior segment inflammation (eg, red eye associated with acute and chronic iritis).

13. Describe the symptoms, signs, testing, and evaluation for dry eye (eg, Schirmer test, tarsorrhaphy); and treatment for dry eye. Describe the signs and symptoms of meibomitis.

14. Describe the etiologies and treatment of superficial punctate keratopathy (eg, dry eye, Thygeson superficial punctate keratopathy, neurotrophic keratitis, blepharitis, toxicity, ultraviolet photo keratopathy, contact lens-related keratitis).

15. Recognize and describe the etiologies of hyphema and microhyphema.

16. Describe the basic mechanisms of traumatic and toxic injury to the anterior segment and treatment (eg, chemical and thermal burns, lid laceration, orbital fracture, perforating injuries).

17. Recognize corneal lacerations (perforating and nonperforating), anterior segment trauma, corneal and conjunctival foreign bodies.

18. Describe the epidemiology, differential diagnosis, evaluation, and management of common benign and malignant lid lesions, including pigmented lesions of the conjunctiva and lid (eg, nevi, melanoma, primary acquired melanosis, ocular surface squamous neoplasia).

B. Technical/Surgical Skills

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

2. Administer topical anesthesia, as well as special topical stains of the cornea (eg, fluorescein dye and rose bengal).

3. Perform tests for dry eye (eg, Schirmer test, tear film breakup, and dye disappearance).
4. Perform punctal occlusion (temporary or permanent) or insert plugs.
5. Perform simple corneal sensation testing (eg, cotton-tipped swab).
6. Perform tonometry (eg, applanation, Tono-Pen, Schiotz, pneumotonometry).
7. Perform techniques of sampling for viral, bacterial, fungal, and protozoal ocular infections (eg, corneal scraping and appropriate culture techniques).
8. Interpret simple stains of the cornea and conjunctiva (eg, Gram stain, Giemsa stain).
9. Manage corneal epithelial defects (eg, pressure patching and bandage contact lenses).
10. Perform removal of a conjunctival or corneal foreign body (eg, rust ring).
11. Perform simple (nonrecurrent) pterygium excision (eg, with autologous conjunctival transplantation).
13. Perform an isolated corneal laceration repair (eg, linear laceration not extending to limbus, not involving uveal or intraocular structures).
15. Perform a lateral tarsorrhaphy.
16. Perform incision, drainage, and/or remove a primary chalazion/stye.
17. Perform a simple incisional or excisional biopsy of a lid lesion.
18. Perform irrigation of chemical burn to the eye.
20. Perform amniotic membrane grafting

Standard Level Goals:

A. Cognitive Skills

1. 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. Describe the more complex congenital abnormalities of the cornea, sclera, anterior segment and globe and their associated systemic manifestations (eg, Axenfeld, Rieger, and Peter anomalies, aniridia, hamartomas and choristomas).

3. Understand more complex corneal optics and refraction (eg, irregular astigmatism, keratoconus, anisometropia).

4. Correlate the concordance of the visual acuity with the density of media opacity (eg, cataract, corneal scars, edema), and evaluate the etiology of discordance between acuity and findings from examination of the media.

5. Recognize and treat less common corneal or conjunctival presentations of degenerations and common conjunctival neoplasms (eg, inflamed, atypical, or recurrent pterygium, band keratopathy, benign and malignant tumors).

6. Describe the epidemiology, clinical features, pathology, evaluation, and treatment of peripheral corneal thinning disorders or ulceration (eg, Terrien marginal degeneration, Mooren ulcer, rheumatoid arthritis-related corneal melt, dellen).

7. Describe the epidemiology, differential diagnosis, evaluation, and management of vitamin A deficiency (eg, Bitot spot, dry eye, slowed dark adaptation, keratomalacia) and neurotrophic corneal diseases.

8. Recognize and treat recurrent corneal erosions.

9. Recognize, evaluate, and treat chronic conjunctivitis (eg, chlamydia, trachoma, molluscumcontagiosum, Parinaud oculoglandular syndrome, ocular rosacea).

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

11. Describe the more complex principles of ocular pharmacology of anti-infective, anti-inflammatory, and immune modulating agents (eg, use of topical nonsteroidal and steroidal agents, cyclosporine, and anti-tumor necrosis factor agents).

12. Describe the differential diagnosis, evaluation, and management of Thygeson superficial punctate keratopathy.
13. Describe more complex differential diagnosis of red eye (eg, autoimmune and inflammatory disorders causing scleritis, episcleritis, conjunctivitis, orbital cellulitis).

14. Describe key features of trachoma, including epidemiology, clinical features, staging, and its complications (eg, cicatization), prevention (eg, facial hygiene), and topical and systemic antibiotic treatment (especially in hyperendemic regions), and surgery (eg, tarsal rotation).

15. Describe differential diagnosis, evaluation, and treatment of interstitial keratitis (eg, syphilis, viral diseases, noninfectious, immunologic, inflammation).

16. Describe the differential diagnosis and the external manifestations of more complex anterior segment inflammation (eg, acute and chronic iritis with and without systemic disease).

17. Recognize, evaluate, and treat the ocular complications of severe diseases, such as chronic exposure keratopathy, contact dermatitis, and rosacea.

18. Describe the clinical features, pathology, evaluation, and treatment of ocular cicatricial pemphigoid and Stevens-Johnson syndrome.

19. Describe the classification, pathology, indications for surgery, and prognosis of common eyelid abnormalities (eg, blepharoptosis, trichiasis, distichiasis, essential blepharospasm, entropion, ectropion) and understand their relationship to secondary diseases of the cornea and conjunctiva (eg, exposure keratopathy).

20. Recognize and treat foreign body, animal, and plant substance injuries and understand the risk of injury with organic material.

21. 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).

22. Recognize and treat corneal lacerations (perforating and nonperforating).

23. Recognize and treat more complex hyphemas (eg, surgical indications, evacuation).

24. Recognize the anterior segment manifestations of systemic diseases (eg, Wilson disease) and pharmacologic side effects (eg, Amiodarone vortex keratopathy).

25. Recognize and treat common and uncommon benign and malignant lid lesions.
B. **Technical/Surgical Skills**

1. Perform more advanced techniques, including keratometry, keratoscopy, endothelial cell count and/or evaluation, specular microscopy, and pachymetry.

2. Perform stromal micropuncture.

3. Perform application of corneal glue.

4. Perform simple keratectomy and lamellar keratectomy.

5. Assist in more complex corneal surgery (eg, penetrating keratoplasty and lamellar keratoplasty).

6. Perform more complex and recurrent pterygium excision, including conjunctival grafting.

7. Perform more complex lid laceration repair.

8. Perform more complex corneal laceration repair (eg, stellate perforating laceration).

9. Perform and interpret more complex stains of the cornea and conjunctiva (eg, calcofluor white, acid fast).

10. Repair simple lacerations of the lacrimal drainage apparatus (eg, perform intubations and primary closure).

11. Treat hyphema and microhyphema with associated increased intraocular pressure and/or blood staining (eg, surgical evacuation).

**Advanced Level Goals:**

A. **Cognitive Skills**

1. 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. Understand the most complex corneal optics and refraction (eg, postkeratoplasty) and their methods of treatment (eg, contact lenses, refractive surgery).

3. Describe the most complex and less common congenital abnormalities of the cornea,
sclera, and globe (eg, cornea plana, keratoglobus).

4. Recognize the less common corneal dystrophies and degenerations (eg, Meesman dystrophy, Reis-Buckler dystrophy, François syndrome, Schnyder crystalline dystrophy, congenital hereditary stromal dystrophy, congenital hereditary endothelial dystrophy, posterior polymorphous dystrophy) in addition to the more common dystrophies (eg, anterior membrane dystrophy, granular, lattice, and macular).

5. Recognize common and uncommon corneal and conjunctival neoplasms and degenerations (eg, spheroidal degeneration, carcinoma in situ).

6. Describe less common and rare ocular infections, and describe the differential diagnosis of the most complicated corneal and conjunctival infections (eg, amoebas, leishmaniasis, nematodes).

7. In nonendemic areas, describe the basic features of onchocerciasis.

8. In endemic areas, define the etiology, vector (eg, black fly), and incidence, diagnostic features (eg, microfilariae, keratitis, iritis), diagnosis (eg, skin snip test), course and prognosis, treatment (eg, ivermectin, nodulectomy), and prevention (eg, vector control, environmental and behavioral changes) of onchocerciasis.

9. 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).

10. Describe the most complex differential diagnosis of red eye (eg, pemphigoid, pemphigus, Stevens-Johnson syndrome).

11. Describe the differential diagnosis and the external manifestations of the most complex or uncommon anterior segment inflammations (eg, syphilitic keratouveitis).

12. Diagnose and treat the most complex traumatic and toxic injuries to the anterior segment (eg, total lid avulsion, severe alkali burn).

13. Recognize and treat complex corneal lacerations (eg, lacerations extending beyond the limbus, uveal involvement).

14. Diagnose and treat the most severe corneal exposure cases (eg, conjunctival flap).

15. Describe the indications for ocular surface transplantation, including conjunctival
autograft/flap, amniotic membrane transplantation, and limbal stem cell transplantation.

16. Describe the surgical indications (eg, Fuchs dystrophy, aphakic/pseudophakic bullous keratopathy, keratoconus), surgical techniques, and recognition and management of postoperative complications (especially immunologically-mediated rejection) of corneal transplantation (eg, penetrating, lamellar).

B. Technical/Surgical Skills

1. Perform and interpret the most advanced corneal techniques (eg, endothelial microscopy, computerized corneal topography and tomography, anterior segment ocular coherence tomography).

2. Perform a thin conjunctival flap (eg, Gunderson flap).

3. Perform specialized and complicated fitting of contact lenses (eg, postkeratoplasty, advanced keratoconus).

4. Perform more complex corneal surgery (eg, penetrating or lamellar keratoplasty such as ALTK, DALK and DSAEK, keratorefractive procedures, and phototherapeutic keratectomy), and understand the postoperative management including postkeratoplasty astigmatism management and graft rejection.

5. Perform other complex conjunctival surgery (eg, autograft, stem cell transplant).

6. Manage and treat more complex neoplasms of the conjunctiva (eg, carcinoma, melanoma).

Contact Lenses

Basic Level Goals:

A. Cognitive Skills

1. List advantages and disadvantages of contact lens (CL) wear.

2. List indications and contraindications for CL wear.

3. List medical indications for CL wear.

4. Describe a systematic and comprehensive ophthalmic examination oriented for CL
fitting, including complex and challenging cases.

5. Describe the various CL indications and options for each contact lens type (eg, soft CL [SCL], rigid gas permeable [RGP] CL, toric CL, multifocal CL, scleral CL).

6. Describe how to decide which CL categories (eg, SCL, RGP CL, hybrid CL, and subgroups within each category (eg, sphere, toric, bifocal, frequent planned replacement) are best suited for a particular patient.

7. Describe how to convey the basic CL parameters for SCL and RGP CL:
   a. Base curve
   b. Diameter refractive power
   c. Lens materials
      i. Center thickness
      ii. Peripheral curvature

8. Explain the concept and clinical relevance of oxygen permeability (Dk) and oxygen transmissibility (Dk/center thickness).

9. Describe various materials used in the manufacture of CL.

10. Explain the optics of SCL and RGP CL:
    a. Base curve changes
    b. Lacrimal lens
    c. Vertex distance
    d. Optic zone.

11. Recognize the importance of obtaining central keratometry in CL fitting of patients without complex needs, and explain the conversion between radians and diopters.

12. Identify different methods of obtaining central keratometry readings (eg, manual keratometry, computerized corneal topography).

13. Explain the importance of using diagnostic staining agents (eg, fluorescein, lissamine
green, rose bengal) to assess corneal and conjunctival staining patterns.

14. Describe basic tests to assess the tear film properties (eg, Schirmer test, tear break-up time, phenol red thread tear test, meibomian gland assessment).

15. Describe conversion of a spectacle prescription (Rx) to a CL Rx, including method of converting from plus to minus cylinder and vertex distance calculations.

16. Describe basic steps for SCL fitting.

17. Identify the main characteristics to be present in a CL prescription (eye designation, brand identification, base curve, diameter, and refractive power).

18. Describe CL care guidelines to be given to the patient related to insertion, removal, and disinfection of CL.

19. Describe risk factors for CL-related complications (eg, overnight wear, nonpreserved saline solution usage).

20. Describe treatment of CL-related complications (eg, tight lens syndrome, overwear syndrome, giant papillary conjunctivitis, infectious keratitis).

B. Technical/Surgical Skills

1. Perform a basic CL history.

2. Perform all the steps of a basic clinical examination oriented for CL fitting (ie, refraction, keratometry, visual acuity assessment).

3. Perform a routine comprehensive slit-lamp examination of the anterior segment as applied to CL fitting.


5. Perform the techniques of retinoscopy, refraction, and over-refraction in the routine CL patient.

6. Perform central keratometry.

7. Discuss with the patient the most appropriate choice for their particular clinical case.

8. Perform initial SCL fitting, evaluation of fit (loose CL versus tight CL), and over-
9. Insert and remove a trial SCL.

10. Instruct patients regarding safe CL insertion and removal, CL wearing schedule, lens care regimens, CL disinfection care, indications, contraindications, and possible complications.

11. Work effectively within a medical care team.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Explain applied anatomy and physiology (eg, corneal metabolism and temperature, oxygen consumption, stromal acidosis, tear osmolarity, tissue fragility, cell apoptosis, corneal sensitivity, closed eyelid-related ocular surface repercussions).

2. Recognize signs and symptoms of CL intolerance and overwear.

3. Explain the importance of assessing tear film and ocular surface condition with more complex auxiliary tests in certain CL fitting situations (eg, tear film osmolarity and biochemical composition, impression cytology).

4. Identify CL fitting situations requiring corneal topography (eg, computerized/Placido rings).

5. Explain the rationale underlying different topography profiles and how these relate to the manifest refraction.

6. Summarize and analyze topography maps.

7. Explain physical properties of CL materials:
   a. International Organization for Standardization (ISO) classification

8. Explain advantages and disadvantages of SCL materials.

9. Explain advantages and disadvantages of RGP CL materials.

10. Explain RGP/SCL geometry relation with corneal geometry (ie, lacrimal meniscus, refraction, and ocular surface implications).
11. Explain main principles to fit RGP CL (eg, first trial CL choice, fluorescein patterns, alignment, movement, wearing and replacement schedule, fitting motivation, and follow up).

12. Explain main principles to fit toric SCL:
   a. Stabilization
      i. LARS rule (ie, Left Add, Right Subtract)
      ii. Movement
      iii. Rotation
      iv. Possible refitting needs


14. Explain when CL refitting is indicated and perform refitting when needed.

15. Recognize signs and symptoms of a tight, optimal, and loose CL fitting.

16. Explain advantages and disadvantages of different wearing schedules (eg, conventional, frequent planned replacement, flexible, daily).

17. Describe ocular impact and physiological needs regarding different CL wearing schedules.

18. Identify and describe CL requirements for materials needed for extended/flexible CL wearing.

19. Explain patient and CL selection and fitting techniques as applied to fit presbyopia.

20. Explain how to keep a CL fitting trial set (ie, CL, equipment, and disinfection care).

21. Describe and evaluate different CL care systems.

22. Explain the clinical importance of CL environment (ie, CL patient surrounding, ocular surface, and storage case).

**B. Technical Skills**

1. Perform a CL history in patients requiring more complex CL fitting (eg, subclinical
ectatic corneal disorders such as keratoconus and pellucid marginal degeneration, regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

2. Perform a clinical examination, including retinoscopy and refraction techniques to verify and inspect CL in patients requiring more complex CL fitting (eg, subclinical ectatic corneal disorders such as keratoconus and pellucid marginal degeneration, regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

3. Indicate more complex additional auxiliary tests (eg, computer-based corneal topography, tear film osmolarity, impression cytology) in patients requiring more complex CL fitting (eg, subclinical ectatic corneal disorders such as keratoconus, pellucid marginal degeneration, regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

4. Perform RGP CL fitting (spherical).

5. Perform SCL toric fitting.

6. Perform presbyopia CL fitting.

7. Perform appropriate CL selection and material or parameters modification in CL refit.

8. Perform CL verification for visual acuity, fitting, and comfort in patients requiring more complex CL fitting.

9. Educate patients regarding CL-related complications.

10. Diagnose, manage, and treat CL-related complications.

11. Perform the skills needed for long-term management and follow up of CL patients.

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe the various options for SCL, RPG CL, and hybrid CL fitting in advanced ectatic corneal disorders such as keratoconus and pellucid marginal degeneration, including post-intracorneal ring segment implantation cases.
2. Describe the various options for SCL and RPG CL fitting in postkeratoplasty cases.

3. Describe the various options for SCL and RPG CL fitting in complex post-refractive surgery, including corneal ectasia.

4. Describe CL fitting in special clinical situations such as severe dry eye, glaucoma, diabetes, allergy, pregnancy, strabismus, sports practice, adverse environmental and occupational conditions.

5. Describe indications, fitting techniques, and long-term management of CL wear for children and adolescents.

6. Describe CL options and most complex fitting techniques for medical CL indications such as aphakia, albinism, recurrent corneal erosions, neurotrophic keratitis, corneal scarring, aniridia, and prosthetic cosmosis.

7. Identify indications for scleral CL fitting.

8. Explain reverse geometry RGP CL for post-graft or post-refractive surgery cases.

9. Synthesize the concept underlying orthokeratology.

10. List the indications for therapeutic CL.

11. Describe material selection, physiological implications, mechanisms of action, and adjuvant topical treatment associated with therapeutic CL.

12. Describe the various possibilities of fitting with soft and hard therapeutic CL.

13. Explain the importance of appreciating visual acuity, fit, and comfort in therapeutic CL.

14. Describe the differences among CL material choices especially suited for more complex cases and its clinical correlation.

15. Explain the influence of both systemic and topical medication on CL fitting and tolerance.

16. Describe the methods of modifying a CL to improve comfort, vision, or physiological response.

17. Evaluate CL-induced complications, and describe treatment strategies for their
management, in particular acanthamoeba and fungi infections.

18. Appraise clinical situations requiring additional complementary examinations in CL fitting and follow up (eg, endothelial, confocal biomicroscopy, aberrometry).

19. Describe indications and methods for fitting front surface toric, back surface toric, and bitoric RGP CL.

B. Technical Skills

1. Perform an advanced CL history and examination.

2. Obtain a full ocular history and conduct necessary tests to perform a complex CL fitting examination (eg, postkeratoplasty, multiple surgeries, post-refractive surgery, corneal ectasia, advanced corneal ectatic disorders such as keratoconus and pellucid marginal degeneration, and active corneal and ocular surface disease).


4. Perform scleral CL fitting.

5. Perform refraction, retinoscopy, and over-refraction in complex cases.

6. Use advanced CL designs including reverse geometry.

7. Indicate the auxiliary CL instruments in patients with complex needs (eg, computerized topography, fluorescein patterns, diagnostic lenses).

8. Interpret and interpret topography in complex CL fittings.

9. Perform and analyze aberrometry and endothelial/confocal biomicroscopy.

10. Indicate CL modification and refitting in complex cases, when needed.

11. Select the appropriate CL in complex clinical cases (eg, postkeratoplasty, multiple surgeries, post-refractive surgery, corneal ectasia, advanced ectatic corneal disorders such as keratoconus, pellucid marginal degeneration, and active corneal and ocular surface disease).

12. Perform therapeutic CL fitting and follow up.

13. Diagnose and treat CL-induced complications, both infectious and noninfectious
14. (eg, sterile infiltrates, corneal neovascularization, corneal permanent staining, giant papillary conjunctivitis).

15. Develop an educational skill set to effectively educate rotating students and residents about CL topics.

External Diseases

*Very Advanced Level Goals:*

Fellowship training requires more in-depth education about the pathophysiology and management than can usually be obtained in residency training in ophthalmology. Fellowships include a continuous period of intense and focused training in developing and maintaining knowledge, skills, scholarship, and professionalism. A fellow should be knowledgeable and proficient in all the activities listed for residency training. Subspecialty fellowship training should include a more in-depth exposure and understanding of the diagnosis and medical management of diseases of the eyelids, conjunctiva, cornea/sclera, and anterior ocular segment, as well as recognition and treatment of posterior segment disease that may affect the anterior segment. Subspecialty fellowship training should include hands-on training covering surgery of the conjunctiva, cornea/sclera, anterior segment, lens, and anterior vitreous, with special emphasis on corneal transplantation and related procedures. The fellow should be exposed to opportunities to develop research skills. A specific block of time may be set aside for clinical or laboratory research.

A. *Cognitive Skills*

1. Recognize acute and chronic blepharitis, including both infectious and noninfectious etiologies, with emphasis on microbial blepharitis, meibomian gland dysfunction, and rosacea.

2. Recognize acute and chronic conjunctivitis, neonatal conjunctivitis, chlamydial disease, adenoviral conjunctivitis, allergic conjunctivitis, and bacterial conjunctivitis.

3. Recognize acute and chronic infectious keratitis including bacterial, viral, fungal, and parasitic, with emphasis on herpes simplex, herpes zoster, adenovirus, acanthamoeba, and contact lens-associated problems.

4. Recognize noninfectious keratitis including marginal keratitis, central ulcerative
keratitis, epitheliopathy, endothelialitis, and interstitial keratitis.

5. Recognize anterior segment anomalies, including various anomalies associated with specific genetic abnormalities, corneal dystrophies, and corneal degenerations.

6. Recognize autoimmune and immunologic diseases of the anterior segment including allergy, corneal graft rejection, and cicatrizng conjunctivitis.

7. Recognize and be familiar with oral and topical immunosuppression and anti-allergy medications.

8. Describe fundamentals of anterior segment anatomy, chemistry, physiology, and wound healing including tear formation and function, corneal topography/tomography, endothelial cell function, and maintenance of corneal clarity.

9. Understand principles of anterior segment pharmacology including antimicrobial, anti-inflammatory, ocular hypotensive and immunosuppressive agents, with emphasis on bioavailability, mechanism of actions, relative efficacy, safety, and potential complications.

10. Demonstrate fundamental knowledge of contact lens physiology, design and materials, and complications for both cosmetic and therapeutic use.

11. Develop proficiency in performing diagnostic techniques including biomicroscopy, specular microscopy, corneal topography/tomography, vital stains of the ocular surface, corneal biopsy techniques and interpretation, and corneal pachymetry.

12. Develop proficiency in medical and surgical management of corneal thinning and perforation, including techniques of pharmacological manipulation; and office procedures, such as application of tissue glue and therapeutic contact lenses.

13. Demonstrate a detailed understanding of cornea and conjunctival pathology results and interpretation of ocular cultures.

14. Complete an eye-banking curriculum, including a review of specific eye banking functions (recovery, processing, storage, evaluation, and distribution of tissue), donor eligibility, and donor selection.

15. Demonstrate skill in use of reference material, including electronic searching and retrieval of relevant articles, monographs, and abstracts.
B. Technical/Surgical Skills

1. Demonstrate skill in anterior segment surgery including eyelid, conjunctival, scleral, and corneal procedures, with emphasis on corneal protective procedures (eg, tarsorrhaphy), reconstruction of the ocular surface, surgical management of corneal erosions, and phototherapeutic keratectomy.

2. Demonstrate skill in penetrating and lamellar keratoplasty, with emphasis on patient selection, surgical technique, and postoperative care including recognition and management of graft rejection and endophthalmitis and advanced techniques for lamellar and penetrating keratoplasty, including full thickness and lamellar transplants and endothelial keratoplasty.

3. The fellow should receive instruction and develop surgical proficiency in both full-thickness penetrating keratoplasty and selective endothelial keratoplasty and lamellar keratoplasty. The faculty must participate as primary surgeon or assistant surgeon to the fellow in a sufficient number of surgical procedures to confirm the fellow’s surgical judgment and skill.

4. The fellow should actively participate in the postoperative management in the majority of grafts where they are part of the surgical team.

5. The fellow should have sufficient experience and demonstrate proficiency with other surgeries, including pterygium excision with graft, corneal and conjunctival biopsies, astigmatic keratotomies, and phototherapeutic keratectomy.

6. The fellow should participate in the surgery of more complex conditions, including extensive conjunctival reconstruction, amniotic membrane transplantation, ocular surface neoplasia, and limbal stem cell transplantation.

7. The fellow should have knowledge of different techniques of keratoprosthesis surgery.

8. The fellow should be familiar with the use of mitomycin (and/or other chemotherapeutic agents) in corneal and conjunctival surgeries and recognize the appropriate application and potential side effects.
Minimum number of diagnostic, therapeutic and surgical procedures for FAICO

### DIAGNOSTIC PROCEDURES

<table>
<thead>
<tr>
<th>Procedure</th>
<th>NUMBER</th>
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<tbody>
<tr>
<td><strong>Basic</strong></td>
<td></td>
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<tr>
<td>Keratometry</td>
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<td>Topography</td>
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<tr>
<td>Corneal Scrapping</td>
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<tr>
<td>Pachymetry</td>
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<tr>
<td>Schirmer's Test</td>
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<td>TBUT</td>
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<tr>
<td>Interpreting microbiological specimens</td>
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<tr>
<td>Interpreting pathology specimens</td>
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<tr>
<td><strong>Advanced</strong></td>
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<tr>
<td>Video Tomography/Anterior segment imaging (Pentacam, Orbscan, AS OCT)</td>
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<tr>
<td>Specular microscopy</td>
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<tr>
<td>Confocal microscopy</td>
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### THERAPEUTIC PROCEDURES

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<tr>
<td>Therapeutic debridement</td>
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<td>Stromal micropuncture</td>
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<tr>
<td>Contact lens fitting</td>
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<td>Subconjunctival/Supratarsal injection</td>
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<tr>
<td><strong>Advanced</strong></td>
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<tr>
<td>RGP/RoseK lens/Hybrid lens fitting</td>
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<tr>
<td>BCL with glue application</td>
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<tr>
<td>Punctal plugs insertion</td>
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<td>----------------------------------------------------------</td>
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<tr>
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<td>Primary Pterygium with CAG Glue/Suture/Fibrin</td>
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<td>Optical keratoplasty</td>
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<tr>
<td>Corneal tear repair</td>
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<td>Corneal collagen cross-linking</td>
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<td>Deep corneal foreign body removal</td>
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<td>Scrapping for corneal degenerations</td>
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<td>Excision biopsy</td>
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<td><strong>Advanced</strong></td>
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<td>DSAEK</td>
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<td>PKP with IOL</td>
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<tr>
<td>Limbal stem cell transplant</td>
<td>1</td>
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<tr>
<td>Keratoprosthesis</td>
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</table>
The minimum facilities including equipment needed to be accredited for fellowship in the subspecialty.

The minimum facilities required for cornea/external disease fellowships:

**Clinical Components**

The goal of the fellowship is to produce an ophthalmologist with subspecialty skills that allow independent medical and surgical management of cornea and external disease.

1. **Independent examination cubicle in OPD – assisted by optometrist or ophthalmic assistant/nurse**

   This includes:

   Subjective and Objective refraction

   (Autorefractometer/autokeratometer and Noncontact tonometry reading)

   Slit lamp examination (may include anterior segment photography attachment in any form)

   Vital staining of the ocular surface, like Fluorescein, Rose Bengal and Lissamine Green

   Schirmer’s strip

   Corneal sensation

   Cornea scraping facility for Microbiology

   Foreign body removal facility

   Wash facility (in chemical burn)

   Hand wash facility

   Patency test facility
Suture (loose) removal facility

Minimum requirements to examine a child in OPD – like lid retractor, speculum, etc.

A binocular loupe and pencil torch for examination of a child.

Access to Contact Lens services (Bandage CL, RGP and Soft Lenses)

2. **Investigative tools in OPD**

   Microbiology microscope or access to it (to learn and interpret)

   Minimum smear staining facility (Gram/Gimsa) and KOH mount OR access to them

   (Also for impression cytology)

   Keratometer (Auto or Manual)

   Clinical Specular microscope – to learn and interpret

   Corneal Topography or Tomography

   Anterior Segment OCT

   Access to USG B scan

   Ultrasonic Pachymetry

3. **Pharmacy access: Access to prepare fortified antibiotics drops and antifungal medications.**

   Access to prepare other off level drops (MMC drops; PHMB; Chlorohexidine; EDTA solution etc.)

   Access for Vitamin A injection/tablets

4. **Emergency Services:**

   Facility to manage Emergency anterior segment problems – like, Mechanical injuries, Chemical burn, Thermal injuries and Acute Vitamin A deficiency (Keratomalacia).

   Management of Graft rejection in Emergency

   Managing other graft related complications
5. **Inpatient services/surgical facilities:**

Anterior Segment surgery including some basic lid surgeries:

- Tarsorrhaphy
- Electro-epilation (or other trichiasisSx)
- Basic Entropion/Ectropion surgery or access
- Evisceration
- Repair of penetrating injuries
- Removal of Deep Foreign Body
- Paracentesis – Hyphema
- Surgical Mx of Corneal erosion
- Intracameral/intrastromal injection
- Amniotic membrane grafting
- Buccal mucous membrane grafting
- Cyanoacrylate Glue and BCL
- Fibrin glue access
- Pterygium surgery with Conjunctival Grafting
- Other kinds of conjunctival surgeries including Biopsy
- Therapeutic PK
- Optical PK
- Lamellar procedures or should have facility to discuss about EK and ALK/DALK etc and their complications.

Access to Excimer Laser for PRK/PTK, etc.

Instruments:
Surgical Microscope with teaching Binocular or Video display

Video recording facility

Basics anterior segment instruments, including calipers, All kinds of trephine, Teflon blocks,

Basic Keratoplasty sets; Basic lamellar keratoplasty sets;

Instruments for evisceration, etc.

Access to Phaco machine/Cataract surgery sets

6. **To be involved in Eye Banking:**

To know the SOPs of nearest /in-house Eye Bank

To involve intissue recovery, processing, storage and evaluation

To interpret Eye Bank specular

To know about donor medical contraindications

7. **Wet Lab facility: for corneal suturing practice and different kinds of Keratoplasty in Human donor tissue/animal eyes (goat/pig).**

8. **Regular Class(two in a week in proper Projector display):**

In the form of Didactic Lectures, Case presentation and Journal Club

Statistical discussion facility (with other colleague)

Active involvement in a study project (at least one)

At least write one article for peer review journal

Grand round- if possible once in a month

9. **Attending conferences (at least two):**

Subspeciality meetings at National Level.

Attend specific Cornea related CMEs
State/Zonal Ophthalmic Conference
National Ophthalmic Conference.

10. **Access to Library, Journals (online), Internet Facility, Video viewing facility**

11. **Faculty as assistant surgeon**

The faculty should be able to give time as an assistant surgeon to the fellow insufficient number of surgical procedures to confirm the fellow’s surgical judgment and skill.

To gain further competency, the fellow should be the assistant surgeon for at least the minimum number of surgeries needed to demonstrate competence. Procedures should include:

i. Endothelial transplants; and

ii. Anterior lamellar transplants

The fellow should be the primary surgeon for at least the minimum number of surgeries needed to demonstrate competence. Procedures should include:

i. Therapeutic PK, Optical, Tectonic and Endothelial keratoplasty

ii. Anterior lamellar transplants (eg, deep anterior lamellar keratoplasty).

Actively participate in the postoperative management in the majority of grafts where he/she is part of the surgical team;

Have sufficient experience with other surgical procedures, including pterygium excision with graft, corneal and conjunctival biopsies, astigmatic keratotomies, and phototherapeutic keratectomy;

Maintain a surgical log of the type of case and clearly differentiate between being primary surgeon or assisting surgeon.

The faculty should make a determination that the fellow uses sound clinical judgment in making recommendations for surgery that is in patients’ best interests.

The faculty is responsible in determining that the fellow has sufficient surgical skill to practice independently.
12. Duty Hours and Conditions of Work

Duty hours and night and weekend call for fellows should reflect the concept of responsibility for patients and provide for adequate patient care.

Salary is left up to the discretion of the program (PG getting in the Final year in respective State).

It is strongly suggested that individual health benefits be included in any compensation package (even in the absence of salary).

A minimum of 15-days’ vacation and 1-week of approved conference time should be allotted.

A signed agreement between the fellowship director (or institution, practice, or department) and the fellow should be in place outlining the salary and benefits prior to any formal patient contact.

The fellow must be made aware of any restrictive covenant prior to accepting the fellowship.

13. Fellow Research Activities

The fellow should be exposed to opportunities to develop research skills. A specific block of time may be set aside for clinical or laboratory research.

When the research component exceeds 20% of the total time it may be necessary that the fellowship be extended.

14. EVALUATION

A. Program and Faculty Evaluation

The educational effectiveness of a program should be evaluated in a systematic manner. In particular, the quality of the curriculum, and the extent to which the educational goals have been met by fellows, should be assessed. Teaching faculty should be evaluated on a regular basis.

Faculty evaluation should include teaching ability and commitment, clinical knowledge, and academic activity, including publications and participation in national and/or international meetings.
There should be a formal mechanism by which fellows participate in this evaluation.

B. Fellow Evaluation

There should be regular evaluation of the fellow’s knowledge, skills, and overall performance, including the development of professional attitudes consistent with being a physician.

The program director, with the participation of members of the faculty, shall:

1. At least quarterly review the surgical log and evaluate the knowledge, skills, and professional growth of the fellow.

2. Communicate each evaluation to the fellow in a timely manner.

3. Advance each fellow to positions of higher responsibility on the basis of evidence of their progressive development of knowledge, skills, and professionalism.

4. Maintain a permanent record of evaluation for each fellow.

C. Program director should maintain a written, final evaluation for each fellow who completes the program. The evaluation should include a review of the fellow’s performance during the period of training and should verify that the fellow has demonstrated sufficient professional ability to practice competently and independently.
REFRACTIVE SURGERY
Refractive Surgery

Basic Level Goals:

A. Cognitive Skills

1. Describe simple types of refractive errors:
   a. Myopia
   b. Hyperopia
   c. Astigmatism
   d. Presbyopia

2. Describe basic optic principles, such as line of sight and Purkinje image.

3. Explain theories of accommodation.

4. Describe the basics of ophthalmic optics, including how the following affect the optics of the eye:
   a. Low and high order aberrations
   b. Corneal layers
   c. Shape of cornea
   d. Shape of lens

5. Describe basic refraction techniques using trial lenses or phoropter for basic refractive errors, including:
   a. Retinoscopy
   b. Modification and refinement of subjective refraction
   c. Cycloplegic retinoscopy and refraction
   d. Postcycloplegic refraction
6. Describe the optical principles of common refractive surgery diagnostic tools, including:
   a. Ultrasonic pachymetry
   b. Keratometer
   c. Lensometer
   d. Pupillometry
   e. Corneal topography
   f. Scheimpflug imaging and elevation maps
   g. Optical coherence tomography (OCT)

7. Describe the following topographic maps using different scales (ie, absolute, normalized, adjustable):
   a. Axial
   b. Instantaneous
   c. Refractive

8. Describe normal corneal topographic patterns, as well as topographic signs of keratoconus and ectasia.

9. Describe elevation topography maps and their importance in screening refractive surgery candidates.

10. Describe indications and limitations of corneal topography in refractive surgery.

11. List the mandatory diagnostic tests necessary for refractive surgery.

12. Describe the basics of laser biophysics and laser tissue interaction.

13. Describe the complications of high myopia, high hyperopia, and pathologies related to high astigmatism.

14. Define the clinical stages of keratoconus and forme fruste keratoconus using clinical and topographic tests.
15. Describe the milestones in refractive surgery development, including radial keratotomy, keratomileusis, and phakic intraocular lenses (IOLs).

16. List current refractive procedures, their mechanisms of action, indications, and limitations, including:
   a. Types of excimer laser procedures
   b. Phakic IOLs
   d. Implantation of intracorneal ring segments
   e. Corneal inlays
   f. Accommodative lenses

17. Describe the main IOL calculation formulas.

18. Describe the principles and different types (ie, linear, rotational, pendular) of mechanical microkeratomes, including their characteristics, indications, risks, and possible complications.

19. Describe the role of femtosecond technology in refractive surgery, including advantages and limitations of flap creation with a femtosecond laser.

20. Describe different techniques of keratoplasty and their relation with refractive surgery.

B. Technical/Surgical Skills

1. Perform objective and subjective refraction, including cross cylinder and Worth 4-dot test.

2. Diagnose refractive defects.

3. Use different prescription formulas.

4. Prescribe spectacles for at least 20 patients with simple refractive errors (eg, myopia, hyperopia, regular astigmatism).

5. Perform refraction on patients with extreme errors of refraction (eg, 5 patients with hyperopia over 8.0 D, and 5 patients with myopia above 20.0 D).
6. Use the lensometer to measure spectacle power.
7. Use the keratometer to make corneal measurements.
8. Use the ultrasonic pachymeter to measure corneal thickness.
9. Validate corneal topography maps, including elevation topography. Recognize signs of ectatic disorders and/or candidates at risk for an unsatisfactory refractive surgery outcome, and rule out poor-quality tests (eg, artifacts, alignment, and corneal exposure issues).
10. Interpret an aberration map and evaluate its significance in the refractive defect of a patient, as well as the need to treat or not.
11. Validate a manual refraction as a real refractive defect of a patient, comparing results with keratometers, aberrometers, and topography.
13. Recognize and unmask astigmatism from higher order aberrations, such as coma.
14. Demonstrate how informed consent should be explained.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Describe various types of refractive defects, and define the possible corrective solutions for each one.
2. Describe basic diagnostic tools used in refractive surgery, including topography, pachymetry, and biometry; and interpret results.
3. Describe more complex types of refractive errors, including postoperative refractive errors following cataract surgery, keratoplasty, refractive surgeries, ectatic conditions, and irregular astigmatism.
4. Explain basics of wavefront analysis, including ray tracing and dynamic skiascopy, and graphical representation of wavefront errors, including corneal and entire eye high-order aberration maps, point-spread function, and modulation-transfer function.
5. Describe the basics of Zernike polynomials and Fourier analysis.

6. Use different topographic maps and scales for different purposes (eg, screening, postoperative evaluation, detection of complications).

7. Describe the basics of measuring contrast sensitivity.

8. Describe laser-tissue interaction and explain Munnerlyn formula.

9. Describe corneal biomechanics, including biomechanical responses to keratorefractive surgery, corneal healing after excimer laser procedures, corneal hysteresis, and corneal resistance factor.

10. Define and diagnose post laser in-situ keratomileusis (LASIK) ectasia, and differentiate it from other conditions.

11. Describe the mechanism of action, indications, advantages, and potential complications of mitomycin C application in surface ablation.

12. Describe the affect of corneal crosslinking on the biomechanical properties of the cornea, including its indications and how it can be combined with other refractive surgery procedures.

B. Technical/Surgical Skills

1. Perform refraction techniques using trial lenses or phoropter for basic and more complex cases, including:
   a. Modification and refinement of subjective manifest refractive error
   b. Cycloplegic retinoscopy and refraction
   c. Postcycloplegic refraction
   d. Contact lens use
   e. Irregular astigmatism
   f. Postkeratoplasty
   g. Refractive surgery cases
2. Apply the basics of optics and optical principles of refraction and retinoscopy in the clinical setting, including higher order aberrations.

3. Gather accurate information essential for preoperative evaluation of patients seeking refractive surgery, including:
   a. Medical interview
      i. Patient expectation
      ii. Social history
      iii. Medical history
      iv. Pertinent ocular history
   b. Physical examination
      i. Uncorrected visual acuity
      ii. Manifest and cycloplegic visual acuity
      iii. Intraocular pressure
      iv. Slit-lamp examination
      v. Fundus examination

4. Diagnose and manage dry eye prior to surgery.

5. Use the keratometer to make corneal measurements in more complex patients (eg, prior corneal surgery or corneal disease), and correlate results with corneal topography maps, visual acuity, and quality of vision.

6. Use basic refractive instruments and techniques (eg, auto refractor, pachymetry, automated corneal topography, aberrometer, pupillometry, contact lens refraction, OCT, corneal hysteresis, and corneal resistance factor) in the clinical setting for refractive surgery patients.

7. Assist in developing patient care management plans for simple refractive errors (eg, myopia, hyperopia, regular astigmatism), and define the risks and benefits for each procedure.
8. Assist in various types of refractive surgery, including:
   a. Twenty surface ablation procedures
   b. Twenty LASIK procedures
   c. Ten intracorneal ring segment implantation procedures
   d. Ten phakic IOL surgeries

Advanced Level Goals:

A. Cognitive Skills

1. Describe and diagnose various types of refractive problems, including irregular astigmatism, and identify the best solution for each.

2. Describe the most complex types of refractive errors, including postoperative refractive errors, postkeratoplasty, and refractive surgery.

3. Describe the most advanced optics and optical principles of refraction and retinoscopy, including higher-order aberrations.

4. List the indications for and interpret preoperative and postoperative diagnostic testing, including:
   a. Corneal topography
   b. Wavefront analysis
   c. Pachymetry
   d. Calculation of stromal-bed thickness before and after LASIK
   e. Aspheric profile of ablation

5. Formulate informed diagnostic and therapeutic decisions based on patient information, current scientific evidence, clinical judgment, and patient expectations.

6. Describe accommodative and nonaccommodative treatments of presbyopia, including:
a. Monovision
b. Excimer laser correction
c. Conductive keratoplasty
d. Corneal inlays
e. Accommodating IOLs
f. Multifocal IOLs

7. Describe the advanced formulas for IOL calculation in extreme myopia, hyperopia, and after corneal refractive surgery.

8. Develop patient care management plans for more complex cases (eg, mixed and irregular astigmatism, irregular corneas, combined refractive surgery procedures).

9. Describe the basics of modulation transfer function (MTF), point speed function (PSF), and Strehl ratio as objective ways to measure quality of vision.

10. Describe the basics of topography-guided, wavefront-guided, and optimized ablations as compared to standard ablations.

B. Technical/Surgical Skills

1. Perform basic refractive surgery procedures, such as low myopia or low hyperopia with LASIK (microkeratome) and surface ablation (LASIK or photorefractive keratectomy [PRK]).

2. Perform the most advanced objective and subjective refraction techniques using trial lenses or the phoropter, including:
   a. Contact lens refraction for more complex refractive errors, including modification and refinement of subjective manifest refractive error
   b. Cycloplegic retinoscopy and refraction
   c. Postcycloplegic refraction
   d. Irregular astigmatism
e. Postkeratoplasty
f. Refractive surgery cases

3. Utilize the most advanced optics and optical principles for refraction and retinoscopy, including higher order aberrations.

4. Utilize the keratometer for detection of subtle or complex advanced corneal refractive errors.

5. Use and interpret results from more advanced refraction instruments and techniques (eg, corneal topography, pupillometry, aberrometry, Scheimpflug imaging, OCT).

6. Fit contact lenses in patients with irregular corneas, irregular astigmatism, and following refractive surgery.

7. Assist in advanced refractive surgeries, including topography-guided ablation, wavefront-guided ablation, and combined refractive surgeries.

8. Encourage patients to actively participate in their own care by providing disease and treatment information, and counsel patients on how to prevent postoperative injury.

9. Correct refractive error after surgeries, such as penetrating keratoplasty, deep anterior lamellar keratoplasty, and radial keratotomy.

**Very Advanced Level Goals:**

**A. Cognitive Skills**

1. Diagnose and treat difficult cases such as irregular astigmatism.

2. Identify and utilize the new technological advances in refractive surgery.

3. Formulate informed diagnostic and therapeutic decisions based on patient information, current scientific evidence, and clinical judgment:
   a. Use effective and appropriate clinical problem-solving skills
   b. Understand the limits of one’s knowledge and expertise
   c. Use consultants and referrals appropriately
4. Collect data, analyze refractive outcomes, and develop personal nomograms based on data.

5. Plan for retreatment of patients who had refractive surgery.

6. Develop refractive surgery management plans in the context of other conditions (eg, dry eyes, herpes, keratoconus, postkeratoplasty, glaucoma, retinal disease, amblyopia).


B. Technical/Surgical Skills

1. Prescribe and perform procedures essential for the scope of practice.

2. Screen patients for refractive surgery.

3. Develop and carry out patient care management plans.

4. Perform the following, if feasible:
   a. Twenty surface ablation procedures
   b. Ten microkeratome LASIK procedures
   c. Five femtosecond assisted LASIK procedures
   d. Two femtoassisted intracorneal ring segment implantation procedures
   e. Five corneal collagen cross-linking procedures

5. Perform under supervision 5 advanced refractive surgeries for complicated cases, including excimer laser enhancement procedures and topography-guided ablations for highly irregular corneas.
A. Minimum Number of Diagnostic and therapeutic Procedure required by the Candidate (Minimum numbers)

- List of Diagnostic Procedures:
  - Keratometry
  - Corneal topography/ Scheimpflug imaging
  - Aberrometry
  - Pachymetry
  - A Scan

- List of therapeutic procedures: (Wetlab training for the following desirable)
  - 20 Surface ablation
  - 10 Microkeratome Lasik
  - 5 Femto second assisted Lasik
  - 2 Femto second assisted ICRS
  - 5 Collagen Cross Linking Procedures
  - 10 Phakic IOLs (Assisted)

Perform under supervision 5 Advanced refractive surgeries for complicated cases including Excimer laser Enhancement procedures, topography guided ablations for highly irregular corneas & Refractive. Exposure to LRIs, Tonic and multifocal IOLs, management of post refractive surgery cataracts including biometry.
B. Minimum requirement for accreditation of Institutions for subspecialty fellowship

Equipments

- Slit Lamp biomicroscope
- Keratometer
- A-scan
- Corneal Topographer
- Ultrasound pachymetry
- Manual microkeratome with blades
- Excimer laser work station
- Femto second laser work station
- Device for Cross linking.
RETINA & VITREOUS
Basic Level Goals:

A. Cognitive Skills

1. Describe basic principles of retinal anatomy and physiology (ie, basic retinal and choroidal anatomy, retinal and choroidal physiology), with emphasis on macular anatomy and physiology.

2. Describe fundamentals of ancillary testing and demonstrate basic understanding of fluorescein angiography (angiographic phases), optical coherence tomography (OCT) (eg, macular anatomy, determine pathophysiology behind structural alterations).

3. Describe pathological anatomy, physiopathology, and clinical pictures of the most common vascular diseases:
   a. Diabetic retinopathy
   b. Central vein occlusion
   c. Branch vein occlusion
   d. Arterial occlusion
   e. Hypertensive retinopathy

4. Describe features of different types of retinal detachment (ie, rhegmatogenous, tractional, exudative).

5. Describe typical features of common macular diseases (eg, age-related macular degeneration [AMD], macular hole, macular pucker, central serous chorioretinopathy, chloroquine maculopathy, pseudophakic cystoid macular edema).

6. Describe and recognize features of traumatic pathologies, including:
   a. Commotio retinae
   b. Traumatic choroidal rupture
c:  Purtscher retinopathy

7.  Describe typical features of retinitis pigmentosa, main macular dystrophies (eg, Stargardt, Best, cone dystrophy), and other hereditary pathologies.

8.  Describe basic principles of laser photocoagulation (eg, laser response to change in power, duration, and spot size) and photodynamic therapy for retinal treatment.

9.  Describe basic principles, techniques, and safety of intravitreal injections.

10. Diagnose, evaluate, and treat (or refer) postoperative/posttraumatic endophthalmitis.

B.  Technical/Surgical Skills

1.  Perform direct ophthalmoscopy.

2.  Perform indirect ophthalmoscopy.

3.  Perform slit-lamp biomicroscopy with precorneal lenses, 3-mirror contact lenses, or other wide-field contact lenses.

4.  Diagnose the presence of common retinal disorders such as exudative AMD, diabetic retinopathy, cystoid macular edema, central serous retinopathy, based on results of fundus examination, fundus photographs, OCT, and fluorescein angiography.

Standard Level Goals:

A.  Cognitive Skills

1.  Describe more advanced retinal anatomy and physiology.

2.  Describe more advanced ancillary testing concepts of fluorescein and indocyanine green (ICG) angiography as applied to retinal vascular and other diseases (eg, indications, basic differential diagnosis based on angiographic patterns).

3.  Describe the fundamentals of retinal electrophysiology and basic ophthalmic echography.

4.  Diagnose, evaluate, treat (or refer) the following retinal vascular diseases:
a. Macular telangiectasia
b. Coats disease
c. Acquired retinal macroaneurysms
d. Ocular ischemic syndrome
e. Sickle cell retinopathy
f. Eales Disease

5. Describe the findings of major studies in vascular retinal diseases, including the following:

a. Diabetic retinopathy
   i. Early Treatment Diabetic Retinopathy Study (ETDRS)
   ii. Diabetes Control and Complications Trial (DCCT)
   iii. United Kingdom Prospective Diabetes Study (UKPDS)
   iv. Diabetic Retinopathy Clinical Research Network (DRCRnet) Trials

b. Central vein occlusion
   i. Central Vein Occlusion Study (CVOS)
   ii. Standard Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE)
   iii. Global Evaluation of implaNtable dExamethasone in retinal
        Vein occlusion with macular edemA (GENEVA) Study Group
   iv. Central Retinal Vein Occlusion (CRUISE) Study

c. Branch vein occlusion
   i. Branch Vein Occlusion Study (BVOS)
   ii. Standard Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE)
   iii. GENEVA Study Group
iv. BRAnch Retinal Vein Occlusion (BRAVO) Trial
d. Retinopathy of prematurity
   i. Cryotherapy for Retinopathy of Prematurity (CRYO-ROP)
   ii. Early Treatment for Retinopathy of Prematurity (ETROP)

6. Describe the fundamentals of, evaluate, and treat (or refer) peripheral retinal diseases and vitreous pathologies (eg, vitreous hemorrhage, posterior vitreous detachment, retinal tears, giant retinal tears, lattice degeneration with atrophic holes).

7. Describe the techniques for retinal detachment repair, including indications, mechanics, instruments, basic techniques, and surgical adjuvants, including heavy liquids, expandable gases, and silicone oil for the following:
   a. Pneumatic retinopexy
   b. Scleral buckling
   c. Vitrectomy

8. Describe and recognize typical features of less common macular diseases:
   a. Myopic maculopathy
   b. Serous retinal detachment secondary to optic disc pit
   c. Ocular histoplasmosis syndrome
   d. Phenothiazine/tamoxifen toxicity

9. Diagnose, evaluate, treat, and classify open and closed globe trauma (eg, Birmingham Eye Trauma Terminology System).

10. Describe, evaluate, and treat (or refer) postoperative/posttraumatic choroidal detachments and sympathetic ophthalmia.

11. Describe, recognize, and evaluate hereditary pathologies, such as juvenile retinoschisis and choroidal dystrophies (eg, choroideremia, gyrate atrophy).

12. Describe the indications/complications for and perform basic laser treatment for diabetic retinopathy (eg, panretinal photocoagulation, macular grid).
B. Technical/Surgical Skills

1. Perform indirect ophthalmoscopy with scleral indentation.

2. Perform ophthalmoscopic examination with contact lenses, including panfunduscopie lenses.

3. Interpret fluorescein and indocyanine green (ICG) angiography and correlate findings with differential diagnosis.

4. Diagnose the presence of pigment granules in the anterior vitreous (ie, Shafer sign) during a retinal detachment or retinal break.

5. Describe the indications for and interpret retinal imaging technology (eg, OCT, retinal thickness analysis).

6. Perform posterior segment photocoagulation.


8. Perform peripheral scatter photocoagulation (panretinal).

9. Perform laser retinopexy (demarcation) for isolated retinal breaks.

10. Describe the indications for and interpret basic electrophysiological tests (eg, electroretinogram [ERG], electrooculogram [EOG], visual evoked potential [VEP], dark adaptation).

11. Interpret basic echographic patterns (eg, rhegmatogenous retinal detachment, tractional retinal detachment, posterior vitreous detachment, choroidal detachment, intraocular foreign body).

12. Perform fundus drawings of the retina, showing vitreoretinal relationships and findings.

13. Perform (or assist during) cryotherapy of retinal holes and other pathology.

14. Describe indications, techniques, and complications of pars plana vitrectomy and scleral buckling.

15. Perform (or assist during) vitreous tap and intravitreal antibiotic injections for the treatment of endophthalmitis.

17. Perform intravitreal injection of anti-vascular endothelial growth factor (VEGF) drugs for the treatment of AMD.

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Apply into clinical practice the most advanced knowledge of retinal anatomy and physiology (eg, surgical anatomy).

2. Apply into clinical practice the most advanced ancillary testing concepts of fluorescein/ICG angiography in complex retinal vascular disease and other vascular diseases.

3. Describe and apply retinal electrophysiology.

4. Evaluate, treat, or refer the most complex forms of retinal vascular diseases:
   a. Combined arterial and venous obstructions
   b. Advanced diabetic retinopathy
   c. Advanced hypertensive retinopathy
   d. Peripheral retinal vascular occlusive disease

5. Describe the findings of major studies in age-related macular degeneration:
   a. Treatment of Age-Related Macular Degeneration with Photodynamic Therapy Study (TAP)
   b. Verteporfin in Photodynamic Therapy Study (VIP)
   c. Minimally Classic/Occult Trial of the Anti-Vascular Endothelial Growth Factor (VEGF) Antibody Ranibizumab in the Treatment of Neovascular AMD (MARINA)
   d. Anti-VEGF Antibody for the Treatment of Predominantly Classic Choroidal...
Neovascularisation in AMD (ANCHOR)
e. The Comparisons of Age-Related Macular Degeneration Treatments Trials (CATT)

6. Evaluate and diagnose complex cases of retinal detachment (eg, acute retinal necrosis, proliferative vitreoretinopathy).

7. Diagnose and classify retinopathy of prematurity.

8. Diagnose and manage (or refer) complex trauma cases (eg, chorioretinitis sclopetaria, intraocular foreign body, shaken baby syndrome).


10. Describe the treatment algorithm for each specific retinal condition, with special emphasis on pros and cons.

B. Technical/Surgical Skills

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

2. Perform ophthalmoscopic examination with panfunduscopic or other lenses in complex retinal conditions (eg, giant retinal tears, proliferative vitreoretinopathy).

3. Interpret and apply in clinical practice the results of fluorescein and ICG angiography and OCT in complex retinal or choroidal pathology.

4. 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 (panretinal)
   c. Laser retinopexy (demarcation) of large or multiple breaks; cryotherapy

5. Interpret and apply in clinical practice electrophysiology (eg, ERG, EOG, VEP, dark adaptation) in more complicated retinal pathology.
6. Interpret and apply in clinical practice ocular imaging techniques (eg, B-scan echography) in more complex cases (eg, choroidal osteoma).

7. Perform detailed 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. Perform laser therapy or cryotherapy of retinal holes and other more complex retinal pathologies.

9. Participate during scleral buckling and pars plana vitrectomy surgeries.

**Very Advanced Level Goals:**

Subspecialty training level should require a greater understanding of the cognitive skills outlined in the previous levels. It should include an intensive hands-on training covering both laser and surgical treatment of the retina.

The trainee should be able to independently manage current medical treatment for vitreoretinal diseases and to discuss recent discoveries and possible future treatments for these disorders.

**A. Cognitive Skills**

1. Diagnose, evaluate, treat (or refer) the most complex forms of retinal vascular diseases and diagnose/manage risk factors (eg, blood dyscrasia) and systemic complications.

2. Diagnose, evaluate, and treat inherited, congenital, and acquired macular diseases.

3. Compare the current therapeutic retinal treatment strategies and be able to discuss the future improvements of the therapeutic armamentarium.

4. Evaluate and treat traumatic injuries to the retina, including complex cases such as intraocular foreign body with rhegmatogenous retinal detachment and traumatic macular holes, and be able to manage complications to the other ocular structures.

5. Diagnose, evaluate, and understand the genetic alterations and the possible applications of gene therapy for hereditary diseases.
6. Develop surgical proficiency in different surgical techniques for management of retinal detachment, including complex cases (eg, combined rhegmatogenous/ tractional retinal detachments).

B. Technical/Surgical Skills

1. Perform posterior photocoagulation in complicated retinal cases:
   a. Retinal breaks with vitreous hemorrhage
   b. Cases with intraocular tamponade (ie, gas, silicone oil)

2. Interpret and apply electrophysiology in clinical practice.

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

4. Perform detailed fundus drawings of the retina with vitreoretinal relationships in the most complex retinal cases (eg, recurrent retinal detachment, retinoschisis with and without retinal detachment).

5. Perform laser therapy or cryotherapy of retinal holes and other more complex retinal pathology.

6. Perform scleral buckling in complex retinal detachment.

7. Perform advanced pars plana vitrectomy.
A. Minimum Number of Diagnostic and therapeutic Procedure required by the Candidate

A. Slit lamp biomicroscopy with 90D lens : 500
B. Indirect ophthalmoscopy with Indentation : 250
C. ( Diagnosis of variety of Vitreo-Retinal disorders + Screening of ROP )
D. FFA : 50
E. ICG : 15
F. OCT : 100
G. USG ( B Scan ) : 100
H. Laser photocoagulation : 50
I. ( Slit-Lamp Laser + LIO Laser + Endolaser + Laser for ROP)
J. Photodynamic Therapy ( PDT ) : 5
K. Cryopexy : 20
L. Subtenon Injections : 10
M. Intravitreal injections : 100
N. ( ForEndophthalmitis + Anti-VEGF + Implants )
O. Aqueous &Vitreous Tap/ Biopsy : 20
P. Scleral Buckling : 20
Q. Pars Plana Vitrectomy : 30
R. ( Including those for RD, Giant Tear, Vitreous Hemorrhage, Macular Hole, PVR surgery, Diabetic Vitrectomy, Gas Injection, Dislocated Nucleus / IOL, Secondary IOL fixation )
S. Management of Trauma Patients : 15-20
T. ( Including Repair of Lacerations, IOFB etc )
B. Minimum requirement for accreditation of Institutions for subspecialty fellowship

Hospital should have minimum of below listed facilities / equipment.

Slit lamp biomicroscopy with 90D lens : 500
Indirect ophthalmoscopy with Indentation : 250
( Diagnosis of variety of Vitreo-Retinal disorders + Screening of ROP )
FFA : 50
ICG : 15
OCT : 100
USG ( B Scan ) : 100
Laser photocoagulation : 50
( Slit-Lamp Laser + LIO Laser + Endolaser + Laser for ROP)
Photodynamic Therapy ( PDT ) : 5
Cryopexy : 20
Subtenon Injections : 10
Intravitreal injections : 100
( ForEndophthalmitis + Anti-VEGF + Implants )
Aqueous & Vitreous Tap/ Biopsy : 20
Scleral Buckling : 20
Pars Plana Vitrectomy : 30

( Including those for RD, Giant Tear, Vitreous Hemorrhage, Macular Hole, PVR surgery, Diabetic Vitrectomy, Gas Injection, Dislocated Nucleus / IOL, Secondary IOL fixation )

Management of Trauma Patients : 15-20

( Including Repair of Lacerations, IOFB etc )
COMPREHENSIVE OPHTHALMOLOGY
Comprehensive Ophthalmology

I. Lens and Cataract

General Educational Objectives

1. Describe the diagnosis, evaluation, and management of intraoperative and postoperative complications of cataract and intraocular lens (IOL) surgery, including planned extracapsular extraction (ECCE) and phacoemulsification.

2. Perform the complete preoperative ophthalmologic examination of cataract patients, including the consent for the procedure.

3. Formulate the differential diagnoses for cataract and related lens conditions.

4. Perform routine and advanced cataract surgery with IOL placement.

5. Perform the complete postoperative examinations following cataract surgery, including refraction.

6. Manage intraoperative and postoperative complications of cataract surgery.

7. Develop and exercise clinical and ethical decision making in cataract patients.

8. Develop good patient communication techniques regarding cataract surgery.

9. Work effectively as a member of the medical care team.

10. Develop teaching skills about cataract for instructing junior trainees and students.

Basic Level Goals:

A. Cognitive Skills

1. Describe the lens anatomy, physiology, and accommodation.

2. Identify the most common causes and types of cataract (eg, anterior polar, cortical, nuclear sclerotic, posterior subcapsular, posterior polar, mature lenses such as the
Morgagnian cataract).

3. Describe the relationship between the lens and systemic disease (eg, diabetes, myotonic dystrophy).

4. List ocular conditions that are associated with cataract (eg, uveitis, Wilson disease, ocular ischemia, ocular tumors, including treatment for tumors such as radiotherapy).

5. List systemic and topical medicine that can cause pathologic changes in the lens (eg, oral and topical corticosteroid use).

6. List the basic history and examination steps for preoperative cataract and posterior capsular opacification evaluation.

7. Identify and describe the principles and mechanisms of the following instruments in the evaluation of cataract:
   a. Lensometer
   b. Autorefractor
   c. Retinoscope
   d. Phoropter or loose lenses
   e. Keratometer
   f. Slit-lamp biomicroscope
   g. Glare and contrast testing devices
   h. Potential acuity meter

8. Describe the basics of IOL power estimation, including:
   a. Linear regression formulas (eg, Sanders-Retzlaff-Kraff [SRK] and SRKII)
   b. Theoretical eye model prediction formulas (eg, SRKT, Holladay, and Haigis)

9. Describe the methods to estimate axial eye length, including:
   a. Contact ultrasound
b. Immersion ultrasound
c. IOLMaster, LENSTAR, or equivalent, even if equipment is unavailable

10. List the steps of routine intracapsular cataract extraction (ICCE), ECCE, and phacoemulsification.

11. Define the elementary refraction techniques to obtain best-corrected vision prior to considering cataract extraction.

12. Describe the major etiologies of dislocated or subluxated lens (eg, pseudoexfoliation syndrome, trauma, Marfan syndrome, homocystinuria, Weill-Marchesani syndrome, syphilis).

13. Describe the following:
   a. Basic ophthalmic optics as related to cataract
   b. Types of refractive error in cataract
   c. Retinoscopy techniques for cataract
   d. Subjective refraction techniques for cataract patients

14. Describe methods to decrease postoperative infection, including presurgical preparation, intraoperative antibiotics, and postoperative antibiotic techniques.

15. Describe postoperative medications used for cataract surgery, including antibiotics, nonsteroidal anti-inflammatory drugs, and corticosteroid therapy.

16. Describe the risk factors for intraoperative floppy iris syndrome (IFIS) and intraoperative techniques to limit the risk of this syndrome (eg, alpha blockers, use of rings, hooks)

17. Describe the special considerations when dealing with a unilateral cataract (trauma, history of uveitis, history of topical steroid use, past surgeries)

B. Technical/Surgical Skills

1. Perform basic slit-lamp biomicroscopy, retinoscopy, and ophthalmoscopy.
2. Evaluate and classify common types of lens opacities.

3. Perform subjective refraction techniques and retinoscopy in patients with cataract.

4. Perform and document laser capsulotomy on routine cases of posterior capsule opacification.

5. Perform direct and indirect ophthalmoscopy prior to and following cataract surgery.

6. Perform the basic steps of cataract surgery (eg, incision, wound closure) in the practice lab, if available.

7. Assist with cataract surgery and perform patient preparation, sterile draping, and anesthesia.

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

9. Use the operating microscope for basic cataract surgery.

10. Perform some of the steps of cataract surgery under direct supervision, including any or all of the following:

   a. Wound construction

   b. Anterior capsulotomy/capsulorhexis

   c. Instillation and removal of viscoelastics

   d. Hydrodissection and hydrodelineation

   e. Extracapsular and phacoemulsification techniques

   f. Irrigation and aspiration

   g. Cortical cleanup

   h. IOL implantation (eg, anterior and posterior)

   i. Removal of viscoelastic

   j. Suturing of the wound
k. Wound hydration

**Standard Level Goals:**

**A. Cognitive Skills**

1. Describe the less common causes of lens abnormalities (e.g., spherophakia, lenticonus, ectopia lentis, coloboma).

2. Describe the preoperative evaluation of the cataract patient, including:
   a. Systemic diseases of interest or relevance to cataract surgery
   b. Systemic medication of relevance to cataract surgery (e.g., alpha 1 adrenergic blocking agent, blood thinning agents, corticosteroids)
   c. Relationship of external and corneal diseases of relevance to cataract and cataract surgery (e.g., lid abnormalities, dry eye)
   d. Management of uveitis prior to and following cataract surgery
   e. Management of glaucoma prior to and following cataract surgery, including options for postoperative intraocular pressure (IOP) control

3. Describe glare analysis testing for cataract surgery.

4. Describe the use of A-scan and B-scan contact and immersion ultrasonography and optical coherence techniques in cataract surgery to measure axial eye length.

5. Describe the instruments and techniques of cataract extraction, including extracapsular surgery and phacoemulsification.

6. Describe the important parameters of the phacoemulsification machine and how to alter them for particular conditions of surgery.

7. Describe the types, indications, and techniques of anesthesia for cataract surgery (e.g., topical, local, general).

8. Describe indications, techniques, and complications of surgical procedures, including: ECCE, ICCE, phacoemulsification, paracentesis, and IOL placement.
9. Describe the pathogenesis and strategies for prevention of posterior capsular opacification.

10. Describe history and techniques of basic IOL implantation.

11. Correlate the level of visual acuity with the lens or capsular opacities.

12. Describe the pathogenesis, clinical presentation, differential diagnosis, evaluation, clinical course, treatment, and outcome of the common complications of cataract and anterior segment surgery (eg, intraoperative floppy iris syndrome, corneal edema, IOP elevation, hyphema, endophthalmitis, toxic anterior segment syndrome (TASS), cystoid macular edema (CME), retinal detachment, IOL dislocation, lens-induced glaucoma, uveitis).

13. Describe the indications for, principles of, and techniques of yttrium aluminium garnet (YAG) laser capsulotomy, and understand the proper timing of YAG laser capsulotomy.

14. Describe advanced IOL power calculation (eg, after radial keratotomy [RK], myopic laser-assisted in situ keratomileusis [LASIK]/photorefractive keratectomy [PRK], hyperopic LASIK/PRK).

15. Describe the properties of different ophthalmic viscoelastic devices (OVDs) (eg, dispersive, cohesive, adaptive) and the advantages and disadvantages for certain phases of surgery.

16. Describe the fluid dynamics in phacoemulsification, including the difference between peristaltic and venture pump types.

17. Recognize and treat common postoperative complications of cataract surgery (eg, endophthalmitis, toxic anterior segment syndrome, elevated IOP, CME, wound leak, uveitis, capsular block syndrome).

18. Define the more complex indications for cataract surgery (eg, better view of posterior segment, lens-induced glaucoma).

19. Describe the techniques to manage a small pupil, including mechanical manipulation, management of iris membrane, iris hooks, viscoelastic, and phaco techniques.

20. Describe techniques to diagnose and operate on patients with posterior polar cataract.
21. Describe the preoperative preparations for surgery and special intraoperative considerations for patients with uveitis.

22. Describe techniques for prevention of capsular opacification and phimosis (before, during, after surgery), including the use of capsular tension rings and IOL factors.

B. Technical/Surgical Skills

1. Perform local injections of corticosteroids, antibiotics, and anesthetics, including retrobulbar and subtenons.

2. Perform extracapsular surgery in a practice setting (eg, animal or practice lab).

3. Practice surgery in the operating room under supervision, including mastery of the following skills:
   a. Wound construction
   b. Anterior capsulotomy/capsulorhexis
   c. Instillation and removal of viscoelastics
   d. Hydrodissection and hydrodelineation
   e. Extracapsular technique
   f. Beginning phacoemulsification techniques (eg, sculpting, divide and conquer, phaco chop)
   g. Irrigation and aspiration
   h. Cortical cleanup
   i. IOL implantation (eg, anterior and posterior, special IOLs)
   j. Wound suturing
   k. Wound hydration

4. Perform paracentesis of the anterior chamber.
5. Implement advanced applications of viscoelastics in surgery (eg, control of iris prolapse, elevation of dropped nucleus, viscodissection, aspiration of residual/retained viscoelastic, soft shell technique).

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe the principles, indications for, mechanics of, and performance of contact and immersion A-scan ultrasonography and calculation of IOL power.

2. Describe the performance of and describe the complications of more advanced anterior segment surgery (eg, pseudoexfoliation, small pupils, intraoperative floppy iris syndrome, mature cataract, hard nucleus, posttraumatic, zonular dehiscence, cataract surgery after pars plana vitrectomy, short eye, corneal endothelial diseases).

3. Describe the use of special devices for cataract surgery in complex situations such as specialized IOLs, capsular tension rings and segments, iris hooks, Malyugin ring, use of indocyanine green/trypan blue staining of the anterior capsule.

4. Describe IOL fixation options in the lack of capsular support for in the bag fixation (anterior chamber [AC] IOL, sulcus fixation +/- optic capture, iris fixation, scleral fixation).

5. Describe the indications for, techniques of, and complications of cataract extraction in the context of the subspecialty disciplines of the following:
   a. Glaucoma (eg, combined cataract and glaucoma procedures, glaucoma in cataractous eyes, cataract surgery in patients with prior glaucoma surgery)
   b. Retina (eg, cataract surgery in patients with scleral buckles or prior vitrectomy)
   c. Cornea (eg, cataract extraction in patients with corneal opacities) and the use of fiber optic for better visualization
   d. Ophthalmic plastic surgery (eg, ptosis following cataract surgery)
   e. Refractive surgery (eg, cataract surgery in eyes that have undergone refractive surgery)
6. Independently evaluate and establish a management plan for complications of cataract and IOL implant surgery (eg, posterior capsular tears, vitreous prolapse, intravitreal dislocation of cataractous fragments, corneal wound burn, expulsive hemorrhage, choroidal effusions, damage to the iris tissue).

7. List indications for and techniques of intracapsular surgery (eg, rare cases may require this procedure, or patients may have had the procedure performed previously).

8. Describe instrumentation and techniques used to implant foldable and nonfoldable IOLs.

9. Describe the evaluation and management of common and uncommon causes of postoperative endophthalmitis and TASS.

10. Describe the causes and indication for performing, repositioning, removal, or exchange of IOLs.

12. Describe the government and hospital regulations that apply to cataract surgery.

13. Describe the indication and option for astigmatism management during cataract surgery (eg, on axis incision, limbal relaxing incisions [LRI], opposite clear corneal incision [OCCI], toric IOL).

14. Describe the use of corneal topography and wavefront analysis to help select the best type of IOL for a patient especially following keratorefractive surgery.

15. Describe the option for presbyopic correction solutions during cataract surgery (eg, monovision, multifocal IOLs, accommodative IOLs, dual optic IOLs).

16. Describe the mechanisms of actions, indications, contraindications, advantages, and disadvantages of premium IOLs (eg, multifocal, accommodating, toric, aspheric, blue blocker, intraocular miniature telescope).

17. Describe evaluation and management of IOL complications (eg, intraoperative damage to IOL, postoperative IOL opacification, dislocation, sublocation).

18. Describe the advantages and disadvantages of the materials used for IOL fabrication (eg, poly-methylmethacrylate [PMMA], silicone, hydrophobic acrylic, hydrophilic acrylic).

19. Describe lens/IOL surgery solutions for myopia and hyperopia (eg, refractive lens
exchange, phakic IOLs).

**B. Technical/Surgical Skills**

1. Assist in the teaching and supervision of basic and standard level learners.

2. Perform phacoemulsification in a practice setting (eg, animal or practice lab) and then in the operating room, ideally 50-100 cases of a combination of phacoemulsification and ECCE, including mastery of the following skills:
   
   a. Wound construction  
   b. Anterior capsulotomy/capsulorhexis  
   c. Viscoelastics  
   d. Intracapsular, extracapsular, and phacoemulsification techniques (eg, sculpting, divide and conquer, stop and chop, phaco chop)  
   e. Instrumentation and techniques of irrigation and aspiration  
   f. IOL implantation (eg, anterior and posterior, foldable and nonfoldable)  
   g. IOL repositioning, removal, or exchange  

3. 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. Loss of anesthesia
h. Elevated intraocular pressure
i. Use of topical and systemic medications
j. Astigmatism
k. Postoperative refraction (simple and complex)
l. Corneal edema
m. Wound dehiscence
n. Hyphema
o. Residual cortex
p. Dropped nucleus
q. Uveitis
r. CME
s. Elevated intraocular pressure and glaucoma
t. Postoperative early and late intraocular infection
u. Corneal burn
v. Intraoperative floppy iris syndrome

II. Cornea, Contact Lens, Refractive Surgery and External Diseases

Basic Level Goals:

A. Cognitive Skills

1. 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. Understand the fundamentals of corneal optics and refraction (eg, astigmatism, keratoconus).
3. Describe congenital abnormalities of the cornea, sclera, and globe (e.g., Peter anomaly, microphthalmos, birth trauma, buphthalmos).

4. Describe characteristic corneal and conjunctival degenerations (e.g., pterygium, pinguecula, Salzmann nodular degeneration, senile plaques of the sclera).

5. Recognize the classic corneal dystrophies (e.g., map-dot-fingerprint dystrophy, lattice dystrophy, granular dystrophy, macular dystrophy, Fuchs dystrophy).

6. Describe the fundamentals of ocular microbiology and recognize corneal and conjunctival inflammations and infections (e.g., staphylococcal hypersensitivity, simple microbial keratitis, fungal corneal ulcers, trachoma, ophthalmia neonatorum, herpes zoster ophthalmicus, herpes simplex keratitis, adenovirus keratoconjunctivitis and conjunctivitis).

7. Describe the basic principles of ocular pharmacology of anti-infective, anti-inflammatory, and immune modulating agents (e.g., indications and contraindications for topical corticosteroids, nonsteroidal anti-inflammatory agents, and antibiotics).

8. Recognize and treat lid margin disease (e.g., staphylococcal blepharitis, meibomian gland dysfunction).

9. Describe the basic differential diagnosis of acute and chronic conjunctivitis or red eye (e.g., scleritis, episcleritis, conjunctivitis, orbital cellulitis, gonococcal and chlamydial conjunctivitis).

10. Recognize and treat pyogenic granuloma.

11. Recognize the basic presentations of ocular allergy (e.g., phlyctenules, seasonal hay fever, vernal conjunctivitis, allergic and atopic conjunctivitis, giant papillary conjunctivitis).

12. 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).

13. Describe the symptoms, signs, testing, and evaluation for dry eye (e.g., Schirmer test, tarsorrhaphy); and treatment for dry eye.

14. Describe the etiologies and treatment of superficial punctate keratopathy (e.g., dry
eye, Thygeson superficial punctate keratopathy, neurotrophic keratitis, blepharitis, toxicity, ultraviolet photo keratopathy, contact lens-related keratitis).

15. Recognize and describe the etiologies of hyphema and microhyphema.

16. Describe the basic mechanisms of traumatic and toxic injury to the anterior segment and treatment (eg, chemical and thermal burns, lid laceration, orbital fracture).

17. Recognize corneal lacerations (perforating and nonperforating), anterior segment trauma, corneal and conjunctival foreign bodies.

18. Describe the epidemiology, differential diagnosis, evaluation, and management of common benign and malignant lid lesions, including pigmented lesions of the conjunctiva and lid (eg, nevi, melanoma, primary acquired melanosis, ocular surface squamous neoplasia).

B. Technical/Surgical Skills

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

2. Administer topical anesthesia, as well as special topical stains of the cornea (eg, fluorescein dye and rose bengal).

3. Perform tests for dry eye (eg, Schirmer test, tear film breakup, and dye disappearance).

4. Perform punctal occlusion (temporary or permanent) or insert plugs.

5. Perform simple corneal sensation testing (eg, cotton-tipped swab).

6. Perform tonometry (eg, applanation, Tono-Pen, Schiøtz, pneumotonometry).

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

8. Interpret simple stains of the cornea and conjunctiva (eg, Gram stain, Giemsa stain).

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

10. Perform removal of a conjunctival or corneal foreign body (eg, rust ring).
11. Perform simple (nonrecurrent) pterygium excision (eg, with autologous conjunctival transplantation).


13. Perform an isolated corneal laceration repair (eg, linear laceration not extending to limbus, not involving uveal or intraocular structures).


15. Perform a lateral tarsorrhaphy.

16. Perform incision, drainage, and/or remove a primary chalazion/stye.

17. Perform a simple incisional or excisional biopsy of a lid lesion.

18. Perform irrigation of chemical burn to the eye.


**Standard Level Goals:**

_A. Cognitive Skills_

1. 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. Describe the more complex congenital abnormalities of the cornea, sclera, anterior segment and globe and their associated systemic manifestations (eg, Axenfeld, Rieger, and Peter anomalies, aniridia, hamartomas and choristomas).

3. Understand more complex corneal optics and refraction (eg, irregular astigmatism, keratoconus, anisometropia).

4. Correlate the concordance of the visual acuity with the density of media opacity (eg, cataract, corneal scars, edema), and evaluate the etiology of discordance between acuity and findings from examination of the media.

5. Recognize and treat less common corneal or conjunctival presentations of
degenerations and common conjunctival neoplasms (eg, inflamed, atypical, or recurrent pterygium, band keratopathy, benign and malignant tumors).

6. Describe the epidemiology, clinical features, pathology, evaluation, and treatment of peripheral corneal thinning disorders or ulceration (eg, Terrien marginal degeneration, Mooren ulcer, rheumatoid arthritis-related corneal melt, dellen).

7. Describe the epidemiology, differential diagnosis, evaluation, and management of vitamin A deficiency (eg, Bitot spot, dry eye, slowed dark adaptation) and neurotrophic corneal diseases.

8. Recognize and treat recurrent corneal erosions.

9. Recognize, evaluate, and treat chronic conjunctivitis (eg, chlamydia, trachoma, molluscum contagiosum, Parinaud oculoglandular syndrome, ocular rosacea).

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

11. Describe the more complex principles of ocular pharmacology of anti-infective, anti-inflammatory, and immune modulating agents (eg, use of topical nonsteroidal and steroidal agents, cyclosporine, and anti-tumor necrosis factor agents).

12. Describe the differential diagnosis, evaluation, and management of Thygeson superficial punctate keratopathy.

13. Describe more complex differential diagnosis of red eye (eg, autoimmune and inflammatory disorders causing scleritis, episcleritis, conjunctivitis, orbital cellulitis).

14. Describe key features of trachoma, including epidemiology, clinical features, staging, and its complications (eg, cicatrization), prevention (eg, facial hygiene), and topical and systemic antibiotic treatment (especially in hyperendemic regions), and surgery (eg, tarsal rotation).

15. Describe differential diagnosis, evaluation, and treatment of interstitial keratitis (eg, syphilis, viral diseases, noninfectious, immunologic, inflammation).

16. Describe the differential diagnosis and the external manifestations of more complex anterior segment inflammation (eg, acute and chronic iritis with and without systemic
Recognize, evaluate, and treat the ocular complications of severe diseases, such as chronic exposure keratopathy, contact dermatitis, and rosacea.

Describe the clinical features, pathology, evaluation, and treatment of ocular cicatricial pemphigoid and Stevens-Johnson syndrome.

Describe the classification, pathology, indications for surgery, and prognosis of common eyelid abnormalities (eg, blepharoptosis, trichiasis, distichiasis, essential blepharospasm, entropion, ectropion) and understand their relationship to secondary diseases of the cornea and conjunctiva (eg, exposure keratopathy).

Recognize and treat foreign body, animal, and plant substance injuries and understand the risk of injury with organic material.

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).

Recognize and treat corneal lacerations (perforating and nonperforating).

Recognize and treat more complex hyphemas (eg, surgical indications, evacuation).

Recognize the anterior segment manifestations of systemic diseases (eg, Wilson disease) and pharmacologic side effects (eg, amiodarone vortex keratopathy).

Recognize and treat common and uncommon benign and malignant lid lesions.

**B. Technical/Surgical Skills**

1. Perform more advanced techniques, including keratometry, keratoscopy, endothelial cell count and/or evaluation, specular microscopy, and pachymetry.

2. Perform stromal micropuncture.

3. Perform application of corneal glue.

4. Perform simple keratectomy and lamellar keratectomy.
5. Assist in more complex corneal surgery (eg, penetrating keratoplasty and lamellar keratoplasty).

6. Perform more complex and recurrent pterygium excision, including conjunctival grafting.

7. Perform more complex lid laceration repair.

8. Perform more complex corneal laceration repair (eg, stellate perforating laceration).

9. Perform and interpret more complex stains of the cornea and conjunctiva (eg, calcofluor white, acid fast).

10. Repair simple lacerations of the lacrimal drainage apparatus (eg, perform intubations and primary closure).

11. Treat hyphema and microhyphema with associated increased intraocular pressure and/or blood staining (eg, surgical evacuation).

**Advanced Level Goals:**

**A. Cognitive Skills**

1. 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. Understand the most complex corneal optics and refraction (eg, postkeratoplasty) and their methods of treatment (eg, contact lenses, refractive surgery).

3. Describe the most complex and less common congenital abnormalities of the cornea, sclera, and globe (eg, cornea plana, keratoglobus).

4. Recognize the less common corneal dystrophies and degenerations (eg, Meesman dystrophy, Reis-Buckler dystrophy, François syndrome, Schnyder crystalline dystrophy, congenital hereditary stromal dystrophy, congenital hereditary endothelial dystrophy, posterior polymorphous dystrophy) in addition to the more common dystrophies (eg, anterior membrane dystrophy, granular, lattice, and macular).
5. Recognize common and uncommon corneal and conjunctival neoplasms and degenerations (eg, spheroidal degeneration, carcinoma in situ).

6. Describe less common and rare ocular infections, and describe the differential diagnosis of the most complicated corneal and conjunctival infections (eg, amoebas, leishmaniasis, nematodes).

7. In nonendemic areas, describe the basic features of onchocerciasis.

8. In endemic areas, define the etiology, vector (eg, black fly), and incidence, diagnostic features (eg, microfilariae, keratitis, iritis), diagnosis (eg, skin snip test), course and prognosis, treatment (eg, ivermectin, nodulectomy), and prevention (eg, vector control, environmental and behavioral changes) of onchocerciasis.

9. 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).

10. Describe the most complex differential diagnosis of red eye (eg, pemphigoid, pemphigus, Stevens-Johnson syndrome).

11. Describe the differential diagnosis and the external manifestations of the most complex or uncommon anterior segment inflammations (eg, syphilitic keratouveitis).

12. Diagnose and treat the most complex traumatic and toxic injuries to the anterior segment (eg, total lid avulsion, severe alkali burn).

13. Recognize and treat complex corneal lacerations (eg, lacerations extending beyond the limbus, uveal involvement).

14. Diagnose and treat the most severe corneal exposure cases (eg, conjunctival flap).

15. Describe the indications for ocular surface transplantation, including conjunctival autograft/flap, amniotic membrane transplantation, and limbal stem cell transplantation.

16. Describe the surgical indications (eg, Fuchs dystrophy, aphakic/pseudophakic bullous keratopathy, keratoconus), surgical techniques, and recognition and management of postoperative complications (especially immunologically-mediated rejection) of corneal transplantation (eg, penetrating, lamellar).
B. Technical/Surgical Skills

1. Perform and interpret the most advanced corneal techniques (eg, endothelial microscopy, computerized corneal topography and tomography, anterior segment ocular coherence tomography).

2. Perform a thin conjunctival flap (eg, Gunderson flap).

3. Perform specialized and complicated fitting of contact lenses (eg, postkeratoplasty, advanced keratoconus).

4. Perform more complex corneal surgery (eg, penetrating or lamellar keratoplasty, keratorefractive procedures, and phototherapeutic keratectomy), and understand the postoperative management including postkeratoplasty astigmatism management and graft rejection.

5. Perform other complex conjunctival surgery (eg, autograft, stem cell transplant).

6. Manage and treat more complex neoplasms of the conjunctiva (eg, carcinoma, melanoma).

III. Contact Lenses

Basic Level Goals:

A. Cognitive Skills

1. List advantages and disadvantages of contact lens (CL) wear.

2. List indications and contraindications for CL wear.

3. List medical indications for CL wear.

4. Describe a systematic and comprehensive ophthalmic examination oriented for CL fitting, including complex and challenging cases.

5. Describe the various CL indications and options for each contact lens type (eg, soft CL [SCL], rigid gas permeable [RGP] CL, toric CL, multifocal CL, scleral CL).
6. Describe how to decide which CL categories (eg, SCL, RGP CL, hybrid CL, and subgroups within each category (eg, sphere, toric, bifocal, frequent planned replacement) are best suited for a particular patient.

7. Describe how to convey the basic CL parameters for SCL and RGP CL:
   a. Base curve
   b. Diameter refractive power
   c. Lens materials
      i. Center thickness
      ii. Peripheral curvature

8. Explain the concept and clinical relevance of oxygen permeability (Dk) and oxygen transmissibility (Dk/center thickness).

9. Describe various materials used in the manufacture of CL.

10. Explain the optics of SCL and RGP CL:
   a. Base curve changes
   b. Lacrimal lens
   c. Vertex distance
   d. Optic zone.

11. Recognize the importance of obtaining central keratometry in CL fitting of patients without complex needs, and explain the conversion between radians and diopters.

12. Identify different methods of obtaining central keratometry readings (eg, manual keratometry, computerized corneal topography).

13. Explain the importance of using diagnostic staining agents (eg, fluorescein, lissamine green, rose bengal) to assess corneal and conjunctival staining patterns.

14. Describe basic tests to assess the tear film properties (eg, Schirmer test, tear break-up time, phenol red thread tear test, meibomian gland assessment).
15. Describe conversion of a spectacle prescription (Rx) to a CL Rx, including method of converting from plus to minus cylinder and vertex distance calculations.

16. Describe basic steps for SCL fitting.

17. Identify the main characteristics to be present in a CL prescription (eye designation, brand identification, base curve, diameter, and refractive power).

18. Describe CL care guidelines to be given to the patient related to insertion, removal, and disinfection of CL.

19. Describe risk factors for CL-related complications (eg, overnight wear, nonpreserved saline solution usage).

20. Describe treatment of CL-related complications (eg, tight lens syndrome, overwear syndrome, giant papillary conjunctivitis, infectious keratitis).

B. Technical/Surgical Skills

1. Perform a basic CL history.

2. Perform all the steps of a basic clinical examination oriented for CL fitting (ie, refraction, keratometry, visual acuity assessment).

3. Perform a routine comprehensive slit-lamp examination of the anterior segment as applied to CL fitting.


5. Perform the techniques of retinoscopy, refraction, and over-refraction in the routine CL patient.

6. Perform central keratometry.

7. Discuss with the patient the most appropriate choice for their particular clinical case.

8. Perform initial SCL fitting, evaluation of fit (loose CL versus tight CL), and over-refraction.

9. Insert and remove a trial SCL.
10. Instruct patients regarding safe CL insertion and removal, CL wearing schedule, lens care regimens, CL disinfection care, indications, contraindications, and possible complications.

11. Work effectively within a medical care team.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Explain applied anatomy and physiology (eg, corneal metabolism and temperature, oxygen consumption, stromal acidosis, tear osmolarity, tissue fragility, cell apoptosis, corneal sensitivity, closed eyelid-related ocular surface repercussions).

2. Recognize signs and symptoms of CL intolerance and overwear.

3. Explain the importance of assessing tear film and ocular surface condition with more complex auxiliary tests in certain CL fitting situations (eg, tear film osmolarity and biochemical composition, impression cytology).

4. Identify CL fitting situations requiring corneal topography (eg, computerized/Placido rings).

5. Explain the rationale underlying different topography profiles and how these relate to the manifest refraction.

6. Summarize and analyze topography maps.

7. Explain physical properties of CL materials:
   a. International Organization for Standardization (ISO) classification

8. Explain advantages and disadvantages of SCL materials.

9. Explain advantages and disadvantages of RGP CL materials.

10. Explain RGP/SCL geometry relation with corneal geometry (ie, lacrimal meniscus, refraction, and ocular surface implications).

11. Explain main principles to fit RGP CL (eg, first trial CL choice, fluorescein patterns,
alignment, movement, wearing and replacement schedule, fitting motivation, and follow up).

12. Explain main principles to fit toric SCL:
   a. Stabilization
      i. LARS rule (ie, Left Add, Right Subtract)
      ii. Movement
      iii. Rotation
      iv. Possible refitting needs


14. Explain when CL refitting is indicated and perform refitting when needed.

15. Recognize signs and symptoms of a tight, optimal, and loose CL fitting.

16. Explain advantages and disadvantages of different wearing schedules (eg, conventional, frequent planned replacement, flexible, daily).

17. Describe ocular impact and physiological needs regarding different CL wearing schedules.

18. Identify and describe CL requirements for materials needed for extended/flexible CL wearing.

19. Explain patient and CL selection and fitting techniques as applied to fit presbyopia.

20. Explain how to keep a CL fitting trial set (ie, CL, equipment, and disinfection care).

21. Describe and evaluate different CL care systems.

22. Explain the clinical importance of CL environment (ie, CL patient surrounding, ocular surface, and storage case).

B. Technical Skills

1. Perform a CL history in patients requiring more complex CL fitting (eg, subclinical ectatic corneal disorders such as keratoconus and pellucid marginal degeneration,
regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

2. Perform a clinical examination, including retinoscopy and refraction techniques to verify and inspect CL in patients requiring more complex CL fitting (eg, subclinical ectatic corneal disorders such as keratoconus and pellucid marginal degeneration, regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

3. Indicate more complex additional auxiliary tests (eg, computer-based corneal topography, tear film osmolarity, impression cytology) in patients requiring more complex CL fitting (eg, subclinical ectatic corneal disorders such as keratoconus, pellucid marginal degeneration, regular moderate astigmatism, presbyopia, ocular surface disease, and post-refractive surgery).

4. Perform RGP CL fitting (spherical).

5. Perform SCL toric fitting.

6. Perform presbyopia CL fitting.

7. Perform appropriate CL selection and material or parameters modification in CL refit.

8. Perform CL verification for visual acuity, fitting, and comfort in patients requiring more complex CL fitting.

9. Educate patients regarding CL-related complications.

10. Diagnose, manage, and treat CL-related complications.

11. Perform the skills needed for long-term management and follow up of CL patients.

**Advanced Level Goals:**

*A. Cognitive Skills*

1. Describe the various options for SCL, RPG CL, and hybrid CL fitting in advanced ectatic corneal disorders such as keratoconus and pellucid marginal degeneration,
including post-intracorneal ring segment implantation cases.

2. Describe the various options for SCL and RPG CL fitting in postkeratoplasty cases.

3. Describe the various options for SCL and RPG CL fitting in complex post-refractive surgery, including corneal ectasia.

4. Describe CL fitting in special clinical situations such as severe dry eye, glaucoma, diabetes, allergy, pregnancy, strabismus, sports practice, adverse environmental and occupational conditions.

5. Describe indications, fitting techniques, and long-term management of CL wear for children and adolescents.

6. Describe CL options and most complex fitting techniques for medical CL indications such as aphakia, albinism, recurrent corneal erosions, neurotrophic keratitis, corneal scarring, aniridia, and prosthetic cosmesis.

7. Identify indications for scleral CL fitting.

8. Explain reverse geometry RGP CL for post-graft or post-refractive surgery cases.

9. Synthesize the concept underlying orthokeratology.

10. List the indications for therapeutic CL.

11. Describe material selection, physiological implications, mechanisms of action, and adjuvant topical treatment associated with therapeutic CL.

12. Describe the various possibilities of fitting with soft and hard therapeutic CL.

13. Explain the importance of appreciating visual acuity, fit, and comfort in therapeutic CL.

14. Describe the differences among CL material choices especially suited for more complex cases and its clinical correlation.

15. Explain the influence of both systemic and topical medication on CL fitting and tolerance.

16. Describe the methods of modifying a CL to improve comfort, vision, or physiological response.
17. Evaluate CL-induced complications, and describe treatment strategies for their management, in particular acanthamoeba and fungi infections.

18. Appraise clinical situations requiring additional complementary examinations in CL fitting and follow up (eg, endothelial, confocal biomicroscopy, aberrometry).

19. Describe indications and methods for fitting front surface toric, back surface toric, and bitoric RGP CL.

B. Technical Skills

1. Perform an advanced CL history and examination.

2. Obtain a full ocular history and conduct necessary tests to perform a complex CL fitting examination (eg, postkeratoplasty, multiple surgeries, post-refractive surgery, corneal ectasia, advanced corneal ectatic disorders such as keratoconus and pellucid marginal degeneration, and active corneal and ocular surface disease).


4. Perform scleral CL fitting.

5. Perform refraction, retinoscopy, and over-refraction in complex cases.

6. Use advanced CL designs including reverse geometry.

7. Indicate the auxiliary CL instruments in patients with complex needs (eg, computerized topography, fluorescein patterns, diagnostic lenses).

8. Interpret and interpret topography in complex CL fittings.

9. Perform and analyze aberrometry and endothelial/confocal biomicroscopy.

10. Indicate CL modification and refitting in complex cases, when needed.

11. Select the appropriate CL in complex clinical cases (eg, postkeratoplasty, multiple surgeries, post-refractive surgery, corneal ectasia, advanced ectatic corneal disorders such as keratoconus, pellucid marginal degeneration, and active corneal and ocular surface disease).
12. Perform therapeutic CL fitting and follow up.

13. Diagnose and treat CL-induced complications, both infectious and noninfectious

14. (eg, sterile infiltrates, corneal neovascularization, corneal permanent staining, giant papillary conjunctivitis).

15. Develop an educational skill set to effectively educate rotating students and residents about CL topics.

IV. Refractive Surgery

Basic Level Goals:

A. Cognitive Skills

1. Describe simple types of refractive errors:
   a. Myopia
   b. Hyperopia
   c. Astigmatism
   d. Presbyopia

2. Describe basic optic principles, such as line of sight and Purkinje image.

3. Explain theories of accommodation.

4. Describe the basics of ophthalmic optics, including how the following affect the optics of the eye:
   a. Low and high order aberrations
   b. Corneal layers
   c. Shape of cornea
   d. Shape of lens

5. Describe basic refraction techniques using trial lenses or phoropter for basic refractive
errors, including:

a. Retinoscopy
b. Modification and refinement of subjective refraction
c. Cycloplegic retinoscopy and refraction
d. Postcycloplegic refraction

6. Describe the optical principles of common refractive surgery diagnostic tools, including:

a. Ultrasonic pachymetry
b. Keratometer
c. Lensometer
d. Pupillometry
e. Corneal topography
f. Scheimpflug imaging and elevation maps
g. Optical coherence tomography (OCT)

7. Describe the following topographic maps using different scales (ie, absolute, normalized, adjustable):

a. Axial
b. Instantaneous
c. Refractive

8. Describe normal corneal topographic patterns, as well as topographic signs of keratoconus and ectasia.

9. Describe elevation topography maps and their importance in screening refractive surgery candidates.

10. Describe indications and limitations of corneal topography in refractive surgery.
11. List the mandatory diagnostic tests necessary for refractive surgery.

12. Describe the basics of laser biophysics and laser tissue interaction.

13. Describe the complications of high myopia, high hyperopia, and pathologies related to high astigmatism.

14. Define the clinical stages of keratoconus and forme fruste keratoconus using clinical and topographic tests.

15. Describe the milestones in refractive surgery development, including radial keratotomy, keratomileusis, and phakic intraocular lenses (IOLs).

16. List current refractive procedures, their mechanisms of action, indications, and limitations, including:
   a. Types of excimer laser procedures
   b. Phakic IOLs
   d. Implantation of intracorneal ring segments
   e. Corneal inlays
   f. Accommodative lenses

17. Describe the main IOL calculation formulas.

18. Describe the principles and different types (ie, linear, rotational, pendular) of mechanical microkeratomes, including their characteristics, indications, risks, and possible complications.

19. Describe the role of femtosecond technology in refractive surgery, including advantages and limitations of flap creation with a femtosecond laser.

20. Describe different techniques of keratoplasty and their relation with refractive surgery.

B. Technical/Surgical Skills

1. Perform objective and subjective refraction, including cross cylinder and Worth
4-dot test.

2. Diagnose refractive defects.

3. Use different prescription formulas.

4. Prescribe spectacles for at least 20 patients with simple refractive errors (e.g., myopia, hyperopia, regular astigmatism).

5. Perform refraction on patients with extreme errors of refraction (e.g., 5 patients with hyperopia over 8.0 D, and 5 patients with myopia above 20.0 D).

6. Use the lensometer to measure spectacle power.

7. Use the keratometer to make corneal measurements.

8. Use the ultrasonic pachymeter to measure corneal thickness.

9. Validate corneal topography maps, including elevation topography. Recognize signs of ectatic disorders and/or candidates at risk for an unsatisfactory refractive surgery outcome, and rule out poor-quality tests (e.g., artifacts, alignment, and corneal exposure issues).

10. Interpret an aberration map and evaluate its significance in the refractive defect of a patient, as well as the need to treat or not.

11. Validate a manual refraction as a real refractive defect of a patient, comparing results with keratometers, aberrometers, and topography.


13. Recognize and unmask astigmatism from higher order aberrations, such as coma.

14. Demonstrate how informed consent should be explained.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Describe various types of refractive defects, and define the possible corrective solutions for each one.
2. Describe basic diagnostic tools used in refractive surgery, including topography, pachymetry, and biometry; and interpret results.

3. Describe more complex types of refractive errors, including postoperative refractive errors following cataract surgery, keratoplasty, refractive surgeries, ectatic conditions, and irregular astigmatism.

4. Explain basics of wavefront analysis, including ray tracing and dynamic skiascopy, and graphical representation of wavefront errors, including corneal and entire eye high-order aberration maps, point-spread function, and modulation-transfer function.

5. Describe the basics of Zernike polynomials and Fourier analysis.

6. Use different topographic maps and scales for different purposes (eg, screening, postoperative evaluation, detection of complications).

7. Describe the basics of measuring contrast sensitivity.

8. Describe laser-tissue interaction and explain Munnerlyn formula.

9. Describe corneal biomechanics, including biomechanical responses to keratorefractive surgery, corneal healing after excimer laser procedures, corneal hysteresis, and corneal resistance factor.

10. Define and diagnose post laser in-situ keratomileusis (LASIK) ectasia, and differentiate it from other conditions.

11. Describe the mechanism of action, indications, advantages, and potential complications of mitomycin C application in surface ablation.

12. Describe the affect of corneal crosslinking on the biomechanical properties of the cornea, including its indications and how it can be combined with other refractive surgery procedures.

B. Technical/Surgical Skills

1. Perform refraction techniques using trial lenses or phoropter for basic and more complex cases, including:
a. Modification and refinement of subjective manifest refractive error
b. Cycloplegic retinoscopy and refraction
c. Postcycloplegic refraction
d. Contact lens use
e. Irregular astigmatism
f. Postkeratoplasty
g. Refractive surgery cases

2. Apply the basics of optics and optical principles of refraction and retinoscopy in the clinical setting, including higher order aberrations.

3. Gather accurate information essential for preoperative evaluation of patients seeking refractive surgery, including:
   a. Medical interview
      i. Patient expectation
      ii. Social history
      iii. Medical history
      iv. Pertinent ocular history
   b. Physical examination
      i. Uncorrected visual acuity
      ii. manifest and cycloplegic visual acuity
      iii. Intraocular pressure
      iv. Slit-lamp examination
      v. Fundus examination

4. Diagnose and manage dry eye prior to surgery.
5. Use the keratometer to make corneal measurements in more complex patients (eg, prior corneal surgery or corneal disease), and correlate results with corneal topography maps, visual acuity, and quality of vision.

6. Use basic refractive instruments and techniques (eg, auto refractor, pachymetry, automated corneal topography, aberrometer, pupillometry, contact lens refraction, OCT, corneal hysteresis, and corneal resistance factor) in the clinical setting for refractive surgery patients.

7. Assist in developing patient care management plans for simple refractive errors (eg, myopia, hyperopia, regular astigmatism), and define the risks and benefits for each procedure.

8. Assist in various types of refractive surgery, including:
   a. Twenty surface ablation procedures
   b. Twenty LASIK procedures
   c. Ten intracorneal ring segment implantation procedures
   d. Ten phakic IOL surgeries

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe and diagnose various types of refractive problems, including irregular astigmatism, and identify the best solution for each.

2. Describe the most complex types of refractive errors, including postoperative refractive errors, postkeratoplasty, and refractive surgery.

3. Describe the most advanced optics and optical principles of refraction and retinoscopy, including higher-order aberrations.

4. List the indications for and interpret preoperative and postoperative diagnostic testing, including:
   a. Corneal topography
b. Wavefront analysis  
c. Pachymetry  
d. Calculation of stromal-bed thickness before and after LASIK  
e. Aspheric profile of ablation  

5. Formulate informed diagnostic and therapeutic decisions based on patient information, current scientific evidence, clinical judgment, and patient expectations.

6. Describe accommodative and nonaccommodative treatments of presbyopia, including:
   a. Monovision  
   b. Excimer laser correction  
   c. Conductive keratoplasty  
   d. Corneal inlays  
   e. Accommodating IOLs  
   f. Multifocal IOLs  

7. Describe the advanced formulas for IOL calculation in extreme myopia, hyperopia, and after corneal refractive surgery.

8. Develop patient care management plans for more complex cases (eg, mixed and irregular astigmatism, irregular corneas, combined refractive surgery procedures).

9. Describe the basics of modulation transfer function (MTF), point speed function (PSF), and Strehl ratio as objective ways to measure quality of vision.

10. Describe the basics of topography-guided, wavefront-guided, and optimized ablations as compared to standard ablations.

B. Technical/Surgical Skills

1. Perform basic refractive surgery procedures, such as low myopia or low hyperopia
with LASIK (microkeratome) and surface ablation (LASIK or photorefractive keratectomy [PRK]).

2. Perform the most advanced objective and subjective refraction techniques using trial lenses or the phoropter, including:
   a. Contact lens refraction for more complex refractive errors, including modification and refinement of subjective manifest refractive error
   b. Cycloplegic retinoscopy and refraction
   c. Postcycloplegic refraction
   d. Irregular astigmatism
   e. Postkeratoplasty
   f. Refractive surgery cases

3. Utilize the most advanced optics and optical principles for refraction and retinoscopy, including higher order aberrations.

4. Utilize the keratometer for detection of subtle or complex advanced corneal refractive errors.

5. Use and interpret results from more advanced refraction instruments and techniques (eg, corneal topography, pupillometry, aberrometry, Scheimpflug imaging, OCT).

6. Fit contact lenses in patients with irregular corneas, irregular astigmatism, and following refractive surgery.

7. Assist in advanced refractive surgeries, including topography-guided ablation, wavefront-guided ablation, and combined refractive surgeries.

8. Encourage patients to actively participate in their own care by providing disease and treatment information, and counsel patients on how to prevent postoperative injury.

9. Correct refractive error after surgeries, such as penetrating keratoplasty, deep anterior lamellar keratoplasty, and radial keratotomy.
V. Glaucoma

Basic Level Goals:

A. Cognitive Skills

Basic Science

1. Describe the anatomy of the anterior chamber, angle, and ciliary body.
2. Describe the anatomy of the retinal nerve fiber layer, optic nerve head, and visual pathway from the retina to the visual cortex.
3. Describe the mechanisms and dynamics of aqueous humor inflow and outflow.
4. Describe the microscopic anatomy of the retina from inner to outer portions, with attention to the retinal ganglion cell layer and nerve fiber layer.
5. Describe the blood supply of the optic nerve and ciliary body.
6. Describe the apoptotic mechanism of retinal ganglion cell death.
7. Know the physiology underlying visual-field examination and its interpretation.
8. Describe the fundamentals of Goldmann static, kinetic perimetry, and standard automated perimetry.
9. Know basic principles of tonometry and aqueous outflow, and applications of tonometric data (eg, diurnal curve, peak and trough values).

Clinical Science

1. Describe the major features of primary open-angle glaucoma (high and low tension), angle-closure glaucoma, glaucoma suspects, and ocular hypertension.
2. Describe the major risk factors for primary open-angle glaucoma and angle-closure glaucoma.
3. Describe the steps in evaluating primary open-angle glaucoma and angle-closure glaucoma.
4. Define glaucoma as a progressive neural degeneration of retinal ganglion cells, their axons and their connections to central visual centers.
5. Describe the features of glaucomatous optic neuropathy.

6. Describe the basic features of the major glaucomas: primary open-angle glaucoma, angle-closure glaucoma, exfoliative glaucoma, and pigmentary glaucoma.

7. Know the role of intraocular pressure (IOP) in the development and progression of glaucoma.

8. Understand the factors that influence IOP.

9. Describe and understand basic principles of Goldmann applanation tonometry.

10. Describe tonometers (eg, Schiøtz, Tono-Pen) and recognize artifacts of testing.

11. Describe principles and basic techniques of gonioscopy (3 or 4 mirror lenses) to evaluate angle structures.

12. Describe normal and abnormal angle findings.

13. Know risk factors other than IOP for primary open-angle glaucoma.


15. Describe corneal pachymetry and how biomechanics and measurements of corneal thickness affect IOP interpretations.

16. Understand the principles of indirect ophthalmoscopy to evaluate the optic nerve and retinal nerve fiber layer.

17. Describe the most common types of visual field defects in glaucoma.

18. Describe principles and mechanisms of medical management of glaucoma.

19. Describe major classes of glaucoma medications, their mechanisms of action, indications, contraindications, and side effects (topical and systemic).

20. Know drug interactions between systemic drugs and glaucoma drugs.

21. Know basic medical statistics to interpret major glaucoma studies.

22. Describe the major results of large prospective clinical trials in addition to those appropriate to the practice region.
a. The Glaucoma Laser Trial (GLT)
b. The Ocular Hypertension Treatment Study (OHTS)
c. The Collaborative Initial Glaucoma Treatment Study (CIGTS)
d. The Fluorouracil Filtering Surgery Study (FFSS)
e. The Normal Tension Glaucoma Study (NTGS)
f. The Advanced Glaucoma Intervention Study (AGIS)
g. The European Glaucoma Prevention Study (EGPS)
h. The Early Manifest Glaucoma Trial (EMGT)

B. Technical/Surgical Skills

1. Take a relevant patient history and recognize the signs and symptoms of glaucoma.
2. Perform basic slit-lamp biomicroscopy (including peripheral anterior chamber depth evaluation, Van Herick test).
3. Perform basic tonometry (eg, applanation, Schiøtz, Tono-Pen, airpuff).
4. When performing basic tonometry, recognize and correct artifacts, and know how to disinfect tonometer and check calibration.
5. Perform basic gonioscopy with Goldmann-type and indentation lenses.
6. Recognize and evaluate angle structures, abnormalities, and appositional and synechial angle closure.
7. Perform central corneal pachymetry and relate to IOP findings.
8. Recognize the common features of the glaucomatous optic nerve including the significance of optic nerve head size, and perform stereo examination, using direct ophthalmoscope, fundus lens, and indirect lenses (ie, 60, 66, 78, or 90 diopter lens).
9. Recognize typical features of glaucomatous optic neuropathy (eg, neuroretinal rim changes, disc hemorrhage, peripapillary atrophy).
10. Recognize optic nerve features of disorders that cause visual field loss (eg, optic
nerve head drusen, optic neuritis).

11. Describe slit-lamp findings of secondary glaucomas (eg, iridocorneal endothelial syndrome, pigment dispersion syndrome, exfoliation syndrome, angle recession).

12. Interpret visual field results for Goldmann kinetic perimetry and Humphrey or Octopus standard automated perimetry.


14. Be able to test for relative afferent pupillary defect.

15. Recognize ocular emergencies of acute angle closure, and blebitis/endophthalmitis.

16. Perform paracentesis to lower acute IOP.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Know epidemiology of congenital glaucoma, primary open-angle glaucoma, exfoliation syndrome and exfoliative glaucoma, and angle-closure glaucoma.

2. Know the genetics of:
   a. Primary congenital glaucoma (CYP1B1)
   b. Syndromes associated with congenital/developmental glaucoma
      i. Lowe syndrome
      ii. Nail-patella syndrome
      iii. Aniridia (PAX 6)
      iv. Axenfeld-Rieger syndrome (PITX2, FOXC1, FKHL7)
   c. Primary open-angle glaucoma
      i. GLC1A and the molecular biology of myocilin
ii. Optineurin

iii. Other genes as they become identified

3. Describe the features of primary infantile and juvenile glaucomas.

4. Describe etiologies and major risk factors for secondary open-angle glaucomas.

5. Recognize secondary glaucomas (eg, angle recession, inflammatory, steroid induced, pigmentary, exfoliative, phacolytic, neovascular, postoperative, malignant, lens-particle glaucomas, plateau iris, glaucomatocyclitic crisis, iridocorneal endothelial syndrome) with attention to appropriate pathophysiology.

6. Describe the evaluation and treatment of complex secondary glaucomas (eg, exfoliation, angle recession, inflammatory, steroid induced, pigmentary, phacolytic, neovascular, postoperative, malignant, lens-particle glaucomas; plateau iris; glaucomatocyclitic crisis; iridocorneal endothelial syndromes; aqueous misdirection/ciliary block).

7. Describe diurnal fluctuations in IOP and ocular perfusion pressure and their application in the approach to therapy.

8. Recognize and describe more advanced optic nerve and nerve fiber layer anatomy in glaucoma and typical and atypical features associated with glaucomatous cupping (eg, rim pallor, disc hemorrhage, parapapillary atrophy, rim thinning, notching, circumlinear vessels, central acuity loss, hemianopic or other nonglaucomatous types of visual field loss).

9. Describe tools and techniques for quantitative anterior segment imaging such as ultrasound biomicroscopy and anterior segment optical coherence tomography (OCT).

10. Describe basic principles of tools to analyze optic nerve and retinal nerve fiber layer such as OCT, Heidelberg Retina Tomograph (HRT), and GDx.

11. Interpret HRT, OCT, and GDx scans.

12. Describe and interpret more advanced forms of perimetry (kinetic and automated static), including various perimetry strategies such as threshold testing, suprathreshold testing, and special algorithms.
13. Describe the principles involved in determining glaucomatous progression both clinically and perimetrically.

14. Describe the principles, and more advanced anatomic gonioscopic features of primary and secondary glaucomas (eg, plateau iris, appositional closure).

15. Describe target IOP and its use in glaucoma management.

16. Describe the principles of medical management of more advanced glaucomas (eg, advanced primary open-angle glaucoma, secondary open and closed angle glaucomas, normal tension glaucoma).

17. Describe pitfalls of medical treatment, in particular poor compliance and adherence.

18. Describe and recognize the features of angle-closure glaucomas and aqueous misdirection.

19. Describe the most common clinical features and etiologies of ocular hypotony.


21. Describe and know how to apply the results of major clinical trials in glaucoma to clinical practice (eg, GLT, OHTS, CIGTS, FFSS, NTGS, AGIS, EGPS, EMGT).

22. Describe and apply specific medical treatments in more advanced glaucoma.

23. Describe the principles, indications, and techniques of various types of laser energy, spot size, and laser wavelengths.

24. Describe the principles, indications, and techniques of trabeculectomy (with or without cataract surgery, with or without antimetabolites), glaucoma drainage devices, and cyclodestructive procedures.

25. Describe the major etiologies of dislocated or subluxated lens associated with glaucoma (eg, trauma, Marfan syndrome, homocystinuria, Weill-Marchesani syndrome, syphilis).

26. Describe the less common causes of lens abnormalities associated with glaucoma (eg, spherophakia, lenticonus, ectopia lentis).

27. Define the relationships of glaucoma and uveitis.
28. Describe diagnostic accuracy, false positive and false negative diagnoses and their significance at individual and societal levels, differences between case-based and community-based screening, including an understanding of sensitivity and specificity, number needed to treat, t tests, life-table analysis, prospective versus retrospective studies, case control and cohort studies.

B. Technical/Surgical Skills

1. Select appropriate drugs and be able to customize or modify medical treatment for open-angle, secondary, and angle-closure glaucomas.

2. Perform argon and selective laser trabeculoplasty for open-angle glaucoma.

3. Perform argon or YAG laser for angle-closure glaucoma.

4. Perform surgical peripheral irido(ec)tomy for angle-closure glaucoma.

5. Perform peripheral iridoplasty for nonpupillary block angle-closure glaucoma.

6. Perform laser suture lysis.

7. Perform cyclodestructive surgery (photocoagulation or cryotherapy).

8. Assist with trabeculectomy and glaucoma drainage device surgery in the operating room.

9. Describe and manage a flat anterior chamber.


Advanced Level Goals:

A. Cognitive Skills

1. Describe the etiology, pathophysiology, and clinical characteristics of the most complex glaucomas (eg, angle recession, multimechanism glaucoma, traumatic glaucoma, neovascular, uveitic glaucoma, iridocorneal endothelial syndrome).

2. Identify the key examination techniques and management of complex medical and surgical problems in glaucoma (eg, complicated or postoperative primary and
secondary open-angle and closed-angle glaucoma, uncommon visual field defects).

3. Apply in clinical practice tonometric methods (eg, diurnal curve) in complicated or atypical cases of glaucoma, advanced tonometric methods, and the effect of central corneal thickness (pachymetry) on IOP readings.

4. Apply in clinical practice tonometric methods, such as PASCAL tonometer, pneumotonometry, and rebound tonometry (ICare).

5. Apply the most advanced knowledge of optic nerve and nerve fiber layer anatomy and describe and interpret techniques, methods, and tools for analyzing the nerve fiber layer.

6. Recognize and evaluate atypical or multifactorial glaucomatous cupping (eg, rim pallor) and when to order additional tests to rule out other pathologies (eg, magnetic resonance imaging, computerized tomography scan, carotid Doppler).

7. Know how to diagnose progression using special software available with optic nerve and retinal measurement technologies and know the errors and limitations of the instruments.

8. Describe, interpret, and apply the results of the most complex and advanced forms of perimetry, including special kinetic and automated static perimetry strategies (eg, special algorithms) in atypical or multifactorial glaucoma.

9. Describe visual field damage, progression, rate of progression, caveats, and their use in glaucoma management.

10. Describe medical management of the most advanced and complex glaucoma (eg, advanced primary open-angle glaucoma previously treated with medicine, laser, or surgery; secondary glaucomas).

11. Describe, recognize, and know how to 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).

12. Describe, recognize, and know how to treat primary angle-closure glaucoma and complex glaucomas (eg, postoperative cases, secondary angle closure, aqueous misdirection).
13. Describe the clinical features of ocular hypotony, recognize and know how to treat common and uncommon etiologies (eg, choroidal detachment, leaking trabeculectomy bleb).

14. Describe the results, apply the conclusions, and critically analyze the major clinical trials in glaucoma (eg, GLT, OHTS, CIGTS, FFSS, NTGS, AGIS, EGPS, EMGT), as well as describe and use other publications in the management of glaucoma patients.

15. Describe the features of and know how to evaluate and treat or when to refer the primary infantile, developmental (eg, aniridia, Axenfeld-Rieger), and juvenile glaucomas.

16. Describe and know how to apply specific medical treatments in advanced glaucoma cases.

17. Describe the principles, indications, and complications of laser treatment of more advanced or complex glaucoma (eg, repeat procedures).

18. Describe the more advanced surgical treatment of glaucoma: (eg, trabeculectomy, combined cataract and trabeculectomy, glaucoma drainage devices, and cyclodestructive procedures), including indications, techniques, and complications.

19. Describe use of antimetabolites and antiangiogenic agents and potential complications from their use.


21. Describe and treat intraocular infections resulting from filtering blebs or other glaucoma procedures.

22. Describe new nonpenetrating glaucoma surgery techniques: principles, techniques, advantages, limitations, and complications.

23. Describe new microsurgical devices (eg, EX-PRESS, iStent, gold shunt, Trabectome) used in glaucoma surgery.

B. Technical/Surgical Skills

1. Perform YAG or argon laser procedures in glaucoma patients (eg, monocular patient, repeat laser, vitreolysis, suture lysis).
2. Perform laser peripheral iridotomy for more advanced glaucoma (eg, monocular patient, acute angle closure, hazy cornea).

3. Perform laser treatments (eg, argon laser trabeculoplasty, iridoplasty) for more advanced glaucoma cases (eg, repeat treatments, monocular patient).

4. Perform cyclophotocoagulation for more advanced cases (eg, prior surgery, monocular patient).

5. Perform routine and repeat trabeculectomy with or without antimetabolites.

6. Manage and treat an anterior chamber as appropriate.

7. Manage and treat medically and/or surgically a flat anterior chamber as appropriate.

8. Perform small incision phaco/intraocular lens surgery combined with trabeculectomy, at the same or different sites.

VI. Neuro-Ophthalmology

Basic Level Goals:

A. Cognitive Skills

1. Describe the neuroanatomy of the visual pathways.

2. Describe the anatomy and functions of cranial nerves 2-8.

3. Describe the anatomy of the bony orbit.

4. Describe the pupillary and accommodative neuroanatomy.

5. Describe ocular motility and related neuronal pathways.

6. Describe the typical features, evaluation, and management of the most common optic neuropathies (eg, infectious, demyelinating, ischemic, inflammatory, hereditary, toxic, nutritional, compressive, infiltrative).

7. Describe the typical features, evaluation, and management of the most common ocular motor neuropathies (eg, third, fourth, sixth nerve palsy).
8. Describe the typical features of cavernous sinus syndrome and superior orbital fissure syndrome.

9. Describe and distinguish congenital nystagmus versus acquired nystagmus.

10. Describe the typical features, evaluation, and management of the most common efferent pupillary abnormalities (eg, Horner syndrome, third nerve palsy, tonic pupil, light-near dissociation).

11. Describe the typical features and evaluation of the most common visual field defects (eg, optic nerve, optic chiasm, optic radiation, occipital cortex).

12. Describe the clinical features and evaluation of ocular myasthenia gravis.

13. Describe the clinical features and evaluation of carotid-cavernous fistula.

14. Describe the differential diagnosis, evaluation, and management of congenital optic nerve abnormalities (eg, optic pit, disc coloboma, papillorenal syndrome, morning glory syndrome, tilted disc, optic nerve hypoplasia, myelinated nerve fiber layer, melanocytoma, disc drusen, Bergmeister papilla).

15. Describe the features of simple supranuclear and internuclear palsies (eg, internuclear ophthalmoplegia, vertical gaze palsy).

16. Describe the signs of nonorganic visual loss.

17. Describe the indications for obtaining neuroimaging studies, including computerized tomography (CT) scanning, magnetic resonance imaging (MRI), orbital ultrasonography, and catheter angiography.

18. Describe the signs and symptoms of giant cell arteritis and the indications for performing a temporal artery biopsy.

19. Describe the clinical features, evaluation and neuro-ophthalmic aspects of thyroid ophthalmopathy.

20. Describe a systematic, sign-and-symptom-oriented neuro-ophthalmic patient interrogation (ie, history taking) and recording techniques.

21. Describe features of common headache and facial pain syndromes (eg, migraine, trigeminal neuralgia).
B. *Technical/Surgical Skills*

1. Perform basic visual function tests (eg, color vision testing, Amsler grid, photostress test, contrast sensitivity testing).

2. Perform tests of binocularity and fusion (eg, polarized Titmus stereo test, Worth 4-dot test).

3. Perform a basic pupillary examination.

4. Describe indications for and perform basic pharmacologic pupillary testing for Horner syndrome, pharmacologic dilation, and tonic pupil.

5. Describe and detect a relative afferent pupillary defect.

6. Detect light-near dissociation

7. Perform a basic assessment of ocular alignment.

8. Use simple observational techniques (eg, Hirschberg test, Krimsky method).

9. Describe and perform basic cover/uncover testing for tropia.

10. Describe and perform alternate cover testing for phoria.

11. Perform simultaneous prism and cover testing.

12. Perform measurement of deviations with prisms.

13. Describe the indications for and apply Fresnel and grind-in prisms.

14. Describe the indications for and in a clinical setting perform forced duction and forced generation testing.

15. Perform a complete evaluation of the major ocular motor systems (eg, fixation, pursuit, saccades, convergence, vestibuloocular reflex).

16. Perform an evaluation of eyelids (eg, assess lid position, measure palpebral fissure, quantify levator function).

17. List the indications for visual field testing and interpret standard clinical perimetry programs.
18. Perform confrontational field testing (eg, static and kinetic, central and peripheral, red and white targets).

19. Describe the indications for and perform basic kinetic perimetry and interpret results.

20. Describe the indications for and perform basic automated perimetry and interpret results.

21. Describe the format of standard clinical tests (eg, light stimulus, background illumination, test points).

22. Perform basic direct, indirect, and magnified ophthalmoscopy examination of the optic disc, macula, vessels, and periphery of the retina (eg, recognize optic disc swelling, optic atrophy, neuroretinitis, nerve head vascular abnormalities, and macular abnormalities, such as edema, pigmentary changes, subretinal fluid, vessel abnormalities, pigmentary changes) and use the findings to generate a differential diagnosis.

23. Describe the anatomy and indications for CT, MRI, and angiography.

24. Describe the indications for and interpret basic echography (ultrasound) of the orbits.

25. Perform exophthalmometry.

26. Check pulse, blood pressure in both arms, carotid bruit, and heart sounds.

**Standard Level Goals:**

Describe the neuro-ophthalmic anatomy and physiology (ie, the orbit and adnexal structures, the afferent and efferent visual pathways with their intracranial projections, the sensory and motor anatomy of the face, and the autonomic nervous system, including their blood supplies) as it applies to the eye and visual system.

**A. Cognitive Skills**

1. Describe typical and atypical features, evaluation, and management of the most common optic neuropathies (eg, papilledema, optic neuritis, ischemic, inflammatory, infectious, infiltrative, compressive, hereditary optic neuropathies).
2. Describe features, evaluation, and management of the more complex supranuclear and internuclear palsies (eg, progressive supranuclear palsy and subtle internuclear ophthalmoplegia, one-and-half syndrome).

3. List the common causes of an acute versus chronic isolated ocular motor neuropathy and define general management of each.

4. List the common causes of cavernous sinus syndrome and superior orbital fissure syndrome.

5. Describe and differentiate among different forms of acquired nystagmus (eg, downbeat, upbeat, pendular, gaze evoked, rebound, convergence, retraction).

6. List the different mechanism causing nonphysiologic anisocoria and describe characteristics features and evaluation of the less common disorders (eg, mixed sympathetic and parasympathetic denervation of iris, aberrant regeneration in third nerve palsy, pharmacologic miosis).

7. List mechanism and causes of central versus peripheral light near dissociation (eg, Argyll-Robertson pupil, diabetic neuropathy, tonic pupil, Parinaud syndrome).

8. Describe features and evaluation of the less commonly encountered visual field defects (eg, sectoranopia, checkerboard, monocular temporal crescent).

9. Describe more advanced aspects of visual field testing indications, selection, and interpretation (eg, artifacts of automated perimetry, testing, and thresholding strategies).

10. Describe neuro-ophthalmic aspects of common systemic diseases (eg, hypertension, diabetes, thyroid disease, myasthenia gravis, temporal arteritis, sarcoidosis, systemic infections, inflammation).

11. Describe neuro-ophthalmic findings that are common following head trauma (eg, traumatic optic neuropathy, bilateral fourth nerve palsy, traumatic brain injury).


13. Describe evaluation and management of ocular myasthenia gravis.
14. Recognize common pathologic findings of brain and orbits on CT and MRI related to neuro-ophthalmology.

15. Describe the typical features, evaluation, and management of urgent neuro-ophthalmic pathologies (eg, giant cell arteritis, cavernous sinus thrombosis, orbital apex syndrome, pituitary apoplexy).

B. Technical Skills

1. Describe the indications for intravenous edrophonium (ie, Tensilon) and prostigmin tests for myasthenia gravis.

2. Perform a detailed cranial nerve evaluation other than the oculomotor nerve evaluation (eg, trigeminal, and facial and acoustic nerve function).

3. Describe the 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. Describe the evaluation, management, and specific testing (eg, stereopsis, mirror test, red-green testing, monocular prism test) of patients with “functional” (ie, nonorganic) visual loss (eg, recognize nonorganic spiral or tunnel visual fields).

5. Describe the indications for, perform, and list the complications of temporal artery biopsy.

6. Perform and interpret basic ocular coherence tomography (OCT) imaging of the eye (eg, optic disc, retinal nerve fiber layer, macula).

7. Describe the indications and interpret basic ocular electrophysiology (eg, visually-evoked potential [VEP], electroretinogram [ERG], electrooculogram [EOG]).

8. Perform basic neurologic screening examination (eg, tandem walk, sensory examination, cerebellar function testing, basic cognitive evaluation).

9. Identify patients with “functional” visual loss (ie, nonorganic visual loss) and provide appropriate approach and follow up.

10. Quantify relative afferent pupillary defect (RAPD) with neutral density filter and be
able to detect RAPD in patients with only one working pupil.

11. Interpret fluorescein angiography images.

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe the typical and atypical features, evaluation, and management of papilledema and raised intracranial pressure due to a variety of causes (eg, sinus thrombosis, idiopathic, meningitis).

2. Describe the typical features, evaluation, and management of urgent neuro-ophthalmic pathologies (eg, giant cell arteritis, cavernous sinus thrombosis, orbital apex syndrome, pituitary apoplexy).

3. Describe typical features of the most advanced and least common optic neuropathies (eg, chronic recurrent inflammatory optic neuritis, posterior ischemic optic neuropathy, neuromyelitis optica, autoimmune optic neuropathy, toxic/nutritional).

4. Describe typical and atypical features, evaluation, and management of the most complex and least common ocular motor neuropathies and their mimics (eg, patterns of aberrant regeneration).

5. Describe typical and atypical features, evaluation, and management of the most complex and least common forms of nystagmus (eg, spasmus nutans, see-saw nystagmus, periodic alternating nystagmus).

6. Describe typical and atypical features, evaluation, and management of the most advanced and least common pupillary abnormalities (eg, pupil findings in coma, transient pupillary phenomenon).

7. Describe features, evaluation, and management of the most complex and least common visual field defects and recognize pattern mimics (eg, combination of disc-related scotoma plus hemianopia, binasal hemianopia, sectoranopia, bilateral inferior altitudinal loss due to superior occipital lobe lesions and not bilateral anterior ischemic optic neuropathy).

8. Describe, evaluate, and treat the neuro-ophthalmic aspects of systemic diseases
(eg, malignant hypertension, diabetic papillopathy, toxicity of systemic medications, paraneoplastic syndromes, HIV/AIDS).

9. Describe, evaluate, and treat the neuro-ophthalmic manifestations of trauma (eg, corticosteroid or surgical therapy in traumatic optic neuropathy).

10. Describe, evaluate, and provide appropriate genetic counseling for inherited neuro-ophthalmic diseases (eg, hereditary optic neuropathies, chronic progressive external ophthalmoplegia, neurofibromatosis, ataxia syndromes).


12. Describe indications and interpret blood test results for various systemic disorders with neuro-ophthalmic manifestations (eg, thyroid disorders, pituitary disorders, myasthenia gravis).

13. Describe syndromes of cortical visual dysfunction.


15. Describe the neuro-ophthalmic complications related to pregnancy.

B. Technical/Surgical Skills

1. Perform and interpret the results of the intravenous edrophonium (ie, Tensilon) and prostigmin tests for myasthenia gravis; recognize and treat the complications of the procedures.

2. Perform and interpret the complete cranial nerve evaluation in the context of neuro-ophthalmic localization and diseases.

3. 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, ischemia), and appropriately discuss, in advance of testing, the localizing clinicoradiological features with the neuroradiologist in order to obtain the best study and interpretation of the results.
4. Identify patients with “functional” visual loss (ie, nonorganic visual loss) and provide appropriate counseling and follow-up.

5. Quantify RAPD with neutral density filter and detect small RAPD in patients with only one working pupil.

6. Perform optic nerve sheath decompression, if trained, for papilledema.

7. Perform neuro-ophthalmic evaluations for people with special needs (eg, comatose patients, children, children with developmental and visual maturation evaluations).

8. Describe indications, dose, and administration of Botox for neuro-ophthalmic disorders (eg, hemifacial spasm, blepharospasm, paralytic strabismus).

VII. Oculoplastic, Lacrimal Surgery and Orbit

Basic Level Goals:

A. Cognitive Skills

General

1. Perform preoperative and postoperative assessment of patients with common oculoplastic disorders.

Eyelid

1. Describe basic anatomy and physiology (eg, orbicularis, meibomian glands, Zeis glands, orbital septum, levator muscle, Müller muscle, Whitnall ligament, Lockwood ligament, preaponeurotic fat, scalp, face).

2. Describe basic mechanisms and indications for treatment of eyelid trauma (lid margin sparing, lid margin involving, canaliculus involving).

3. Describe mechanisms and indications for treatment of ptosis.

4. Describe mechanisms and indications for treatment of upper and lower eyelid retraction.

5. Describe mechanisms and indications for treatment of entropion.
7. Identify floppy eyelid syndrome and its systemic associations.
8. Identify blepharospasm and hemifacial spasm.
9. Describe history and examination findings for benign and malignant lid lesions.

**Lacrimal**

1. Describe basic anatomy and physiology (eg, puncta, canaliculi, lacrimal sac, nasolacrimal duct, endonasal anatomy, lacrimal glands).
2. Identify dacryocystitis.
3. Describe mechanisms of tearing.
4. Describe mechanisms and indications for treatment of congenital and acquired nasolacrimal duct obstruction.
5. Recite the differential diagnosis of lacrimal gland mass (eg, inflammatory, neoplastic, congenital, infectious).

**Orbital**

1. Describe basic anatomy (eg, orbital bones, orbital foramina, paranasal sinuses, annulus of Zinn, arterial and venous vascular supply, nerves, extraocular muscles).
2. Identify normal orbital and relevant nasal and paranasal sinus anatomy on imaging studies (eg, computed tomography, magnetic resonance imaging).
3. Describe basic mechanisms and indications for treatment of orbital trauma (eg, medial wall and floor fractures, retrobulbar hemorrhage).
4. Describe the pathophysiology of thyroid eye disease.
7. Describe typical features of orbital cellulitis.
B. Technical/Surgical Skills

Eyelid
1. Describe indications for and perform the basic office examination techniques for the most common eyelid abnormalities (eg, margin reflex distance, palpebral fissure height, levator function, lagophthalmos, lid crease, lid laxity assessment, brow height, dermatochalasis, eversion, double eversion).
2. Perform minor lid and conjunctival procedures (eg, repair of small eyelid laceration including marginal, removal of benign eyelid lesions, chalazion curettage or excision, conjunctival biopsy).
3. Treat complications of minor operating room procedures (eg, incision and drainage of chalazia, excision of small eyelid lesions).
4. Identify and treat trichiasis (eg, epilation, cryotherapy, surgical therapy).
5. Describe indications for and perform a temporary tarsorrhaphy.
6. Describe indications for and perform everting sutures (Quickert sutures).
7. Describe indications for and perform a lateral canthotomy/cantholysis.

Lacrimal
1. Describe indications for and perform the basic office examination techniques for the most common lacrimal abnormalities (eg, Schirmer test, dye disappearance test, punctal position, punctal dilation, canalicular probing, lacrimal probing and irrigation).
2. Describe indications for and perform an incision and drainage of the lacrimal sac.
3. Perform punctal plug insertion or removal.

Orbital
1. Describe indications for and perform the basic office examination techniques for the most common orbital abnormalities (eg, Hertel measurement, inspection, palpation, auscultation).
2. Identify indications for and perform the basic anophthalmic socket assessment (eg,
types of implants, implant movement, socket health, socket surface, socket volume, fornices, prosthesis type and fit).

Standard Level Goals:

A. Cognitive Skills

General

1. Perform preoperative and postoperative assessment of patients with simple and more serious oculoplastic disorders (eg, multidisciplinary procedures).

Eyelid

1. Describe more advanced eyelid anatomy and physiology (eg, lymphatics).

2. Describe the mechanisms of and indications for eyelid reconstruction.

3. Describe the genetics (where known), clinical features, evaluation, and treatment of congenital eyelid deformities (eg, coloboma, distichiasis, epicanthus, telecanthus, blepharophimosis, ankyloblepharon, epiblepharon, euryblepharon, cryptophthalmia, Goldenhar syndrome, Treacher-Collins syndrome, Waardenburg syndrome).

4. Describe clinical features, evaluation, syndromic association and management of congenital ptosis (eg, simple, blepharophimosis(ptosis)-epicanthus inversus syndrome [BPES], jaw wink, congenital fibrosis).

5. Describe the genetics (when applicable), clinical features, evaluation, and treatment of acquired myogenic ptosis (eg, oculopharyngeal muscular dystrophy, mitochondrial myopathies, myotonic dystrophy, myasthenia gravis).

6. Describe the clinical features, evaluation, and treatment of acquired neurogenic ptosis (eg, third nerve palsy, Horner syndrome).

7. Describe the mechanisms and indications for treatment of more advanced eyelid trauma (eg, chemical burns, thermal burns, canthal avulsions, eyelid avulsions).

Lacrimal
1. Describe more advanced lacrimal anatomy and physiology (e.g., lacrimal pump theories).
2. Describe the mechanisms and indications for treatment of more advanced lacrimal trauma (e.g., nasolacrimal duct obstructions resulting from facial fractures).
3. Describe features, evaluation, and treatment of more complicated cases of nasolacrimal duct obstruction, canaliculitis, dacryocystitis, and acute and chronic dacryoadenitis.
4. Describe the genetics, clinical features, evaluation, and management of lacrimal dysgenesis.

Orbital
1. Describe more advanced orbital anatomy and physiology (e.g., vascular anatomy, neural anatomy, orbital septa).
2. Describe the clinical features, evaluation, and management of congenital orbital deformities (e.g., anophthalmia, microphthalmia, hypotelorism, hypertelorism versus telecanthus).
3. Describe the genetics, clinical features, evaluation, and management of common craniosynostoses and other congenital malformations (e.g., Crouzon syndrome, Apert syndrome).
4. Describe the mechanisms and indications for treatment of more advanced orbital trauma (e.g., zygomaticomaxillary complex fractures, naso-orbital ethmoid fractures, Le Fort fractures).
5. Identify, evaluate, and treat thyroid ophthalmopathy (e.g., epidemiology, symptoms and signs, associated systemic diseases, orbital imaging, differential diagnosis, surgical, medical, and radiation indications, side effects of treatment).
6. Identify, evaluate, and treat nonspecific orbital inflammation (e.g., symptoms and signs, orbital imaging, differential diagnosis, biopsy indications, choice of treatments).
B. Technical/Surgical Skills

Eyelids

1. Describe indications for and perform more advanced examination techniques for less common eyelid abnormalities (eg, decreased blink, orbicularis weakness, contour abnormalities, marginal entropion).

2. Describe indications for and complications of, and perform more complicated minor lid procedures (eg, larger benign skin lesions, recurrent chalazia).

3. Describe indications for and complications of, and perform more complicated eyelid surgery (eg, upper blepharoplasty, lower lid tightening).

4. Describe indications for and complications of, and perform more advanced eyelid reconstruction (eg, wedge/pentagonal block resection).

5. Identify indications for and complications of, and treat blepharospasm and hemifacial spasm.

6. Identify histopathological features of common eyelid conditions.

Lacrimal

1. Identify indications for and perform more advanced lacrimal assessment (eg, interpretation of dye testing, canalicular probing in trauma).

2. Describe indications for and complications of, and perform basic lacrimal procedures (eg, lacrimal drainage testing [irrigation, Jones Dye Tests 1 and 2], lacrimal probing, lacrimal intubation, incision and drainage of lacrimal sac abscess).

3. Identify indications for and interpret lacrimal imaging (eg, scintigraphy, cystography).

4. Identify histopathological features of common lacrimal conditions.

Orbit

1. Describe indications for and perform more advanced assessment of the orbit (eg, hypoglobus, facial asymmetry, enophthalmos, proptosis).

2. Describe indications for and complications of, and perform enucleation and evisceration.
3. Identify indications for and perform more advanced socket assessment (eg, extrusion of implants, anophthalmic socket complications).

4. Identify common orbital pathology (eg, orbital fractures, orbital tumors) on imaging studies (eg, magnetic resonance imaging, computed tomography, ultrasound).

5. Treat common presentations of orbital cellulitis.

6. Identify histopathological features of common orbital conditions.

Advanced Level Goals:

A. Cognitive skills

General

1. Perform preoperative and postoperative assessment and coordination of care of patients with more advanced or complex oculoplastic-related disorders (eg, systemically ill patients, multidisciplinary procedures).

Eyelid

1. Describe the most advanced eyelid anatomy and physiology.

2. 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, spastic, cicatricial, congenital)
   c. Complex myogenic ptosis (eg, myasthenia gravis, chronic progressive external ophthalmoplegia [CPEO], oculopharyngeal muscular dystrophy [OPMD], myotonic dystrophy)
   d. Upper eyelid retraction
   e. Lower eyelid retraction
   f. Benign, pre-malignant, or malignant eyelid tumors (eg, papilloma, seborrheic
keratosis, epidermal inclusion cyst, molluscum contagiosum, verruca vulgaris, keratoacanthoma, actinic keratosis, basal cell carcinoma, squamous cell carcinoma, sebaceous cell carcinoma, melanoma)

**g.** Single or recurrent inflammatory lesions (eg, recurrent chalazion or its mimics)

**h.** Facial nerve palsy with exposure keratopathy (eg, tarsorrhaphy, gold weight, lower lid tightening/elevation)

**Lacrimal**

1. Describe the most advanced lacrimal anatomy and physiology.

2. Describe the etiology, evaluation, and medical and surgical treatment of the following lacrimal diseases:
   
   a. Punctal stenosis
   
   b. Canalicular stenosis
   
   c. Common canalicular stenosis

**Orbital**

1. Describe the most advanced orbital anatomy and physiology.

2. Describe the etiology, evaluation, and medical and surgical treatment of the following orbital diseases:

   a. Orbital trauma
      
      i. All orbital fractures
      
      ii. Retrobulbar hemorrhage
      
      iii. Orbital foreign bodies
   
   b. Orbital neoplasms
      
      i. All benign
      
      ii. All malignant
c. Orbital inflammation
   i. Infectious
      1. Bacterial
      2. Fungal
      3. Mycoplasma
         ii. Noninfectious
            1. Thyroid eye disease
            2. Sarcoidosis
            3. Wegener granulomatosis
            4. Nonspecific orbital inflammation
   3. Describe epidemiology, clinical features, evaluation, and management of fetal alcohol syndrome.

B. Technical/Surgical Skills

Eyelid

1. Describe indications for and perform more complicated and advanced "in office" examination techniques for less common but important eyelid abnormalities.

2. Perform more complicated lid procedures, including:
   a. Frontalis sling
   b. Lateral tarsal strip
   c. Eyelid reconstruction

Lacrimal

1. Describe indications for and perform more complicated and advanced "in office" examination techniques for less common but important lacrimal abnormalities.
2. Perform more advanced lacrimal assessment (eg, intraoperative and postoperative testing, more complex trauma to lacrimal system).

3. Describe management of and treat lacrimal system abnormalities, including surgeries (eg, lacrimal probing, dacryocystectomy, dacryocystorhinostomy).

Orbital

1. Describe indications for and perform more complicated and advanced “in office” examination techniques for less common but important orbital abnormalities (eg, forced duction testing).

2. Describe typical and atypical features and describe the differential diagnosis, clinical features, and treatment of more complicated orbital diseases, including:
   a. Complex orbital infections (eg, orbital cellulitis, mucormycosis, aspergillosis)
   b. Congenital tumors (eg, dermoid)
   c. Fibro-osseous disorders and tumors (eg, fibrous dysplasia, osteoma, chondrosarcoma, osteosarcoma, Paget disease)
   d. Vascular tumors (eg, capillary hemangioma, cavernous hemangioma, hemangiopericytoma, lymphangioma, Kaposi 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, schwannoma)
   h. Sarcomas (eg, rhabdomyosarcoma, leiomyosarcoma, liposarcoma, osteosarcoma)
   i. Lymphoid lesions (eg, lymphoid hyperplasia, lymphoma, leukemia)
   j. Metastatic lesions (eg, from breast, prostate, lung, colon)
   k. Thyroid eye disease
1. Nonspecific orbital inflammation

m. Trauma (eg, fractures, foreign body, retrobulbar hemorrhage, traumatic optic neuropathy)

3. Describe indications for and complications of basic orbital skills and procedures, including:
   a. Anterior orbitotomy for tumor biopsy/excision
   b. Orbital floor fracture repair

4. Describe indications for and complications of different orbital approaches and incisions (eg, Kronlein, Caldwell-Luc, transconjunctival, transnasal).

5. Describe indications for and interpret orbital ultrasound, computerized axial tomography (CT or CAT) scan, and magnetic resonance imaging (MRI) scan (eg, orbital trauma, orbital lesions, tumors).

VIII. Pediatric Ophthalmology and Strabismus

Basic Level Goals:

A. Cognitive Skills

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

2. Describe basic visual development and visual assessment of the pediatric ophthalmology patient (eg, central, steady, maintained fixation), including any one matching card, resolution and recognition acuity, and crowding using standard vision testing (eg, tumbling E eye chart, Allen cards, Landolt “C” Broken Ring vision chart).

3. Describe the basic anatomy and physiology of strabismus:
   a. Innervation of extraocular muscles
   b. Primary, secondary, and tertiary actions
   c. Laws governing the muscle actions
d. Comitant and incomitant deviations

e. Overaction and underaction

f. Restrictive and paretic saccades

g. Vergence

h. Pursuit movements

4. Describe basic sensory adaptations for binocular vision, including:
   a. Normal and anomalous retinal correspondence
   b. Suppression
   c. Horopter
   d. Panum area
   e. Fusion
   f. Stereopsis

5. Describe and recognize pseudostrabismus.

6. Describe the different etiologies of amblyopia, including:
   a. Deprivation
   b. Ametropic
   c. Strabismic
   d. Anisometropic
   e. Organic

7. Describe various forms of esotropia, such as:
   a. Congenital
   b. Comitant and incomitant
c. Accommodative and nonaccommodative

d. Decompensated

e. Sensory

f. Neurogenic

g. Myogenic

h. Neuromuscular junction

i. Restrictive

j. Nystagmus and esotropia

k. Spasm of the near

l. Monofixation syndrome

m. Consecutive

8. Describe various forms of exotropia, such as:

a. Congenital

b. Comitant and incomitant

c. Decompensated

d. Sensory

e. Neurogenic

f. Myogenic

g. Neuromuscular junction

h. Restrictive

i. Basic divergence excess

j. Exophoria
k. Convergence insufficiency

9. Describe the nonsurgical treatment of strabismus and amblyopia, such as:
   a. Patching
   b. Atropine penalization
   c. Fresnel and grind-in prism therapy
   d. Convergence exercises

10. Describe different forms of childhood nystagmus.


12. Describe etiologies and types of pediatric cataract with consideration of:
   a. Age of onset
   b. When do you treat and types of treatment
   c. Postoperative rehabilitation

13. Describe and recognize ocular findings in child abuse (eg, retinal hemorrhages) and appropriately refer to Child Protective Services or other authorities.

14. Describe basic evaluation of decreased vision in infants and children, such as:
   a. Delayed maturation of vision
   b. Leber congenital amaurosis
   c. Other hereditary retinal disorders
   d. Congenital glaucoma
   e. Congenital rubella syndrome
   f. Retinopathy of prematurity (ROP)
   g. Various globe anomalies
15. Describe the symptoms, associations, findings, and treatment of childhood glaucoma.

16. Summarize ocular embryology development (ie, lens development, fetal vasculature, anterior segment development, closure of embryonic fissure).

17. Describe common causes of conjunctivitis in infants and children in terms of symptoms, diagnosis, and treatment.

18. Assess subluxated and dislocated lenses and know the systemic associations (eg, Marfan syndrome, homocystinuria, Weill-Marchesani syndrome).

19. Describe management of epiphora in children, including congenital nasolacrimal duct obstruction.

20. Describe refractive errors and spectacle correction in childhood (recognizing that it is arguably the most common cause of preventable visual impairment in children worldwide).

21. Describe accommodation and drugs used for cycloplegia.

22. Describe indications and uses of contact lenses in childhood.

23. Describe normal visual development milestones.

24. Describe the basic principles of genetics.

B. Technical/Surgical Skills

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

2. Assess ocular motility using duction and version testing.

3. Apply Hering law and Sherrington law, and 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. Perform basic measurement of strabismus (eg, Hirschberg test, Krimsky method, cover testing, prism cover testing, simultaneous prism cover testing, alternate cover testing).
5. Perform assessment of vision in the neonate, infant, and child, including:
   a. Fixation preference test
   b. Standard subjective visual acuity tests
   c. Induced tropia test

6. Perform cycloplegic retinoscopy in children using loose lenses, lens stick, or phoropter, depending on the age of the child and availability of the devices in the clinic.

7. Measure the refractive condition of a patient’s eyes using a retinoscope.

8. Recognize and apply in a clinical setting the following skills in the ocular motility examination:
   a. Stereoacuity testing
   b. Accommodative convergence/accommodation ratio (eg, heterophoria method, gradient method)
   c. Tests of binocularity and retinal correspondence
   d. Cycloplegic refraction (ie, retinoscopy)
   e. Anterior and posterior segment examination
   f. Basic and advanced measurement of strabismus
   g. Teller acuity cards

9. 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
f. Intraoperative forced duction test (FDT)

10. Probe tear ducts to diagnose and treat an obstruction.

11. Medically and, if indicated, surgically manage chalazions.

12. Treat molluscum contagiosum with curettage, if indicated.

Standard Level Goals:

A. Cognitive Skills

1. Describe basic and more advanced strabismus examination techniques (eg, combined vertical and horizontal prism cover testing, double Maddox rod testing).

2. Describe basic and more advanced visual development and visual assessment of the pediatric ophthalmology patient (eg, blink to light or threat, measures of fixation and following behavior, objective measures of visual acuity) using the optokinetic nystagmus (OKN) drum to assess fixation and electrophysiological techniques such as sweep visual evoked potential (VEP) evaluation.

3. Describe basics of binocular sensory testing (eg, Titmus stereo testing, Randot stereo testing, Worth 4-dot test, Bagolini lenses).

4. Describe etiologies, evaluation, and management of vertical strabismus, including:
   a. Neurogenic
   b. Myogenic
   c. Neuromuscular junction
   d. Oblique overaction or underaction
   e. Dissociated vertical deviation
   f. Restrictive

5. Describe various strabismus patterns (eg, A or V pattern) and associations with various types of comitant strabismus; the anatomic role of muscle pulleys; and the potential role of radiology in assessing complex strabismus.
6. Describe common hereditary or congenital ocular motility or lid syndromes (eg, Duane syndrome, Marcus Gunn jaw-winking syndrome, Brown syndrome).

7. Describe and recognize typical features of retinoblastoma (eg, differential diagnosis, evaluation, treatment indications, and types).

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

9. Describe recognizable causes of blindness in infants (eg, albinism, optic nerve hypoplasia, achromatopsia, Leber congenital amaurosis, retinal dystrophy, congenital optic atrophy) and appropriate work up and associated diseases.

10. Describe cortical visual impairment and periventricular leukomalacia.

11. Interpret diplopia charts (eg, Hess charts, Lees chart, Harms screen).

12. Evaluate a child with congenital blindness, including VEP and interpretation of an electroretinogram (ERG).

B. Technical/Surgical Skills

1. Perform more advanced strabismus testing, such as Parks-Bielschowsky 3-step test, Lancaster red-green test, Maddox rod testing, double Maddox rod testing, and measurement of dissociated vertical deviation (DVD).

2. Perform forced duction test (FDT) and force generation test (FGT) in the clinic.

3. Perform basic extraocular muscle surgery, and exercise surgical judgment for the indications and contraindications for strabismus surgery.

4. Perform preoperative extraocular muscle surgery assessment, intraoperative techniques, and describe intraoperative and postoperative complications of strabismus surgery.

5. Perform the following strabismus surgeries:
   a. Recession
   b. Resection
Advanced Level Goals:

A. *Cognitive Skills*

1. Describe more advanced anatomy (including pulleys) and physiology of strabismus (eg, torsion, tertiary actions, consecutive deviations).

2. Describe more advanced sensory adaptations (eg, anomalous head position).

3. Describe and recognize the different forms of childhood nystagmus (eg, infantile nystagmus syndrome [INS], fixation maldevelopment nystagmus syndrome [FMNS], spasmus nutans syndrome [SNS]), and appropriate work up for different time of onset and age groups.

4. Describe and recognize ROP (eg, stages, treatment indications).

5. List treatment options and indications of low birth weight children, and describe long-term ocular and systemic problems.

6. Describe and recognize less common hereditary or malformative ocular anomalies and syndromes (eg, Mobius syndrome, Goldenhar syndrome, Peter anomaly, including pedigree chart analysis).

7. Describe etiology, evaluation, and management of congenital infections (eg, TORCHES sequence: TOxoplasmosis, Rubella, Cytomegalovirus, HErpes simplex, Syphilis).

8. Describe and recognize the common causes of pediatric uveitis with natural history, indicated work up, and treatment.

9. Describe congenital optic nerve anomalies in children (eg, optic nerve coloboma, morning glory syndrome, optic nerve hypoplasia), and indicate necessary work up and associated diseases.

10. Describe American Association for Pediatric Ophthalmology and Strabismus (AAPOS) etiology position statements on learning difficulties and dyslexia, and know how to locate educational support resources for parents.

11. Identify referral centers for children with retinoblastoma, the work up for leukocoria, the evaluation of family members, and the principals of genetic counseling.
12. Describe typical features of childhood tumors (eg, hemangiomas, rhabdomyosarcoma) and their management.

13. Describe identifiable congenital ocular anomalies (eg, microphthalmia, persistent fetal vasculature), and describe appropriate work up for etiology, criteria for intervention, and genetic counseling for parents.


B. Technical/Surgical Skills

1. Perform a more advanced extraocular muscle examination based on knowledge of the anatomy and physiology of ocular motility.

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

3. Apply Hering law and Sherrington law in more advanced cases (eg, pseudoparesis of the contralateral antagonist, enhancement of ptosis in myasthenia gravis).

4. Perform more advanced measurements of strabismus (eg, use of synoptophore or amblyoscope, when available).

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

6. Perform the following surgical techniques:
   a. Muscle weakening (eg, tenotomy) and strengthening (eg, tuck) procedures of rectus muscles
   b. Inferior oblique weakening procedures
   c. Use of adjustable sutures

7. Manage the complications of strabismus surgery (eg, slipped muscle, anterior segment ischemia, overcorrection, undercorrection).
IX. Retina, Vitreous and Uveal Diseases

Basic Level Goals:

A. Cognitive Skills

1. Describe basic principles of retinal anatomy and physiology (i.e., basic retinal and choroidal anatomy, retinal and choroidal physiology), with emphasis on macular anatomy and physiology.

2. Describe fundamentals of ancillary testing and demonstrate basic understanding of fluorescein angiography (angiographic phases), optical coherence tomography (OCT) (e.g., macular anatomy, determine pathophysiology behind structural alterations).

3. Describe pathological anatomy, physiopathology, and clinical pictures of the most common vascular diseases:
   a. Diabetic retinopathy
   b. Central vein occlusion
   c. Branch vein occlusion
   d. Arterial occlusion
   e. Hypertensive retinopathy

4. Describe features of different types of retinal detachment (i.e., rhegmatogenous, tractional, exudative).

5. Describe typical features of common macular diseases (e.g., age-related macular degeneration [AMD], macular hole, macular pucker, central serous chorioretinopathy, chloroquine maculopathy, pseudophakic cystoid macular edema).

6. Describe and recognize features of traumatic pathologies, including:
   a. Commotio retinae
   b. Traumatic choroidal rupture
   c. Purtscher retinopathy

7. Describe typical features of retinitis pigmentosa, main macular dystrophies (e.g,
Stargardt, Best, cone dystrophy), and other hereditary pathologies.

8. Describe basic principles of laser photocoagulation (eg, laser response to change in power, duration, and spot size) and photodynamic therapy for retinal treatment.

9. Describe basic principles, techniques, and safety of intravitreal injections.

10. Diagnose, evaluate, and treat (or refer) postoperative/posttraumatic endophthalmitis.

B. Technical/Surgical Skills

1. Perform direct ophthalmoscopy.

2. Perform indirect ophthalmoscopy.

3. Perform slit-lamp biomicroscopy with precorneal lenses, 3-mirror contact lenses, or other wide-field contact lenses.

4. Diagnose the presence of common retinal disorders such as exudative AMD, diabetic retinopathy, cystoid macular edema, central serous retinopathy, based on results of fundus examination, fundus photographs, OCT, and fluorescein angiography.

Standard Level Goals:

A. Cognitive Skills

1. Describe more advanced retinal anatomy and physiology.

2. Describe more advanced ancillary testing concepts of fluorescein and indocyanine green (ICG) angiography as applied to retinal vascular and other diseases (eg, indications, basic differential diagnosis based on angiographic patterns).

3. Describe the fundamentals of retinal electrophysiology and basic ophthalmic echography.

4. Diagnose, evaluate, treat (or refer) the following retinal vascular diseases:
   a. Macular telangiectasia
b. Coats disease

c. Acquired retinal macroaneurysms

d. Ocular ischemic syndrome

e. Sickle cell retinopathy

f. Eales Disease

5. Describe the findings of major studies in vascular retinal diseases, including the following:

a. Diabetic retinopathy

i. Early Treatment Diabetic Retinopathy Study (ETDRS)

ii. Diabetes Control and Complications Trial (DCCT)

iii. United Kingdom Prospective Diabetes Study (UKPDS)

iv. Diabetic Retinopathy Clinical Research Network (DRCRnet) Trials

b. Central vein occlusion

i. Central Vein Occlusion Study (CVOS)

ii. Standard Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE)

iii. Global Evaluation of implantable dexamethasone in retinal Vein occlusion with macular edema (GENEVA) Study Group

iv. Central Retinal Vein Occlusion (CRUISE) Study

c. Branch vein occlusion

i. Branch Vein Occlusion Study (BVOS)

ii. Standard Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE)

iii. GENEVA Study Group

iv. BRAnch Retinal Vein Occlusion (BRAVO) Trial
d. Retinopathy of prematurity
   i. Cryotherapy for Retinopathy of Prematurity (CRYO-ROP)
   ii. Early Treatment for Retinopathy of Prematurity (ETROP)

6. Describe the fundamentals of, evaluate, and treat (or refer) peripheral retinal diseases and vitreous pathologies (eg, vitreous hemorrhage, posterior vitreous detachment, retinal tears, giant retinal tears, lattice degeneration with atrophic holes).

7. Describe the techniques for retinal detachment repair, including indications, mechanics, instruments, basic techniques, and surgical adjuvants, including heavy liquids, expandable gases, and silicone oil for the following:
   a. Pneumatic retinopexy
   b. Scleral buckling
   c. Vitrectomy

8. Describe and recognize typical features of less common macular diseases:
   a. Myopic maculopathy
   b. Serous retinal detachment secondary to optic disc pit
   c. Ocular histoplasmosis syndrome
   d. Phenothiazine/tamoxifen toxicity

9. Diagnose, evaluate, treat, and classify open and closed globe trauma (eg, Birmingham Eye Trauma Terminology System).

10. Describe, evaluate, and treat (or refer) postoperative/posttraumatic choroidal detachments and sympathetic ophthalmia.

11. Describe, recognize, and evaluate hereditary pathologies, such as juvenile retinoschisis and choroidal dystrophies (eg, choroideremia, gyrate atrophy).

12. Describe the indications/complications for and perform basic laser treatment for diabetic retinopathy (eg, panretinal photocoagulation, macular grid).
B. *Technical/Surgical Skills*

1. Perform indirect ophthalmoscopy with scleral indentation.

2. Perform ophthalmoscopic examination with contact lenses, including panfundusscopic lenses.

3. Interpret fluorescein and indocyanine green (ICG) angiography and correlate findings with differential diagnosis.

4. Diagnose the presence of pigment granules in the anterior vitreous (ie, Shafer sign) during a retinal detachment or retinal break.

5. Describe the indications for and interpret retinal imaging technology (eg, OCT, retinal thickness analysis).

6. Perform posterior segment photocoagulation.


8. Perform peripheral scatter photocoagulation (panretinal).

9. Perform laser retinopexy (demarcation) for isolated retinal breaks.

10. Describe the indications for and interpret basic electrophysiological tests (eg, electroretinogram [ERG], electrooculogram [EOG], visual evoked potential [VEP], dark adaptation).

11. Interpret basic echographic patterns (eg, rhegmatogenous retinal detachment, tractional retinal detachment, posterior vitreous detachment, choroidal detachment, intraocular foreign body).

12. Perform fundus drawings of the retina, showing vitreoretinal relationships and findings.

13. Perform (or assist during) cryotherapy of retinal holes and other pathology.

14. Describe indications, techniques, and complications of pars plana vitrectomy and scleral buckling.

15. Perform (or assist during) vitreous tap and intravitreal antibiotic injections for the treatment of endophthalmitis.

17. Perform intravitreal injection of anti-vascular endothelial growth factor (VEGF) drugs for the treatment of AMD.

**Advanced Level Goals:**

*A. Cognitive Skills*

1. Apply into clinical practice the most advanced knowledge of retinal anatomy and physiology (eg, surgical anatomy).

2. Apply into clinical practice the most advanced ancillary testing concepts of fluorescein/ICG angiography in complex retinal vascular disease and other vascular diseases.

3. Describe and apply retinal electrophysiology.

4. Evaluate, treat, or refer the most complex forms of retinal vascular diseases:
   a. Combined arterial and venous obstructions
   b. Advanced diabetic retinopathy
   c. Advanced hypertensive retinopathy
   d. Peripheral retinal vascular occlusive disease

5. Describe the findings of major studies in age-related macular degeneration:
   a. Treatment of Age-Related Macular Degeneration with Photodynamic Therapy Study (TAP)
   b. Verteporfin in Photodynamic Therapy Study (VIP)
   c. Minimally Classic/Occult Trial of the Anti-Vascular Endothelial Growth Factor (VEGF) Antibody Ranibizumab in the Treatment of Neovascular AMD (MARINA)
   d. Anti-VEGF Antibody for the Treatment of Predominantly Classic Choroidal
Neovascularisation in AMD (ANCHOR)

e. The Comparisons of Age-Related Macular Degeneration Treatments Trials (CATT)

6. Evaluate and diagnose complex cases of retinal detachment (eg, acute retinal necrosis, proliferative vitreoretinopathy).

7. Diagnose and classify retinopathy of prematurity.

8. Diagnose and manage (or refer) complex trauma cases (eg, chorioretinitis sclopetaria, intraocular foreign body, shaken baby syndrome).


10. Describe the treatment algorithm for each specific retinal condition, with special emphasis on pros and cons.

B. Technical/Surgical Skills

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

2. Perform ophthalmoscopic examination with panfunduscopic or other lenses in complex retinal conditions (eg, giant retinal tears, proliferative vitreoretinopathy).

3. Interpret and apply in clinical practice the results of fluorescein and ICG angiography and OCT in complex retinal or choroidal pathology.

4. 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 (panretinal)
   c. Laser retinopexy (demarcation) of large or multiple breaks; cryotherapy

5. Interpret and apply in clinical practice electrophysiology (eg, ERG, EOG, VEP, dark adaptation) in more complicated retinal pathology.
6. Interpret and apply in clinical practice ocular imaging techniques (eg, B-scan echography) in more complex cases (eg, choroidal osteoma).

7. Perform detailed 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. Perform laser therapy or cryotherapy of retinal holes and other more complex retinal pathologies.

9. Participate during scleral buckling and pars plana vitrectomy surgeries.

X. Uveal Diseases

Basic Level Goals:

A. Cognitive Skills

1. Describe the definition and classification of intraocular inflammation.

2. Describe the basic principles of history taking:

   a. Ocular history

      i. Correlate with possible anatomical diagnosis (eg, photophobia and anterior uveitis; floaters and posterior uveitis)

      ii. Describe the onset (sudden or insidious)

      iii. Describe the duration (limited or persistent)

      iv. Describe the course (acute, recurrent, chronic)

      v. Investigation and treatment history

   b. Systemic history

      i. Known diseases, including immunosuppressed states, such as HIV, malignancy, diabetes mellitus

      ii. Symptoms of recent onset for (eg, fever, chills, and rigors may suggest sepsis)
iii. Systems review, including all medications, past and current

3. List the clinical features of:
   a. Anterior uveitis
   b. Intermediate uveitis
   c. Posterior or panuveitis
   d. Episcleritis and scleritis (eg, red eye, blurred vision)
   e. Anterior segment cell and flare
   f. Keratic precipitates (nongranulomatous or granulomatous)
   g. Posterior synechiae
   h. Vitreous cell and flare
   i. Vitreous opacities
   j. Snowbank
   k. Retinal and/or choroidal lesions
   l. Retinal vasculitic
   m. Retinal detachment (exudative, tractional, and rhegmatogenous)
   n. Optic disc changes (eg, optic disc edema, optic neuritis).

4. Describe the typical demographic features, clinical features, and differential diagnosis of common, rapidly blinding causes for items 3a–3n above (based on local epidemiological data). For example:
   a. Anterior uveitis
      i. Infectious (eg, bacterial, viral, protozoal, parasitic)
      ii. Inflammatory (eg, sarcoidosis, HLA B27-associated, juvenile idiopathic arthritis, Behçet disease, collagen vascular disease)
      iii. Postsurgical uveitis
iv. Posttraumatic

v. Fuchs uveitis syndrome

vi. Posner-Schlossman syndrome

b. Intermediate uveitis

i. Pars planitis

ii. Toxocariasis

iii. Sarcoidosis

iv. Multiple sclerosis

c. Posterior or panuveitis

i. Infectious (eg, toxoplasmosis, toxocariasis, tuberculosis, acquired and congenital ocular syphilis, acute retinal necrosis)

ii. Inflammatory (eg, sarcoidosis, Behçet disease, Vogt-Koyanagi-Harada disease, sympathetic ophthalmia)

iii. Postoperative uveitis

iv. Endophthalmitis (eg, postoperative, traumatic, endogenous, fungal, phacoanaphylactic)

d. Episcleritis and scleritis

i. Collagen vascular diseases (eg, rheumatoid arthritis, Wegener granulomatosis)

ii. Infection (eg, syphilis, tuberculosis, fungal, parasitic, bacterial)

5. Describe indications for ancillary testing in the evaluation of uveitis (eg, fluorescein angiography [FA], indocyanine green [ICG] angiography, optical coherence tomography [OCT], B-scan ultrasonography).

6. Describe indications for a tailored approach (based on clinical features) to laboratory investigations, including obtaining tissue and fluid samples for examination and systemic imaging studies (eg, x-ray of chest, sacroiliac joint, chest computerized axial tomography [CT or CAT] scan).
7. Describe the indications and contraindications of topical steroids, nonsteroidal anti-inflammatory drugs (NSAIDs), and cycloplegics.

B. Technical/Surgical Skills

1. Perform slit-lamp examination of the anterior segment to detect and evaluate clinical features of anterior uveitis, including:
   a. Corneal pathology (active keratitis or scars, endotheliitis, band keratopathy)
   b. Pattern of keratic precipitates (nongranulomatous, granulomatous)
   c. Iris changes (rubeosis iridis, gross iris atrophy)
   d. Anterior chamber evaluation of cells and flare, including grading according to standardization of uveitis nomenclature (SUN) working group grading system
   e. Differentiate episcleritis from scleritis
   f. Describe the activity (active or quiescent)

2. Perform dilated examination of the posterior segment with slit-lamp biomicroscopy using noncontact and contact lenses, indirect ophthalmoscopy.
   a. Vitreous evaluation for cells and flare, including grading of vitreous haze according to SUN working group grading system
   b. Retina/choroid (retinal detachment, choroidal or retinal inflammation)
   c. Retinal vasculature (vascular inflammation)
   d. Optic disc (swelling, pallor)

3. Describe the regional epidemiology of uveitis and relate this information to the diagnosis.

4. List the following:
   a. Uveitis in immunosuppressed individuals with active and recovered acquired immune deficiency syndrome or pharmacologic immunosuppression (eg, cytomegalovirus retinitis, pneumocystis (carinii) jiroveci)
b. Unusual infectious etiologies for uveitis (eg, Lyme disease, West-Nile fever)
c. Masquerade syndromes such as vitreoretinal lymphoma

5. Differentiate infective from noninfective causes of uveitis.

6. Perform pars plana evaluation and sclera depression.

7. Interpret fluorescein angiography, B-scan ultrasonography, and correlate clinically.

8. Provide patient with all relevant information about proposed ancillary testing procedures for uveitis, including risks and complications.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Describe the pathophysiology of intraocular inflammation.

2. Describe the principles of history taking of patients with uveitis according to SUN.

3. Describe the importance of being guided by clinical findings from the ocular examination and taking a more specific history in order to generate a list of differential diagnoses.

4. Describe more advanced principles of examination of patients with uveitis and differential diagnoses of the clinical signs:

   a. Anterior segment (eg, iris nodules, pupillary membrane, peripheral anterior synechiae, iris bombe)
   
   b. Posterior segment (eg, pars plana signs of inflammation [snowballs], retinal detachment, retinal vasculitis, optic swelling [differentiate optic neuritis from hyperemia], macula [macular edema])

5. Describe the regional epidemiology of uveitis and relate this information to the diagnosis.

6. Describe the typical demographic feature, clinical features, and differential diagnosis of:
a. Common uveitis in immunosuppressed individuals (eg, cytomegalovirus retinitis, endogenous endophthalmitis)

b. Masquerade syndromes such as vitreoretinal lymphoma

7. Differentiate serious infective from noninfective causes of uveitis. (eg, recognize an endogenous endophthalmitis and differentiate this from an immune-mediated uveitis, such as Behçet disease).

8. Describe angiographic features of retinitis, choroiditis, and vasculitis.

9. Describe the B-scan features of certain retinal, choroidal, and scleral diseases.

10. Describe the OCT features of macular edema.

11. Describe the common complications of common uveitis syndromes (eg, intraocular pressure elevation, cataract, band keratopathy, macular edema).

12. Describe indications and contraindications for corticosteroid treatment of uveitis (eg, topical, local, systemic), including risks and benefits of therapy.

13. Describe the management of common uveitic syndromes.

B. Technical/Surgical Skills

1. Perform a more advanced examination of the anterior and posterior segment in addition to that described for .

a. Anterior segment (eg, iris nodules, pupillary membrane, peripheral anterior synechiae, iris bombe)

b. Posterior segment (eg, pars plana signs of inflammation [snowballs], retinal detachment, retinal vasculitis, optic swelling [differentiate optic neuritis from hyperemia], macula [macular edema])

2. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of common, rapidly blinding causes of uveitis (based on local epidemiological data), as described in the curriculum of .

3. Administer topical steroids, NSAIDs, and cycloplegics in the treatment of uveitis.
4. Interpret the results of ancillary tests (eg, fluorescein angiography, OCT, B-scan ultrasonography) for diagnosis.

5. Perform a major investigational work up (eg, laboratory testing, radiologic testing) according to epidemiologic data, history, and clinical examination.

6. Evaluate uveitis associated with immunosuppressed individuals (eg, active and recovered acquired immune deficiency syndrome, pharmacologic immunosuppression).

7. Interpret indocyanine green angiography findings and correlate clinically.

8. Perform posterior subtenon or transseptal injection of corticosteroids.


10. Manage side effects of immunosuppressive therapy.

11. Perform an anterior chamber and vitreous tap for diagnostic purposes and administer intravitreal injection antibiotics in cases of bacterial endophthalmitis.

**Advanced Level Goals:**

A. **Cognitive Skills**

1. Describe the more complex complications of common uveitis syndromes in addition to that mentioned in (eg, retinal vascular occlusion, retinal neovascularization and vitreous hemorrhage, inflammatory choroidal neovascularization, hypotony).

2. Describe indications and contraindications for corticosteroid treatment of uveitis (eg, topical, local, systemic), including risks and benefits of therapy.

3. Describe the management of common uveitic syndromes.

4. Describe the techniques of anterior chamber and vitreous tap and of intravitreal injection of antibiotics in cases of bacterial endophthalmitis.

5. Describe more advanced examination principles for patients with more subtle signs of uveitis, such as:

   a. Anterior segment (eg, conjunctival ulcer, iris transillumination defects, granuloma)
b. Posterior segment (eg, pars plana signs of inflammation [snowbanks and snowballs], retinal detachment [exudative, tractional, rhegmatogenous], retinal vasculitis [periphlebitis or arteritis, occlusive or nonocclusive], optic nerve [optic disc granuloma, optic neuritis, disc neovascularization], macula [macular edema, choroidal neovascularization])

6. Describe in greater detail the angiographic features of retinitis, choroiditis, and vasculitis.

7. Describe indications and contraindications for commonly used immunotherapy for uveitis in addition to corticosteroid therapy (eg, azathioprine, cyclosporine A), including risks and benefits of therapy.

8. Describe the clinical features and differential diagnoses for less common forms of uveitis (eg, Whipple disease, Crohn disease).

B. Technical/Surgical Skills

1. Perform a more advanced examination of the anterior and posterior segment, for example:
   a. Anterior segment (eg, conjunctival ulcer, iris transillumination defects, granuloma)
   b. Posterior segment (eg, pars plana signs of inflammation [snowbanks and snowballs], retinal detachment [exudative, tractional, rhegmatogenous], retinal vasculitis [periphlebitis or arteritis, occlusive or nonocclusive], optic nerve [optic disc granuloma, optic neuritis, disc neovascularization], macula [macular edema, choroidal neovascularization])

2. Differentiate active from inactive disease and arterial from venous side disease.

3. Recognize serious infective causes from noninfective causes of uveitis.

4. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of uveitis common in the region via the process of history taking, clinical examination, and the use of investigative tools (such as FA, ICG, B-scan, OCT).
5. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of uveitis in:
   a. Immunosuppressed individuals (eg, cytomegalovirus retinitis, endogenous endophthalmitis)
   b. Masquerade syndromes, such as vitreoretinal lymphoma

6. Evaluate the common complications of common uveitic syndromes (eg, glaucoma, cataract, band keratopathy, macular edema).

7. Administer periocular corticosteroid injections in addition to topical corticosteroids in the treatment of uveitis.

8. Perform an anterior chamber and vitreous tap for diagnostic purposes and to give intravitreal injection of antibiotics in cases of bacterial endophthalmitis.


12. Provide patient with relevant information about possible side effects of medications and proper monitoring of medications.
Minimum requirements for diagnostic and therapeutic procedures for candidates for comprehensive Ophthalmology fellowship

SUBJECT SPECIFIC PRACTICE BASED OR PRACTICAL COMPETENCIES

Essential diagnostic skills:

(The procedures where minimum numbers are listed should be a part of the log book to ensure compliance)

I. Examination techniques along with interpretation

1. Slit lamp Examination
   i. Diffuse examination
   ii. Focal examination
   iii. Retroillumination – direct and indirect
   iv. Sclerotic scatter
   v. Specular reflection
   vi. Staining modalities and interpretation

2. Fundus evaluation
   • Direct/Indirect ophthamoscopy
   • Fundus drawing
   • 3-mirror examination of the fundus
   • 78-D/90-D/60-D examination
   • Amsler’s charting
II. Basic investigations along with their interpretation

1. Tonometry
   Tonometry – Applanation (25)/Indentation (25)/Non-contact

2. Gonioscopy (25)
   Indentation Gonioscopy grading of the anterior chamber angle

3. Tear/ Lacrimal function tests
   i. Staining- fluorescein and Rose Bengal(30)
   ii. Schirmer test/tear film break up time (30)
   iii. Syringing (30)
   iii. Dacrocystography

4. Cornea
   • Corneal scraping and cauterization (10)
   • Smear preparation and interpretation (Gram’s stain (20) /KOH (20)
   • Media inoculation
   • Keratometry - performance and interpretation (25)
   • Pachymetry
   • Corneal topography - if available

5. Colour Vision evaluation
   • Ishihara pseudoisochromatic plates
   • Farnsworth Munsell, if available

6. Refraction (50)
   i. Retinoscopy- Streak/ Priestley Smith
   ii. Use of Jackson’s cross-cylinder
   iii. Subjective and objective refraction
   iii. Prescription of glasses
7. Diagnosis and assessment of Squint
   i. Ocular position and motility examination (25)
   ii. Synoptophore usage
   iii. Hess/Lees screen usage (25)
   iv. Diplopia charting (25)
   v. Assessment of strabismus - cover tests/prisms bars
   vi. Amblyopia diagnosis and treatment
   vii. Assessment of convergence, accommodation, stereopsis, suppression

8. Exophthalmometry

   Usage of Hertel’s exophthalmometer - proptosis measurement

9. Contact lenses
   • Fitting and assessment of RGP and soft lenses
   • Subjective verification of over refraction
   • Complications arising of contact lens use
   • Educating the patient regarding CL usage and imparting relevant knowledge of the complications arising thereon

10. Low Vision Aids
    • Knowledge of basic optical devices available and relative advantages and disadvantages of each.
    • The basics of fitting with knowledge of availability & cost

III. The Fellow must be well versed with the following investigative modalities although he may or may not perform it himself. But he should be able to interpret the following tests:

1. Fundus photography
2. Fluorescein angiography
3. Ophthalmic ultrasound  A-scan/B scan
4. Automated perimetry for glaucoma and neurological lesions

5. Radiological tests - X rays - Antero posterior/ Lateral view
   
   PNS (Water’s view) / Optic canal views
   
   Localisation of intra-ocular and intra-orbital FBs
   
   Interpretations of -USG/ CT/ MRI Scans

6. OCT and UBM

7. ERG, EOG, and VEP

8. Corneal topography

IV. Minor surgical procedures – Must know and perform independently
   
   • Conjunctival and corneal foreign body removal on the slit lamp
   • Chalazion incision and curettage
   • Pterygium excision
   • Biopsy of small lid tumours
   • Suture removal- skin/conjunctival/corneal/ corneoscleral
   • Tarsorrhaphy
   • Subconjunctival injection
   • Retrobulbar, parabulbar anaesthesia
   • Posterior Sub-Tenon’s injections
   • Artificial eye fitting
   • Acute Management of acid & alkali burns.

V. Surgical procedures

1. Must know and can perform independently
   
   a. Ocular anaesthesia:
      
      • Retrobulbar anaesthesia
      • Peribulbar anaesthesia
• Facial blocks - O’Brein / Atkinson/Van lint and modifications
• Frontal blocks
• Infra orbital blocks
• Blocks for sac surgery

2. Must be able to independently perform and deal with complications arising from the following surgeries:
• Lid Surgery - Tarsorrhaphy
  Ectropion and entropion
  Lid repair following trauma
  Epilation
• Destructive procedures
  Evisceration with or without implant
  Enucleation with or without implant
• Sac surgery
  i. Dacryocystectomy
  ii. Dacryocystorhinostomy
  iii. Probing for congenital obstruction of nasolacrimal duct
• Strabismus surgery
  Recession and resection procedures on the horizontal recti.
• Orbit surgery
  Incision and drainage via anterior orbitotomy for abscess
• Cyclocryotherapy/Cyclophotocoagulation

3. Fellows should be well conversant with use of Operating microscope and must be able to perform the surgeries listed below competently under the same:
• Cataract surgery
  i. Standard ECCE with or without IOL implantation
ii. Small incision ECCE with or without IOL implantation and/or Phacoemulsification with PC IOL implantation

iii. Secondary AC or PC IOL implantation

• Vitrectomy/Scleral buckling

  #1. Intra-vitreal and intra-cameral (anterior chamber) injection techniques and doses of drugs for the same

  #2. Needs to know the basis of open sky vitrectomy (anterior segment) as well as management of cataract surgery complications.

  #3. Assisting vitrectomy and scleral buckling procedures

• Ocular surface procedures

  Pterygium excision with modifications
  Conjunctival cyst excision/foreign body removal
  Corneal foreign body removal
  Conjunctival flap/ peritomy

• Glaucoma Trabeculectomy

• Corneal

  Repair of corneo - scleral perforations
  Corneal suture removal
  Application of glue and bandage contact lens

4. Should have performed/assisted the following microscopic surgeries

  i. Keratoplasty

     Therapeutic and optical

  ii. Glaucoma surgery

     Pharmacological modulation of trabeculectomy

     Trabeculotomy
Goniotomy

Glaucoma valve implant surgery

5. Desirable to be able to perform following laser procedures
   - Yag Capsulotomy
   - Laser iridotomy
   - Focal and panretinal photocoagulation

6. Should have assisted/knowledge of Keratorefractive procedures

Operations:

The fellow is provided with an opportunity to perform operations both extra-ocular and intra-ocular with the assistance of or under the direct supervision of a faculty member. He is provided with an opportunity to learn special and complicated operations by assisting the faculty in operations of cases of the specialty and be responsible for the post-operative care of these cases.

It is essential that the fellow should perform at least 50 cataract surgeries, 5 glaucoma surgeries and 5 squint surgeries and 5 sac surgeries and 5 eye retrieval procedures by the completion of the term.
Minimum Infrastructure requirements:

**Equipment:**

- Slit lamps with Applanation tonometer (1 for every 2 students), observer tube/photoattachment (atleast in one slit lamp)
- Direct and indirect ophthalmoscope.
- 90 D, 78 D lens and gonioscope.
- Retinoscope
- Visual Field Analyzer
- Fundus Fluorescein Angiography
- Lasers – YAG, Diode/Double frequency
- A and B ultrasonography
- Keratometer/autorefractometer
- Synaptophore
- Hess/Less chart
- Red/Green Spectacles
- Hertel’s exophthalmometer
- Operating microscope with side viewing piece or a camera.
- Phaco machine
- Vitrectomy machine
- Colour vision charts
- Paediatric vision tools
- Essential anaesthesia and resuscitation equipment
- Basic Wet lab facilities with operating microscope (may be shared with other faculties)
OCULOPLASTIC, ORBITAL AND LACRIMAL SURGERY
Basic Level Goals:

A. Cognitive Skills

General
1. Perform preoperative and postoperative assessment of patients with common oculoplastic disorders.

Eyelid
1. Describe basic anatomy and physiology (eg, orbicularis, meibomian glands, Zeis glands, orbital septum, levator muscle, Müller muscle, Whitnall ligament, Lockwood ligament, preaponeurotic fat, scalp, face).
2. Describe basic mechanisms and indications for treatment of eyelid trauma (lid margin sparing, lid margin involving, canaliculus involving).
3. Describe mechanisms and indications for treatment of ptosis.
4. Describe mechanisms and indications for treatment of upper and lower eyelid retraction.
5. Describe mechanisms and indications for treatment of entropion.
7. Identify floppy eyelid syndrome and its systemic associations.
8. Identify blepharospasm and hemifacial spasm.
9. Describe history and examination findings for benign and malignant lid lesions.

Lacrimal
1. Describe basic anatomy and physiology (eg, puncta, canaliculi, lacrimal sac, nasolacrimal duct, endonasal anatomy, lacrimal glands).
2. Identify dacryocystitis.

3. Describe mechanisms of tearing.

4. Describe mechanisms and indications for treatment of congenital and acquired nasolacrimal duct obstruction.

5. Recite the differential diagnosis of lacrimal gland mass (eg, inflammatory, neoplastic, congenital, infectious).

Orbital

1. Describe basic anatomy (eg, orbital bones, orbital foramina, paranasal sinuses, annulus of Zinn, arterial and venous vascular supply, nerves, extraocular muscles).

2. Identify normal orbital and relevant nasal and paranasal sinus anatomy on imaging studies (eg, computed tomography, magnetic resonance imaging).

3. Describe basic mechanisms and indications for treatment of orbital trauma (eg, medial wall and floor fractures, retrobulbar hemorrhage).

4. Describe the pathophysiology of thyroid eye disease.


7. Describe typical features of orbital cellulitis.

B. Technical/Surgical Skills

Eyelid

1. Describe indications for and perform the basic office examination techniques for the most common eyelid abnormalities (eg, margin reflex distance, palpebral fissure height, levator function, lagophthalmos, lid crease, lid laxity assessment, brow height, dermatochalasis, eversion, double eversion).

2. Perform minor lid and conjunctival procedures (eg, repair of small eyelid laceration including marginal, removal of benign eyelid lesions, chalazion curettage or excision, conjunctival biopsy).
3. Treat complications of minor operating room procedures (eg, incision and drainage of chalazia, excision of small eyelid lesions).

4. Identify and treat trichiasis (eg, epilation, cryotherapy, surgical therapy).

5. Describe indications for and perform a temporary tarsorrhaphy.

6. Describe indications for and perform evert ing sutures (Quickert sutures).

7. Describe indications for and perform a lateral canthotomy/cantholysis.

Lacrimal

1. Describe indications for and perform the basic office examination techniques for the most common lacrimal abnormalities (eg, Schirmer test, dye disappearance test, punctal position, punctal dilation, canalicular probing, lacrimal probing and irrigation).

2. Describe indications for and perform an incision and drainage of the lacrimal sac.

3. Perform punctal plug insertion or removal.

Orbital

1. Describe indications for and perform the basic office examination techniques for the most common orbital abnormalities (eg, Hertel measurement, inspection, palpation, auscultation).

2. Identify indications for and perform the basic anophthalmic socket assessment (eg, types of implants, implant movement, socket health, socket surface, socket volume, fornices, prosthesis type and fit).

Standard Level Goals:

A. Cognitive Skills

General

1. Perform preoperative and postoperative assessment of patients with simple and more serious oculoplastic disorders (eg, multidisciplinary procedures).
Eyelid

1. Describe more advanced eyelid anatomy and physiology (eg, lymphatics).

2. Describe the mechanisms of and indications for eyelid reconstruction.

3. Described the genetics (where known), clinical features, evaluation, and treatment of congenital eyelid deformities (eg, coloboma, distichiasis, epicanthus, telecanthus, blepharophimosis, ankyloblepharon, epiblepharon, euryblepharon, cryptophthalmia, Goldenhar syndrome, Treacher-Collins syndrome, Waardenburg syndrome).

4. Describe clinical features, evaluation, syndromic association and management of congenital ptosis (eg, simple, blepharophimosis-ptosis-epicanthus inversus syndrome [BPES], jaw wink, congenital fibrosis).

5. Describe the genetics (when applicable), clinical features, evaluation, and treatment of acquired myogenic ptosis (eg, oculopharyngeal muscular dystrophy, mitochondrial myopathies, myotonic dystrophy, myasthenia gravis).

6. Describe the clinical features, evaluation, and treatment of acquired neurogenic ptosis (eg, third nerve palsy, Horner syndrome).

7. Describe the mechanisms and indications for treatment of more advanced eyelid trauma (eg, chemical burns, thermal burns, canthal avulsions, eyelid avulsions).


Lacrimal

1. Describe more advanced lacrimal anatomy and physiology (eg, lacrimal pump theories).

2. Describe the mechanisms and indications for treatment of more advanced lacrimal trauma (eg, nasolacrimal duct obstructions resulting from facial fractures).

3. Describe features, evaluation, and treatment of more complicated cases of nasolacrimal duct obstruction, canaliculitis, dacryocystitis, and acute and chronic dacryoadenitis.

4. Describe the genetics, clinical features, evaluation, and management of lacrimal
dysgenesis.

**Orbital**

1. Describe more advanced orbital anatomy and physiology (eg, vascular anatomy, neural anatomy, orbital septa).

2. Describe the clinical features, evaluation, and management of congenital orbital deformities (eg, anophthalmia, microphthalmia, hypotelorism, hypertelorism versus telecanthus).

3. Describe the genetics, clinical features, evaluation, and management of common craniosynostoses and other congenital malformations (eg, Crouzon syndrome, Apert syndrome).

4. Describe the mechanisms and indications for treatment of more advanced orbital trauma (eg, zygomaticomaxillary complex fractures, naso-orbital ethmoid fractures, Le Fort fractures).

5. Identify, evaluate, and treat thyroid ophthalmopathy (eg, epidemiology, symptoms and signs, associated systemic diseases, orbital imaging, differential diagnosis, surgical, medical, and radiation indications, side effects of treatment).

6. Identify, evaluate, and treat nonspecific orbital inflammation (eg, symptoms and signs, orbital imaging, differential diagnosis, biopsy indications, choice of treatments).

**B. Technical/Surgical Skills**

**Eyelids**

1. Describe indications for and perform more advanced examination techniques for less common eyelid abnormalities (eg, decreased blink, orbicularis weakness, contour abnormalities, marginal entropion).

2. Describe indications for and complications of, and perform more complicated minor lid procedures (eg, larger benign skin lesions, recurrent chalazia).

3. Describe indications for and complications of, and perform more complicated eyelid surgery (eg, upper blepharoplasty, lower lid tightening).
4. Describe indications for and complications of, and perform more advanced eyelid reconstruction (eg, wedge/pentagonal block resection).

5. Identify indications for and complications of, and treat blepharospasm and hemifacial spasm.

6. Identify histopathological features of common eyelid conditions.

**Lacrimal**

1. Identify indications for and perform more advanced lacrimal assessment (eg, interpretation of dye testing, canalicular probing in trauma).

2. Describe indications for and complications of, and perform basic lacrimal procedures (eg, lacrimal drainage testing [irrigation, Jones Dye Tests 1 and 2], lacrimal probing, lacrimal intubation, incision and drainage of lacrimal sac abscess).

3. Identify indications for and interpret lacrimal imaging (eg, scintigraphy, cystography).

4. Identify histopathological features of common lacrimal conditions.

**Orbit**

1. Describe indications for and perform more advanced assessment of the orbit (eg, hypoglobus, facial asymmetry, enophthalmos, proptosis).

2. Describe indications for and complications of, and perform enucleation and evisceration.

3. Identify indications for and perform more advanced socket assessment (eg, extrusion of implants, anophthalmic socket complications).

4. Identify common orbital pathology (eg, orbital fractures, orbital tumors) on imaging studies (eg, magnetic resonance imaging, computed tomography, ultrasound).

5. Treat common presentations of orbital cellulitis.

6. Identify histopathological features of common orbital conditions.
Advanced Level Goals:

A. Cognitive skills

General

1. Perform preoperative and postoperative assessment and coordination of care of patients with more advanced or complex oculoplastic-related disorders (eg, systemically ill patients, multidisciplinary procedures).

Eyelid

1. Describe the most advanced eyelid anatomy and physiology.
2. 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, spastic, cicatricial, congenital)
   c. Complex myogenic ptosis (eg, myasthenia gravis, chronic progressive external ophthalmoplegia [CPEO], oculopharyngeal muscular dystrophy [OPMD], myotonic dystrophy)
   d. Upper eyelid retraction
   e. Lower eyelid retraction
   f. Benign, pre-malignant, or malignant eyelid tumors (eg, papilloma, seborrheic keratosis, epidermal inclusion cyst, molluscum contagiosum, verruca vulgaris, keratoacanthoma, actinic keratosis, basal cell carcinoma, squamous cell carcinoma, sebaceous cell carcinoma, melanoma)
   g. Single or recurrent inflammatory lesions (eg, recurrent chalazion or its mimics)
   h. Facial nerve palsy with exposure keratopathy (eg, tarsorrhaphy, gold weight, lower lid tightening/elevation)

Lacrimal
1. Describe the most advanced lacrimal anatomy and physiology.

2. Describe the etiology, evaluation, and medical and surgical treatment of the following lacrimal diseases:
   a. Punctal stenosis
   b. Canalicular stenosis
   c. Common canalicular stenosis

**Orbital**

1. Describe the most advanced orbital anatomy and physiology.

2. Describe the etiology, evaluation, and medical and surgical treatment of the following orbital diseases:
   a. Orbital trauma
      i. All orbital fractures
      ii. Retrobulbar hemorrhage
      iii. Orbital foreign bodies
   b. Orbital neoplasms
      i. All benign
      ii. All malignant
   c. Orbital inflammation
      i. Infectious
         1. Bacterial
         2. Fungal
         3. Mycoplasma
      ii. Noninfectious
1. Thyroid eye disease
2. Sarcoidosis
3. Wegener granulomatosis
4. Nonspecific orbital inflammation
3. Describe epidemiology, clinical features, evaluation, and management of fetal alcohol syndrome.

B. Technical/Surgical Skills

Eyelid
1. Describe indications for and perform more complicated and advanced “in office” examination techniques for less common but important eyelid abnormalities.
2. Perform more complicated lid procedures, including:
   a. Frontalis sling
   b. Lateral tarsal strip
   c. Eyelid reconstruction

Lacrimal
1. Describe indications for and perform more complicated and advanced “in office” examination techniques for less common but important lacrimal abnormalities.
2. Perform more advanced lacrimal assessment (eg, intraoperative and postoperative testing, more complex trauma to lacrimal system).
3. Describe management of and treat lacrimal system abnormalities, including surgeries (eg, lacrimal probing, dacryocystectomy, dacryocystorhinostomy).

Orbital
1. Describe indications for and perform more complicated and advanced “in office” examination techniques for less common but important orbital abnormalities (eg,
2. Describe typical and atypical features and describe the differential diagnosis, clinical
features, and treatment of more complicated orbital diseases, including:
   a. Complex orbital infections (eg, orbital cellulitis, mucormycosis, aspergillosis
   b. Congenital tumors (eg, dermoid)
   c. Fibro-osseous disorders and tumors (eg, fibrous dysplasia, osteoma, chondrosarcoma, osteosarcoma, Paget disease)
   d. Vascular tumors (eg, capillary hemangioma, cavernous hemangioma, hemangiopericytoma, lymphangioma, Kaposi 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, schwannoma)
   h. Sarcomas (eg, rhabdomyosarcoma, leiomyosarcoma, liposarcoma, osteosarcoma)
   i. Lymphoid lesions (eg, lymphoid hyperplasia, lymphoma, leukemia)
   j. Metastatic lesions (eg, from breast, prostate, lung, colon)
   k. Thyroid eye disease
   l. Nonspecific orbital inflammation
   m. Trauma (eg, fractures, foreign body, retrobulbar hemorrhage, traumatic optic neuropathy)

3. Describe indications for and complications of basic orbital skills and procedures, including:
   a. Anterior orbitotomy for tumor biopsy/excision
   b. Orbital floor fracture repair
4. Describe indications for and complications of different orbital approaches and incisions (eg, Kronlein, Caldwell-Luc, transconjunctival, transnasal).

5. Describe indications for and interpret orbital ultrasound, computerized axial tomography (CT or CAT) scan, and magnetic resonance imaging (MRI) scan (eg, orbital trauma, orbital lesions, tumors).

Very Advanced Level Goals:

A. Cognitive Skills

General

1. Perform preoperative and postoperative assessment and counseling of patients with cosmetic oculoplastic concerns.

2. Describe regional anatomy including graft donor sites frequently used (eg, cranial bone, ear, nose, temporal area, mouth and neck, abdomen, buttocks, legs, supraclavicular area, arm).

3. Describe the fundamentals of ocular and orbital anatomy, chemistry, physiology, microbiology, immunology, and wound healing.

4. Order and interpret imaging techniques.

5. Describe indications for more advanced imaging studies (eg, CT, MRI, magnetic resonance angiogram [MRA], positron emission tomography [PET]-CT, bone scan, arteriography, ultrasound).

6. Explain the principles of plain films, CT, MRI, and ultrasound imaging relating to the head and neck with particular emphasis on the orbit.

7. Describe indications for the type of scan/imaging to order given the clinical setting, and be able to read the film or scan.

8. Interpret ocular and periocular pathology and dermatopathology.

Eyelid

1. Describe the clinical features, evaluation, and management of congenital
syndromes, inflammation, trauma, ectropion, entropion, trichiasis, blepharoptosis, eyelid retraction, epiblepharon, dermatochalasis, blepharochalasis, eyelid tumors, blepharospasm, facial nerve palsy, eyebrow, midface and lower face function; and aesthetics, histology, and pathology of the facial skin.

2. Describe ocular surface pathology, including cicatricial processes affecting the bulbar and palpebral conjunctiva, management of corneal and conjunctival exposure, and relationship of the lids, midface, and brow to ocular exposure.

3. Describe the assessment of eyebrow position for brow ptosis and paralysis, and determine its relation to upper eyelid dermatochalasis.

4. Assess facial paralysis and evaluate the effects of upper eyelid lag and midface cicatricial, paralytic, and involutional changes on lower eyelid position.

5. Describe complex eyelid trauma.

6. Describe complex eyelid reconstruction (eg, Hughes flap, free tarsal grafts, local flaps, skin grafts, Cutler-Beard procedure).

Lacrimal

1. Describe the etiology, evaluation, and medical and surgical treatment of congenital tearing, acquired tearing, and trauma.

Orbital

1. Describe the etiology, evaluation, and medical and surgical treatment of orbital problems of children (eg, congenital anomalies, cellulitis, benign and malignant tumors, orbital inflammations).

2. Describe the etiology, evaluation, and medical and surgical treatment of orbital disorders of adults, including orbital cellulitis, thyroid orbitopathy, idiopathic orbital inflammation, vasculitis, congenital tumors, vascular tumors, neural tumors, lacrimal gland tumors, fibro-osseous tumors, histiocytic diseases, lymphoid tumors, metastatic tumors, blunt and penetrating trauma, orbital and facial fractures, anophthalmic socket problems, and skull base disease.

3. Describe the types of and indications for various biomaterials and orbital implants.

Nose
1. Describe basic anatomy and physiology.

**Sinuses**

1. Describe basic anatomy and physiology.

**Head and Neck as it Relates to the Orbit and Adnexa**

1. Describe basic anatomy and physiology.
2. Assess the face in terms of harmonious aesthetic units and evaluate the interrelationships of each.

**B. Technical/Surgical Skills**

**Eyelid**

1. Describe indications for and perform medical and surgical treatment of floppy eyelid syndrome.
2. Perform more complicated eyelid procedures, including:
   a. Levator advancement
   b. Retractor reinsertion
   c. Lower eyelid elevation
   d. Upper eyelid recession
   e. Eyebrow elevation
3. Perform complex ptosis repairs (eg, reoperations for height or contour abnormalities).
4. Perform complex lower eyelid procedures (eg, retraction using a spacer, cicatricial entropion using a mucous membrane graft).
5. Perform midface surgery (eg, midface lift for cicatricial and paralytic ectropion).
6. Perform advanced brow elevation techniques (eg, endoscopic, pretrichial, coronal).
7. Perform advanced eyelid reconstruction (eg, Hughes flap, Cutler-Beard procedure,
tissue transfer, flaps, grafts).

8. Perform cosmetic upper blepharoplasty.


10. Excise benign and malignant tumors involving the periorbital and adjacent regions.

**Lacrimal**

1. Describe management of and treat lacrimal system abnormalities, including:
   a. Complex congenital disorders (eg, canalicular stenosis)
   b. Complex trauma (ie, requiring lacrimal intubation)

2. Describe indications for and complications of, and perform intranasal endoscopic examination.

3. Describe management of complex acquired disorders and their treatment (eg, external and endoscopic dacryocystorhinostomy, conjunctivodacryocystorhinostomy with Jones tube).

**Orbital**

1. Describe indications for and complications of, and perform basic orbital skills and procedures, including:
   a. Socket reconstructions (eg, tissue transfers, grafts, flaps, synthetic implants)
   b. Fracture repair of bones involving the periorbital region and orbit (eg, orbital floor, medial orbital wall, Le Fort, zygomaticomaxillary complex [ZMC], naso-orbito-ethmoid [NOE])
   c. Orbitotomy for exploration, biopsy, and tumor removal using anterior, lateral, medial, and superior approaches; and orbital reconstruction
   d. Enucleation, evisceration, exenteration, and secondary implants of the orbit
   e. Complex or difficult socket-related problems and complications (eg, extrusion of implants, contracted socket, anophthalmic enophthalmos)
   f. Optic nerve sheath fenestration
g. Orbital decompression for thyroid eye disease

**Nasal**

1. Describe nasal endoscopy as related to the management of lacrimal and periorbital processes.
2. Describe turbinectomy and nasal surgery as related to the management of lacrimal and periorbital processes.

**Sinus**

1. Describe sinus surgery and endoscopy as related to periorbital and lacrimal processes.

**Head and Neck**

1. Describe facial flaps, including temporal, midface, lower face/neck for functional and aesthetic conditions related to the management of periorbital processes.
2. Describe rhytidectomy, including the periorbital and adjacent areas.
3. Repair upper face and brow conditions, including brow ptosis repair.
4. Use neuromodulators (eg, botulinum toxin), dermal fillers, other technologies (eg, laser) and chemical/pharmaceutical agents for the management of contour and skin quality abnormalities (ie, functional and aesthetic).
A. Minimum Number of Diagnostic and therapeutic Procedure required by the Candidate (Minimum numbers)

1. DCR / DCT – 30 (A) and 20 (P)
2. Evisceration / Enucleation with orbital implant - 30 (A), 20 (P)
3. Levator resection - 20 (A), 5 (P)
4. Tarsofrontal Sling - 20 (A), 5 (P)
5. Entropion – 20 (A), 5 (P)
6. Ectropion – 10 (A), 3 (P)
7. Fornix formation – 10 (A), 3 (P)
8. Dermis Fat Graft / Secondary implant - 5(A), 2 (P)
9. Mucous Membrane Graft – 5 (A), 2 (P)
10. Skin graft – 10 (A), 3 (P)
11. Eyelid and/or canalicular trauma – 10 (A), 3 (P)
12. Orbital Floor Fracture repair - 5 (A), 2 (P)
13. Orbititomy / Orbital Biopsy / Debulking / Decompression - 10 (A), 3(P)
15. Tarsorraphy / Canthal Repair – 10 (A), 3 (P)
16. Blepharoplasty – 10 (A), 3 (P)
17. Botox – 10 (A), 3 (P)
18. Nasolacrimal duct Probing and Syringing – 10 (A), 3 (P)
19. Lacrimal Intubation – 10 (A), 3 (P)
20. Eyelid Reconstruction - 10 (A), 3 (P)

A : Assisted
P: Performed
B. Minimum requirement for accreditation of Institutions for subspecialty fellowship

Equipments

1. Instrument set and OT facility for Lid Surgery
2. Instrument set and OT facility for Lacrimal Surgery
3. Instrument set and OT facility for Orbital Surgery
4. Instrument set and OT facility for Evisceration/Enucleation Surgery
5. Facility for Syringing, exophthalmometry
6. Facility for Ultrasonography – A & B Scan
7. Imaging facilities – X-ray, CT Scan & MRI Scan (in house or Out Sourced. Candidate should be able to get exposure to different imaging techniques as well as interact with Radiologist)
8. Ocular pathology, Microbiology service (In House or Out sourced. It is desirable that in case of out sourced services candidate spends time on rotation with Pathologist and Microbiologist so as to get exposure in basics of Ocular Pathology and Microbiology
9. Blood bank services (desirable but not mandatory)
10. Consultation facilities from related Specialties such as ENT, Neurosurgery, Hematology, Oncology (The host can also allow candidate to rotate with other specialists in case of Out Sourced services)
11. Photography and Video recording facility
12. Prosthesis fabrication facility (desirable)
13. General Anesthesia Facility
14. Electrosurgical Cautery
15. Facility for Nasal Endoscopy
16. Operating Loupe / Microscope
17. Library / learning resource center
PEDIATRIC OPHTHALMOLOGY
AND STRABISMUS
Pediatric Ophthalmology and Strabismus

Introduction:

It is important that most eye problems presenting in childhood be corrected as early as feasible during childhood. This is because vision develops during childhood and this development process can be affected due to any obstacle to the visual media or any misalignment of the two eyes. Failure to correct these problems at an appropriate time early in life may result in lack of normal stereopsis, visual deficits pertaining to each eye in the form of amblyopia, eye muscle disorder, and possibly even legal blindness. This early attention to a child’s ocular problems should eventually permit him or her to have normal stereopsis, optimal vision and binocularity in adulthood. We believe that it is in the public interest that ophthalmologists who deal exclusively or principally with children be optimally trained to diagnose and treat disorders of the child’s eye.

Perhaps more than any other sub-speciality of ophthalmologists the Pediatric ophthalmologist should work with and at times educate other medical professional groups such as the Pediatricians, General ophthalmologists, Public health and government officials. Communication with these groups will aid in improving children’s eye health. A Pediatric ophthalmologist also works with other sub specialities of ophthalmology like Retina and Vitreous, Uvea, Glaucoma, Cornea, Oculoplasty, Neuro Ophthalmology and Vision Rehabilitation Center. Even here, Pediatric Ophthalmologists should take the primary responsibilty of the children referred to other specialities since associated amblyopia and refractive problems will be best handled by them.

In addition to standard knowledge and skills associated with the practice of Pediatric Ophthalmology, additional knowledge in epidemiology of childhood blindness and certain aspects of community eye care is needed for all developing countries like ours. Hence a structured fellowship training incorporating all the above is essential for the country towards providing a quality service and thereby improving the eye health in all children.

Aims of Training

1. The primary purpose of training is to promote the development of an ophthalmologist who has the appropriate level of knowledge, skills, and competence
to work independently and effectively as a consultant in Pediatric ophthalmology and Strabismus.

2. However child centered approaches and team working are also of vital importance so that pediatric ophthalmologists must also function collaboratively.

3. The fellow will be oriented in setting up a pediatric ophthalmology and strabismus service in their service area.

**Outcome:**

1. Perform a comprehensive assessment of a child with a visual / ocular problem.

2. Competence in surgical management of childhood cataract, strabismus, nystagmus, lid and lacrimal problems

3. Diagnose and manage acute illness / injury.

4. Diagnose and manage those with chronic disease / disability\ inherited pathology .

5. To demonstrate an appropriate level of competency in the following “Sub – Specialities“. Neonatology, Refraction and Low vision care

6. To be familiar with basic research methodology and be familiar with all the latest literature and developments in the field of pediatric ophthalmology and strabismus .

7. Capacity on detection of ocular problems in children at community level including screening programmes in schools and detection of ROP in NICUs.

**Eligibility of Candidate**

Medical graduates from Indian Universities preferably below the age of 35 years

Qualification: Dip.N.B, M.S or MD, FRCS, MRCO Degree in Ophthalmology with enough surgical exposure in adult cataract surgeries

Duration of the Programme:

- **Total Duration**: 12-18 Months
- **First Phase (1-3 Months)**: Orientation to the hospital and various departments
• Second Phase (9-12 Months): Training in Pediatric Ophthalmology and Adult Strabismus.

• Third Phase (2-3 Months): Independent work with special orientation to set up a new Pediatric Ophthalmology unit. (In case of 12 months training the first phase would be one month, second 9 months and independent work for two months.)

Requirements on Training Faculty:
At least two trained Pediatric Ophthalmologists each having a minimum of three years experience in Pediatric ophthalmology. The secondary faculty should include either the clinic heads or the specialists with more than three years of experience in the fields like Glaucoma, Retina Vitreous, Orbit oculoplasty, Vision Rehabilitation Center.

Training Modalities
The actual teaching will include informal and formal didactic teaching, clinical case discussions, demonstration of various evaluation procedures both in person and by using audio visual methods (recorded video and CD’s) teaching and assisting surgeries, provision of appropriate clinical material for reading in the form of books, Journals, Videos and CD’s etc.(library) Efforts should be made to record the actual surgical procedure of the trainee as and when needed, mainly to facilitate self-assessment.

Place of Training;
First Phase: (1-3 Months)

1. Get oriented to the hospital routine and rules; learn communication skills, good ophthalmic practice with team work, participation in community outreach activities etc.

2. Learn the local language enough to examine the patient thoroughly, and the work culture of the Institute.

3. Work in line with the senior fellows or consultants mostly in the form of assisting
them and learning the special skills in assessing the children with various pathology

4. Get used to the commonly used instruments and investigating techniques in all the sub specialties available in the institute.

5. Simultaneously will perform cataract surgeries on adults (2 to 4 per week) to keep hands on experience.

6. This period will allow the trainer to assess the surgical skills of the fellow and refine it as necessary especially on the wound construction and anterior capsulorhexis in adult cataract surgeries, which is very essential before undertaking surgical procedures in children. This will help in reducing the learning curve in surgical procedures on children thus alleviating major complications in them.

7. This time is also best used in the library to orient to the various reading materials available in the subject and select a topic for academic work to be followed in the later months

Second Phase (9-12 Months)

The fellow will learn gradually the skills and art of examining a Pediatric patient. These include:

During this period, the fellow will be in the Pediatric ophthalmology dept most of the time, however will get posted in Retina vitreous dept for 4 weeks, 2 weeks in oculoplasty and 2 weeks in Vision rehabilitation centre. (Can be varied depending upon the infrastructure of the training institute)

I. Focus on Pediatric ophthalmology

1. Good history taking with emphasis on prenatal, birth, and post natal events, general developmental issues, other systemic associations, information on inherited disorders including the pedigree depiction. etc

2. Various modalities of visual acuity estimation in children of all ages.

3. Measuring Intraocular Pressure (Tonopen, Pulsair), handling hand held instruments like Perkins, slit lamp and keratometer
4. **Indirect ophthalmoscopy in children.**

5. **Examination of blind, visually impaired and mentally retarded children.**

6. **Assessment and Management of Pediatric ocular trauma.**

7. **Sound knowledge on the available dilating drops, it’s usage in various ages, along with contraindications especially in association with systemic problems- common side effects of the drugs and their management**

8. **Learning a perfect technique of refraction pertinent to the age and prescription of spectacles according to the guidelines**

9. **Pediatric cataract evaluation; learning to deal both a healthy child and a child with systemic disease \ syndrome\ involving lens subluxation\ dislocations etc and the investigative techniques including IOL power calculations for various ages**

10. **Oculoplasty; evaluation of a child with ptosis / any lid anomalies associated with strabismus**

11. **Evaluation and management of children with epiphora**

12. **Pediatric glaucoma; diagnosis of congenital glaucoma, syndromes associated with it, detection of glaucoma in aphakia, medical and surgical management of the above.**

13. **Management of External ocular diseases especially allergic and infective disorders and congenital / acquired.**

14. **Enough knowledge on the prevailing inherited diseases and their pattern of inheritance**

15. **Oncology; more emphasis on diagnosis, treatment and follow up of retinoblastoma.**

16. **Retina & vitreous; diagnosis of various congenital dystrophies, familiarity with screening for ROP, Imaging and Electrophysiological evaluation e.g: ultrasonography, ERG and VEP recording.**

17. **Epidemiology – includes not only the statistical data but also the strategies for reducing visual impairment in children with major problems.**

18. **Special knowledge in managing untreatable visual impairment including vision**
rehabilitation, good rapport with the nearby available rehabilitation centres including schools for the visually impaired and on integrated education.

19. Good communicating skills in counselling parents on their child’s problem; medical, surgical, and especially genetic aspects.

II. Focus on Strabismus

1. Prescription of spectacles for children with and without strabismus including specific tints for specific problems.

2. Detection of Amblyopia and various modalities in management.

3. Hands on in various basic diagnostic procedures for all forms of concomitant strabismus, pattern deviations, associated with syndromes.

4. Detailed evaluation of all forms of infantile\ acquired esotropia by performing pertinent techniques in examination for example looking for Bruckner’s reflex, Pursuit asymmetry and visuscope examination for eccentric fixation.

5. Getting familiar with techniques in examination of both Intermittent and constant exotropias.

6. Detailed evaluation of paralytic squints by applying a correct methodology towards 3rd, 4th, 6th cranial nerve involvement

7. Evaluation of restrictive strabismus including with various congenital structural pathology. Also understanding the concept of congenital cranial dysinnervation disorders especially the role of imaging for such conditions.

8. Adequate skills in Pre operative assessment and post operative management

9. Learning the skills in decision making; type of surgery, muscles to be operated, number of muscles, amount of recess and resect etc

10. Nystagmus: Detailed evaluation to differentiate various forms like sensory, motor, neurological etc, Manifest / manifest latent as well as spasmus nutans and nystagmus blockage syndrome as also nystagmoid eye movements and their management.
Third phase (2-3 months)

1. Apart from continuing the above activities the fellow will be encouraged to function independently on common disease management including Amblyopia

2. Commit on decision making in strabismus surgery in all forms of strabismus

3. Perform more complex examinations like FDT, Patch test, AC/A Ratio estimations, Diagnosis of asthenopia with orthoptic exercises

4. Assessment of both physically and mentally challenged individuals – with comprehensive rehabilitation details

5. Detailed knowledge on paralytic strabismus with pertinent neuro ophthalmological knowledge

6. Expertise in successful post operative management both in Cataract and Strabismus including the management of residual consecutive deviations

7. Prism therapy including Fresnel prisms, in all ages

8. Competency in management of all forms of strabismus in adults

9. Reading VEP, ERG and nystagmography in special situations

10. Also will be oriented towards setting up a separate pediatric ophthalmology service in his or her area mainly oriented towards “Practice Management” which comprises needs assessment, situational analysis, workload estimation, service organization, decision making on equipment purchase and sustainability concepts.

Community Outreach work:

1. Will attend at least 1- major (general) camp or a community outreach program in a month.

2. Active participation in school screening programmes throughout the year.

3. Concentrating on screening Pediatric population other than school.

4. Helping in the departmental projects involving the community
5. Assist in training technicians and teachers to do vision screening in preschool and school children

6. Participate in outreach activities involving the schools for the blind along with the rehabilitation personnel

Expected knowledge on General anaesthesia

1. Should have adequate knowledge in the basics of General anaesthesia administration, anticipation of problems and measures in avoiding them like ordering the required investigations pertinent to the disease, getting opinion from Pediatrician, cardiologist, neurologist in cases of associated pathologies like congenital cardiac, CNS problems and in metabolic and syndromic patients

2. Knowledge in Handling minor innate problems of GA like fever, vomiting etc in the post operative period

3. Good rapport with the anaesthesia team

Surgical exposure;

1. The fellow will start first with assisting the surgeon, do step by step surgery initially under supervision and later perform independently. The numbers could be anywhere between 75 and 100 in total with at least 50% performed independently. Of these at least 50 should be strabismus procedures.

2. Lens surgeries include, Lens aspiration, primary posterior capsulotomy(+PPC+AV), and anterior vitrectomy with or without IOL implantation for cataracts in children starting with older children followed by the toddlers and infants.

3. Strabismus procedures will start with recess- resect procedures in adults first followed in children and in the last 3 months period should get exposed to adjustable suture technique, inferior and superior oblique muscle surgeries and other complex procedures for complex paralytic strabismus and nystagmus.

4. Minor procedures will include YAG capsulotomy in children, foreign body and suture removal, removal under anaesthesia, performing examination under anesthesia in
consultation with specialists (retina, glaucoma) as and when needed, probing for congenital nasolacrimal obstruction, Enucleation (for Retinoblastoma), Ptosis correction, Trauma repair, assisting in screening for ROP and LASER application. (5 to 10 in total either assisted or performed independently)

Academic and Research activities

1. Active participation in case presentations, Grand rounds, departmental Journal clubs and lecture demonstrations for junior colleagues, residents, medical and optometry students.
2. Taking didactic classes and clinical teaching to trainee MLOP, orthoptists and post graduate residents
3. Should select a topic of interest for research and try to finish it before the fellowship period
4. Paper poster presentation in the State and national ophthalmic meetings like DOS\SPOSI\AIOS \ as well as international meetings wherever possible.
5. Case reports \ research articles for publication
6. Helping the resident in thesis when needed.

Other collaborative efforts

1. Participating in ROP screening program in NICUs situated outside the hospital
2. Genetic workup for congenital disorders and chromosomal anomalies with the help of the genetic department.
3. Active participation in all the departmental activities

Throughout the fellowship period the fellow should have chance to perform Cataract surgery: phacoemulsification/ SICS (2 to 4 in a week) in adults to strengthen the hands on.
Documentation

1. The fellow will have to maintain a Surgical log book.
2. The log book will include diagnosis, surgery performed, and whether the fellow is first assistant or primary surgeon.
3. The surgical log book will be kept by the fellow and reviewed by the programme trainer periodically.
4. It is also preferable if a Clinical log book is maintained in addition, of the interesting case seen, noting the summary of findings and management.
5. The Programme director will keep a summary of the candidate’s overall performance including the surgical experience.
6. A list of conference / lectures given, list of journal club and grand rounds attended with subjects.

Assessment:

Will be judged on the basis of continuous assessment including clinical acumen, surgical skill, communication capability, Team spirit, Commitment towards the children etc apart from reviewing the logbook. Written test ???

Setting up of a Pediatric ophthalmology and Strabismus clinic

Place; preferably in a tertiary eye care centre

Infra structure;

Out patient; little larger area which is segregated from regular OPD, preferably made child friendly with the help of wall paintings of cartoon characters etc.

Inpatient Area; Child friendly beds to accommodate both mother and the child, again segregated from the regular ward designated as GA ward with facility to handle emergencies related to the immediate post operative time.
Operating room; Pre op waiting area (room), post op recovery room with proper gadgets, Place for storing anaesthesia equipments, regular operating room could be on a shared basis

Man power requirement

1. Pediatric ophthalmologist; to provide a comprehensive eye care to all children attending the hospital. The basic qualities should include the capacity in treating all forms of allergy, infections, inflammations, injuries, refractive errors, cataracts, lacrimal and lid problems, taking care of primies coming for ROP screening, detection and management of all forms of amblyopia, all forms of strabismus, patients with diplopia and nystagmus, children needing guidance on vision therapy and educational assistance.

2. Orthoptist/optometrist; with a capacity of assessing vision in all ages irrespective of their mentation, adequate knowledge in strabismus and amblyopia, carry out the battery of tests in ocular motility evaluation, diplopia and Hess charting, familiar with orthoptic exercises and prism therapy, perform refraction, take part in the screening programs.

3. Nurse; Depending upon the load there could be nurse/nurses posted in each area separately or combined in any form according to the suitability of the institute/hospital. In the OPD, the nurse should be able to help the ophthalmologist in examining the children of all ages, familiar with all the examination techniques, instruments and investigations, drugs used for dilatation of the pupil in various ages, anticipated side effects, systemic contraindications for the same etc. Operating room; a) Specially trained one with adequate knowledge on the general anaesthesia, pre op care, monitoring after extubation etc. b) Inside the operating room; one nurse familiar with all the surgical procedures especially on strabismus who is to assist the surgeon and another as running (could be shared from general pool) also helping the anaesthetist. c) In the ward; either a separate nurse or on a shared basis, however with adequate knowledge in recognizing and handling minor emergencies like fever and vomiting post operatively.

4. Counsellor; With good knowledge on Amblyopia and occlusion therapy, refractive errors, all the surgical procedures, reemphasizing the doctor’s instructions to the
parents, counselling both on the admission procedure and the importance of long term follow up, talk with the parents about g.a. procedure to alleviate the apprehension, keeping up appointments, in general acting like a bridging person between the hospital and the patient.

5. Co ordinator: Incharge of overall activities, making sure the smooth flow of patients, day to day man power checking, data management.

6. Community worker; can be on a shared basis, focusing on screening camps at schools, facilitating screening in the local NICU, rapport with the local Pediatricians and other groups to work on increasing the awareness about Pediatric eye care.

Proposed (trained) staff for 50 OP visits per day

| Pediatric Ophthalmologist – 2 | Part time Anesthetist -1 |
| Orthoptist -1 | Assisting Nurses |
| For a Surgeon – 1-2 | For Anesthetist – 1-2 |
| Refractionist - 2 | Running Nurse - 1 |
| Counsellor - 1 | Technician - 1 |
| Ward nurse -1 | |
| Coordinator -1 | |

Equipments needed;

1. Exclusively for the department; special vision testing devices focusing on all ages, hand held slit lamp and keratometer, direct and indirect ophthalmoscopes, non contact tonometry (Pulsair), all gadgets involved with measurement of ocular deviation (fixation target, occluder, RAF ruler, Testing Prisms including Horizontal and Vertical prism bars and at least loose prisms of 30 and 45 prism diopters, Red Green glasses, Bagolini glasses, Double Maddox rods, flip on lenses, therapeutic prisms, BSV and stereopsis measuring gadgets for near like TNO and Randot tests and for distance like Distance Randot/ Frisby Davis Distance tests, Hess\ Less screen, Diplopia chart, minimum things for orthoptic exercises, goniometer (scale and protractor or digital version on smartphones), Trialset, Trialframe, Streak retinoscopy, distance and near vision chart.
In the OT; GA equipments like Boyle’s apparatus, suction device, monitoring system (Pulse oximeter) Vitrectomy probes and machine, lacrimal probes and cannulas. Strabismus surgery and Cataract surgery instruments. Operating microscope, Phaco machine, and other essentials.

2. Instruments which could be shared; In the OPD; A scan, USG, OCT, ERG, Nystagmography, obscan, Low vision devices, optical with a stock of child friendly frames, Microbiology services, X ray machines etc

Books and other reading material


Journals

American Journal of Ophthalmology
Archives of Ophthalmology
British Journal of Ophthalmology
Eye
Journal of AAPOS
Journal of Pediatric Ophthalmology and Strabismus

Other Supporting material

Prepared Practice Pattern of AAO
http://www.aao.org/guidelines-browse?filter=preferredpracticepatterns
Focal Points/AAO
Cochrane Reviews
http://www.cochranelibrary.com/
American Academy of Pediatric Ophthalmology Website
http://www.aapos.org/resources/resources
# Annexure I

**ICO – Ophthalmology Surgical Competency Assessment Rubric**

<table>
<thead>
<tr>
<th>OSCAR-STRABISMUS</th>
<th>Novice (score = 2)</th>
<th>Beginner (score = 3)</th>
<th>Advanced Beginner (score = 4)</th>
<th>Competent (score = 5)</th>
</tr>
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<tbody>
<tr>
<td>Draping:</td>
<td>Is unable to prepare or drape the patient using sterile technique without instruction. Unaware of importance of identifying correct eye and muscle prior to draping.</td>
<td>Is able to prepare and drape the patient but sterile technique is inconsistent. Difficulty attaining proper head position.</td>
<td>Is able to consistently prepare and drape patients using sterile technique however steps are performed inefficiently. Attains proper head position.</td>
<td>Is able to consistently and efficiently prepare and drape patients with appropriate head position.</td>
</tr>
<tr>
<td>Forced duction test</td>
<td>Is unaware of forced duction testing for muscle restriction or laxity.</td>
<td>Is familiar with the test but is unaware of its relevance, timing and is unable to perform it.</td>
<td>Is able to state the purpose of the test and is able to perform the test at the appropriate time(s) and detect moderate to severe restriction.</td>
<td>Is able to consistently detect and describe all degrees of rectus muscle restriction or laxity and comment on relevance to surgical options.</td>
</tr>
<tr>
<td>Globe stabilization</td>
<td>Is able to describe one method of globe stabilization but is unable to perform it.</td>
<td>Is able to describe one method of globe stabilization but needs assistance to perform it.</td>
<td>Is able to describe more than one method of globe stabilization and can perform one of them with minimal verbal supervision.</td>
<td>Is able to describe more than one method and can perform one of them unsupervised and with ease.</td>
</tr>
<tr>
<td>Conjunctival incision &amp; Tenon’s dissection</td>
<td>Is unable to describe limbal or fornix conjunctival incision for rectus muscle surgery.</td>
<td>Is able to describe but not able to perform limbal or fornix conjunctival incision for rectus muscle surgery.</td>
<td>Is able to perform limbal or fornix conjunctival incisions but is inefficient and requires guidance.</td>
<td>Is able to efficiently perform limbal or fornix conjunctival incision.</td>
</tr>
<tr>
<td>Hooking rectus muscle</td>
<td>Is unable to describe proper technique of hooking the muscle and is unable to perform technique.</td>
<td>Is able to describe proper technique but unable to hook muscle on first attempt.</td>
<td>Usually hooks the muscle on first attempt but is inefficient.</td>
<td>Is able to efficiently and precisely hook the muscle on first attempt.</td>
</tr>
<tr>
<td>Exposure of rectus muscle</td>
<td>Is unable to describe proper dissection technique to expose rectus muscle.</td>
<td>Is able to describe dissection technique for muscle exposure but requires constant guidance to perform the basic steps.</td>
<td>Is able to perform basic exposure but is inefficient and/or occasionally disrupts multiple tissue planes or branches of the anterior ciliary arteries.</td>
<td>Is able to efficiently expose muscle using a combination of sharp and blunt dissection as appropriate and avoids branches of anterior ciliary arteries.</td>
</tr>
<tr>
<td>Placement of suture in muscle</td>
<td>Is unable to accurately describe muscle suture technique.</td>
<td>Is able to describe muscle suture technique. Multiple attempts required to load or unload the needle-holder. Suture placement inaccurate. Requires assistance to properly place suture.</td>
<td>Is able to safely secure muscle with suture but is inefficient. May cause bleeding and muscle fiber cuts. Needs supervision for locking bites at two ends of muscle.</td>
<td>Is able to safely, efficiently and accurately secure the muscle with minimal tissue trauma without supervision.</td>
</tr>
<tr>
<td>Disinsertion of rectus muscle</td>
<td>Is unable to describe technique for rectus muscle disinsertion.</td>
<td>Is able to describe but attempts to disinsert the muscle results in inadvertent cutting or nearly cutting the muscle suture or sclera.</td>
<td>Is able to perform disinsertion but occasionally causes inappropriate bleeding or leaves muscle tissue attached to sclera. Requires some verbal instruction.</td>
<td>Is able to safely and efficiently disinsert rectus muscle.</td>
</tr>
<tr>
<td>Use of caliper/scleral ruler</td>
<td>Is unable to mark the sclera with calipers or does not check the caliper setting to confirm planned action or is too aggressive with indenting the sclera with caliper. Does not understand the potential discrepancy between arc-length and chord-length measurement.</td>
<td>Is able to mark sclera with calipers or scleral ruler but measurement is often not perpendicular to the original rectus insertion. Checks caliper for correct measurement. Requires arc-length vs. chord length measurements.</td>
<td>Is able to accurately mark sclera with calipers and/or scleral ruler but marks fade because not prepared to make needle pass.</td>
<td>Is able to efficiently and accurately mark sclera with calipers and/or scleral ruler and is prepared to make needle pass immediately after marking sclera.</td>
</tr>
<tr>
<td>Reattachment of muscle: Intracocular needle pass.</td>
<td>Is unable to describe safe technique for intracocular needle pass.</td>
<td>Is able to describe safe technique for intracocular needle pass but does not approach the globe with needle directed tangentially or does not unlock needle holder before starting the intracocular pass. Unable to accurately obtain correct needle depth or length.</td>
<td>Safely approaches the globe with needle tip directed tangential to the globe. Visualizes needle tip after entering the sclera and has no difficulty exiting the sclera but intracocular passes are frequently too short or too shallow. Minimal muscle belly sagging.</td>
<td>Approaches the globe with needle directed tangentially and intracocular passes are consistently of correct length and depth. No muscle belly sagging.</td>
</tr>
<tr>
<td>Procedure Element</td>
<td>Novice</td>
<td>Competent</td>
<td>Essential</td>
<td>Advanced</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
<td>-----------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>Conjunctival closure (when appropriate)</td>
<td>Unable to close conjunctiva. Unable to differentiate Tenon’s capsule from conjunctiva.</td>
<td>Is able to perform basic conjunctival closure technique but is inefficient and requires significant guidance. Additional sutures are required.</td>
<td>Is able to safely close conjunctiva with good tissue approximation but is inefficient. Does not check forced duction test.</td>
<td>Is able to safely and efficiently close conjunctiva with good tissue approximation. Forced duction test checked.</td>
</tr>
<tr>
<td>Maintaining hemostasis</td>
<td>Is unable to describe proper resect muscle dissection, suture placement and disinsertion to avoid bleeding and/or unable to describe electrocautery technique.</td>
<td>Can describe techniques for avoiding and controlling bleeding but requires significant guidance to perform proper dissection, suture placement, muscle disinsertion and electrocautery to minimize bleeding.</td>
<td>Usually applies proper tissue technique to avoid bleeding and is able to control bleeding using electrocautery but requires multiple attempts to cauterize and may leave burnt carbon marks.</td>
<td>Consistently applies proper tissue technique to avoid bleeding and is able to efficiently control bleeding using electrocautery.</td>
</tr>
<tr>
<td>Tissue handling</td>
<td>Is excessively aggressive or timid in manipulating tissue. Inadvertent tissue damage occurs (including significant corneal epithelium disruption).</td>
<td>Tissue handling is safe but sometimes requires multiple attempts to achieve desired manipulation of tissue. Minimal corneal epithelium disruption may occur.</td>
<td>Tissue handling is efficient, fluid and almost always achieves desired tissue manipulation on first attempt.</td>
<td></td>
</tr>
<tr>
<td>Knowledge of instruments</td>
<td>Can only identify instruments in simple terms such as “muscle hook” and “forceps” but no knowledge of necessary sutures or needle types.</td>
<td>Can identify some but not most of the surgical instruments by proper names and can identify necessary suture sizes and materials but not needle types.</td>
<td>Can identify most but not all of the surgical instruments by proper names and can identify necessary suture sizes/materials but not needle types.</td>
<td>Can identify all surgical instruments by proper names and can identify necessary suture sizes/materials and needle types.</td>
</tr>
<tr>
<td>Technique of holding suture needle in needle holder</td>
<td>Frequently loads needle incorrectly.</td>
<td>Loads needle in proper direction for a forehead pass but sometimes loads incorrectly for backhand pass. Loads too close or too far from the swaged end of the needle.</td>
<td>Loads needle properly for forehead and backhand needle pass but is inefficient and often requires multiple attempts.</td>
<td>Loads needle properly and efficiently for forehead and backhand needle passes.</td>
</tr>
<tr>
<td>Technique of surgical knot tying</td>
<td>Unable to tie knots.</td>
<td>Require multiple extra hand maneuvers to make first throw lay flat and/or loosens first throw while attempting to perform the second throw.</td>
<td>Is able to tie a flat surgeon’s knot first throw but second and third throws are inefficient. Does not inadvertently loosen the first throw.</td>
<td>Is able to efficiently tie a flat, square surgeon’s knot.</td>
</tr>
<tr>
<td>Communication with surgical team</td>
<td>Does not know role of surgical team members. Lacks confidence or has too much. Does not establish good rapport with team. Unable to request instruments from scrub nurse using proper instrument and suture names and/or instructions to surgical assistant are vague or nonexistent.</td>
<td>Knows role of most surgical team members. Lacks confidence. Has difficulty establishing good rapport with team members. Able to request most instruments from scrub nurse using proper instrument and suture names but instructions to surgical assistant are inadequate to perform procedure safely.</td>
<td>Knows role of each surgical team member. Is somewhat confident and usually treats team with respect. Establishes good working relationship. Able to efficiently request instruments from scrub nurse using proper names in correct order. Able to consistently give clear instructions to surgical assistant.</td>
<td>Knows role of each surgical team member. Is confident and treats team with respect. Establishes good working relationship. Able to efficiently request instruments from scrub nurse using proper names in correct order. Able to consistently give clear instructions to surgical assistant.</td>
</tr>
</tbody>
</table>

The Ophthalmology Surgical Competency Assessment Rubric for Strabismus Surgery (OSCAR:Strabismus) contains 17 procedure elements and behavioral anchors for skill levels ranging from novice to competent.

Minimum requirements for candidates

Surgical exposure;

1. The fellow will start first with assisting the surgeon, do step by step surgery initially under supervision and later perform independently. The numbers could be anywhere between 75 and 100 in total with at least 50% performed independently. Of these at least 50 should be strabismus procedures.

2. Lens surgeries include, Lens aspiration, primary posterior capsulotomy(+PPC+AV), and anterior vitrectomy with or without IOL implantation for cataracts in children starting with older children followed by the toddlers and infants. (Minimum 10-25)

3. Strabismus procedures will start with recess-resect procedures in adults first followed in children and in the last 3 months period should get exposed to adjustable suture technique, inferior and superior oblique muscle surgeries and other complex procedures for complex paralytic strabismus and nystagmus.

4. Minor procedures will include YAG capsulotomy in children, foreign body and suture removal, removal under anaesthesia, performing examination under anesthesia in consultation with specialists (retina, glaucoma) as and when needed, probing for congenital nasolacrimal obstruction, Enucleation (for Retinoblastoma), Ptosis correction, Trauma repair, assisting in screening for ROP and LASER application. (5 to 10 in total either assisted or performed independently)
MEDICAL RETINA
I. Mandatory Knowledge and Skill Sets

A) Knowledge of Basic Sciences Relevant to the Eye and particularly to Vitreous, Retina, and Uvea

1. Anatomy and Physiology
   a. Ocular embryology and anatomy
   b. The choroid: Structural considerations and Choroidal Circulation
   c. Retinal Anatomy, Topography, and circulation
   d. Glia of the retina
   e. The retinal pigment epithelium and interphotoreceptor matrix: structure and specialized functions
   f. Retinal photoreceptor disc shedding and pigment epithelium phagocytosis.
   g. Visual Cycle
   h. Gross and microscopic Anatomy of Vitreous and vitreoretinal interface

2. Vision psychophysics
   a. Color vision and night vision
   b. Visual acuity and contrast sensitivity
   c. Amsler grid evaluation
   d. Visual fields in retinal diseases

3. Basic concepts of Genetics of the eye disease with emphasis on common posterior segment diseases

4. Ocular immunology
a. Anterior chamber immune system.

b. Retinal autoimmunity, Retino choroidal immunity and immune privilege.

c. Cells and tissues of the immune system, T and B cell development, lymphocyte trafficking

5. Ocular microbiology: Clinical microbiology of infectious retinal diseases including how to collect/inoculate and send samples, how to correlate and interpret microbiology reports to clinical picture, basic knowledge of newer techniques like PCR in infections

6. Basic concepts of Ocular pathology especially in relation to vitreoretinal signs (example soft exudates, drusen, deep and superficial hages, edema etc.) and also in the context of various posterior segment diseases listed out later in the document

B. Technical Skills

1. Direct ophthalmoscopy: understand construction and working of Direct Ophthalmoscope and learn to assess central fundus and red reflex test (distant direct Ophthalmoscopy) with it.

2. Indirect ophthalmoscopy
   a) Understand the optics and be able to draw diagram to explain the working of an Indirect Ophthalmoscope
   b) Understand how to put on the Indirect Ophthalmoscope and adjust it for optimal use including for small pupil fundus viewing.
   c) Understand and perform indentation during indirect ophthalmoscopy
   d) Understand the concepts of selection of various condensing lenses
   e) Understand the color-coding and methodology of documenting the fundus drawing. Fellows should make the drawings on Amsler Chart in all retinal cases during fellowship training and place in logbook.

3. Understand the optics and Perform slit-lamp biomicroscopy with precorneal lenses, 3-mirror contact lenses, or other wide-field contact and non-contact lenses such as 60, 78 or 90D lenses.
4. Fundus Fluorescein Angiography (should do at least 50 FFA and 50 fundus photos and document in log book)
   
   a) Optics and working of FFA camera with a detailed knowledge of various filters used
   
   b) Indications and Contraindications for FFA
   
   c) Pre-Procedure evaluation
      
      I. Informed Consent
      
      II. Pupillary Dilatation
      
      III. Knowledge about patient’s allergies and systemic status
   
   d) Technique:
      
      i. Venous Access
      
      ii. Knowledge about Sodium Fluorescein and filters used
      
      iii. Timed sequence of Photographs
   
   e) Complications and side effects of FFA, how to avoid and manage
   
   f) Interpretation of FFA
      
      i. How to consistently achieve a good quality angiogram (good dilatation, sharp focus and adequate image contrast with complete field)
      
      ii. Interpretation of Hypo or hyperfluorescence based upon the layer of retina or choroid and the optic disc involved in the pathology
      
      iii. Fundus autofluorescence.
   
   g) How to report an angiogram
   
   h) Follow-up care
      
      i. Band aid over the needle prick site
      
      ii. Remind patient about the discoloration of urine and facial skin to yellow–Orange for little over 24 hours
iii. Observe patient for any allergic reactions

5) Optical Coherence Tomography (at least 50 cases documented in log book)

a) Understand underlying Physical and Optical Principle
   i. Low Coherence Optical Interferometry measures optical reflectance
   ii. 820nm Infrared light
   iii. Non Contact technique (different from USG)
   iv. Time Domain OCT
   v. Spectral Domain OCT

b) Indications
   i. Macular and Vitreoretinal Interface Disorders
      a. Macular Hole
      b. Epiretinal Membrane
      c. Macular edema from diverse etiologies
      d. CSR
      e. Choroidal reovascular membranes including age related Macular Degenerations including myopia / IPCV and Rap Lesions.
      f. Chorioretinal Inflammatory Disorders
      g. Trauma
      h. Mactel (PFT)
      i. VMT
      j. Hereditary retinal degenerations
     ii. Optic Nerve Diseases
        a. Glaucomatous Optic Atrophy
b. Papillitis

c. Optic Disc edema

d. Ischemic Optic Neuropathy

e. Other Optic Disc conditions like optic pit, coloboma, peripapillary cnvm etc

c) Contraindications/limitations: Poor Media clarity, significant nystagmus

d) Pre-procedure Evaluation

i. Explain procedure to the patient

ii. Pupillary dilatation: Image can be obtained through undilated pupil but the resulting image may lack clarity or be truncated

iii. Media clarity required for optimal imaging

iv. Adequate Patient fixation required

e) List the Alternatives to this Procedure their advantages/disadvantages

i. S/L Biomicroscopy using Contact Lens

ii. FFA

iii. ICG Angiography

iv. B scan

f) Interpretation of OCT Images

i. Understanding Qualitative Information:

a. identify different layers

b. hyporeflectivity and hyperreflectivity

c. Thickening, Atrophy and Distortion

d. Ability for serial comparison

ii. Understand Quantitative Information
a. Retinal thickness/Volume measurements
b. Retinal thickness map
c. Choroidal thickness measurements
d. Retinal Nerve Fiber layer Thickness and map
e. Optic Nerve Head Analysis
f. 3D reconstruction and review of layers
g. Serial Comparative review and Analysis

iii. How to report a OCT

6) Ultrasonography (Bscan) and UBM: at least 50 cases documented in log book

a) Understand underlying Physical Principles

b) A scan and B scan: concepts and Principles and limitations: USG can only rule in certain lesions and cannot rule out certain lesions like foreign bodies. May have less accuracy in a crying child or patient in pain or anterior and far peripheral lesions or small lesions.

c) Indications

I. In Presence of Complete or Partial Media Opacity USG is used to identify

i. Vitreous Separation

ii. Vitreous Hemorrhage/Exudation

iii. Retinal Detachment, retinoschisis

iv. Choroidal Effusion and Detachment

v. Intraocular Foreign Body

vi. Intraocular Tumor

vii. PED including haemorrhagic PED

viii. Congenital abnormalities and staphyloma
ix. Disc drusen

II. In clear Ocular Media: USG is useful to measure Height and Diameter of the Lesion:
   a. Retinal Tumor and Mass
   b. Choroidal Tumor and Mass
   c. Ciliary Body Lesions
   d. Scleral Lesions
   e. Orbital lesions

III. Understanding Utility of A Scan (One Dimensional Acoustic Image)
   d) Contraindications: Open Globe Injury and immediate post surgery is a relative Contraindication. USG may be done carefully even in open Globe and immediate post op cases
   e) Pre-procedure Evaluation: Explain Procedure to the patient and that it is a non-invasive test
   f) Alternative Tests to USG: CT Scan, MRI of the Orbit. If Xray reveals metallic foreign Body, avoid MRI
   g) Instrumentation and Technique
      a. Topical anesthesia
      b. Contact Examination and immersion scanning techniques
      c. Probe Positions
         i. Transverse
         ii. Vertical/axial
         iii. Horizontal Macula
         iv. Vertical Macula
   h) Interpretation of USG Data and Correlation
a. Topographic Features of the lesion
b. Sound Absorption and Reflectance
c. Kinetic Features
d. Limitations and reporting

7. Electrophysiological Testing: should watch each procedure (VEP, ERG) at least 10 times and EOG at least 2 times. Should examine and participate in reporting at least 25 recordings documented in log book (can do this at an outsourced facility also if not available in-house)

Electroretinography, Electro-oculography and Visual Evoked Potentials

Principles and basic concepts of electrical signal generation and transmission in visual pathways

Basic principles of each electrophysiological test

How to conduct each test

How to interpret each test, limitations and artifacts

ERG of common Retinal diseases

Reporting of these Visual Electrophysiology tests

7. CT, MRI and PET in retinal diseases:

Basic interpretation, usage, limitations

C) Posterior Segment Diseases: Understand epidemiology, pathological anatomy, pathophysiology, clinical features, appropriate evaluation, differential diagnosis, relevant lab. Study, and management options of following diseases. Candidates should have seen most of these conditions themselves and entered in their log book. They should have thoroughly studied these diseases from text books, atlases, and review articles. It is mandatory to know the published randomized clinical trials and Cochran reviews on the subject. Emphasis in reading should also be about relevant literature from India as much as possible
1. Macular Diseases
   a) Age Related Macular Degeneration
   b) Central Serous Retinopathy/ PED
   c) Macular Edema of Diverse Etiologies
   d) Epiretinal Membrane
   e) Vitreomacular Traction Syndrome
   f) Macular Hole
   g) Myopic Macular Changes
   h) Foveoschisis/ hypoplasia

2. Retinal Vascular Diseases
   a) Diabetic Retinopathy
   b) Hypertensive Retinopathy
   c) Branch Retinal Venous Occlusion
   d) Central Retinal Venous Occlusion
   e) Branch Retinal Arterial Occlusion
   f) Central Retinal Arterial Occlusion
   g) Juxtafoveal Retinal Telangiectasia(PFT/Mactel)
   h) Aquired Retinal Macroaneurysm
   i) Retinopathy of Prematuruty
   j) Various types of Vasculitis
   k) Coats’ disease and other telangiectasia
   l) FEVR
3. Chorioretinal Inflammation
   a) Intermediate Uveitis/Pars Planitis/ perivasculitis
   b) Choroiditis: Serpigenous, Multifocal etc
   c) Acute and Chronic Postoperative Endophthalmitis
   d) Endogenous Endophthalmitis
   e) Sarcoidosis
   f) Tuberculous Chorioretinal Involvement
   g) Vogt Koyanagi Harada Syndrome
   h) Multiple Evanescent White Dot Syndrome
   i) Toxoplasmosis
   j) Toxocara Posterior Uveitis
   k) ARN and PORN
   l) CMV Retinitis
   m) HIV and Related Retinopathy
   n) Posterior scleritis/ Scleral abscess
   o) Carcinoma associated reinopathy

4. Peripheral Vitreo-Retinal Abnormalities
   a) Peripheral Vitreo-Retinal Degenerations
   b) Peripheral Retinal Breaks
   c) Atrophic Holes
   d) Giant Retinal Tear
   e) Traumatic Retinal Breaks and Dialysis
   f) Degenerative Retinoschisis
5. Retinal Detachment
   a) Rhegmatogenous Retinal Detachment
   b) Exudative Retinal Detachment
   c) Tractional Retinal Detachment
   d) Combined Mechanism Retinal Detachment

6. Retinal and Choroidal Dystrophies
   a) Retinitis Pigmentosa (Syndromic and non-syndromic)
   b) Stargards Disease/Fundus Flavimaculatus
   c) Best Disease (Vitelliform Dystrophy)
   d) Juvenile Retinoschisis
   e) Cone/rod dystrophies including rod monochromat
   f) Lebers’ Congenital amaurosis
   g) Other causes of Nyctalopia

7. Vitreous Diseases
   a) Vitreous Syneresis, Synchisis Scintillans, Asteroid Hyalosis
   b) Posterior Vitreous Detachment
   c) Vitreous Hemorrhage

8. Drug and chemical Toxicities
   a) Chloroquine and its Derivatives
   b) Ethambutol
   c) Phenothizines/ tamoxifen
   d) Iron (siderosis)
   e) Others including intravitreal antibiotics
9. Posterior Segment Tumors
   a) Nevus of Choroid
   b) Retinoblastoma
   c) Melanoma of Ciliary Body and Choroid
   d) Melanocytoma and Magnocellular Nevus
   e) Vascular Tumors of Choroid and Retina
   f) Choroidal Osteoma
   g) Choroidal Metastasis
   h) Ocular and Central Nervous System Lymphoma
   i) Phacomatosis (complete spectrum)
   j) Retino choroidal secondary tumours with systemic primary tumours

10. Posterior Segment Trauma
    a) Commotio Retinae/ Berlin’s Edema/Cherry Red Spot
    b) Choroidal Rupture
    c) Sclerotaria
    d) Scleral Rupture and Laceration
    e) Blunt Trauma and its consequences
    f) Ocular Penetrating and Perforating Injury
    g) Intraocular Foreign Body
    h) Hemorrhagic Choroidal Detachment
    i) Serous Choroidal Detachment
    j) Post Traumatic Endophthalmitis
k) Sympathetic Ophthalmia
l) Shaken Baby Syndrome (renamed as Non-accidental injuries)

11. Optic Nerve Disorders
   a) Papillitis
   b) Papilledema
   c) AION
   d) Optic Atrophy: how to evaluate and arrive at a causative diagnosis
   e) Miscellaneous: ONH Drusen, Morning Glory Syndrome

12. Miscellaneous
   a) Retinochoroidal Coloboma and associated anomalies
   b) Ocular and oculo cutaneous albinism
   c) High hyperopia including posterior microphthalmos
   d) Systemic syndromes affecting posterior segment also like Marfans, Sticklers, Tay-Sachs etc and others
   e) Persistent hyperplastic primary vitreous (PHPV)

D) Procedures- Hands On skills

1) Laser Photocoagulation: at least 60 cases including at least 10 of macula, General principals of laser, machines and applications of laser.
   a. Common Indications (also when not to do!)
      i. Retinal Tears and Lattice Degenerations
      ii. DME
      iii. BRVO
      iv. Central Retinal Venous Occlusion
v. Diabetic Retinopathy
vi. Retinal Arterial Macroaneurysm
vii. Retinopathy of Prematurity
viii. Central Serous Retinopathy
ix. Iris Neovascularisation/Neovascular glaucoma
x. Extrafoveal CNVM
xi. Coats’ disease and other telangiectasia

b. Pre-procedure Evaluation
i. Visual Acuity
ii. Duration and Magnitude of Symptoms
iii. FFA when relevant
iv. OCT when relevant
v. Media clarity
vi. Exact Location and extent of the disease

c. Any other Options available to the patient
i. Observation for non-progressive lesions
ii. Cryotherapy
iii. Intravitreal aniti-VEGF agent injections
iv. Intravitreal corticosteroid injections
v. Micropulse laser
vi. Navilas Laser

d. Instrumentation and Technique
i. Laser Wavelength (Green/Yellow/Red)
ii. Slit lamp/Binocular Indirect Ophthalmoscope
iii. Anesthesia: Nil/Topical/Local/GA

e. Extent of Treatment
   i. Focal Macular: modified Grid/Focal Targeted
   ii. Focal Ablative
   iii. Panretinal /sectoral Photocoagulation

f. Follow-up care
   i. First Follow-up Visit
      1. Retinal Tear/Detachment: 1-3 weeks
      2. CNV: 3-4 weeks
      3. DME: 8-12 weeks
      4. PDR: 12-16 weeks
   ii. Subsequent Follow-up Visits
      1. Retinal Tear: 3-6 months
      2. CNV: Monthly until leakage is stable
      3. PDR/DME: 3-6 months

g. Complications
   i. VA or Field Loss
   ii. Scotoma
   iii. Hemorrhage
   iv. Pain
   v. Delayed Dark adaptation
vi. CNV and Chorioretinal Scarring

vii. Serous/Choroidal Detachment (Heavy PRP)

viii. Pupil Accommodation alterations

ix. Increased IOP including acute angle closure glaucoma

x. Cataract/ corneal epithelial damage

h. Prevention and Management

i. Maximize Distance of Laser Burn from the Fovea

ii. Always locate macula periodically during laser

iii. Minimal Necessary Spots

iv. Adequate Intensity and reduce intensity when going to a new area

v. Avoid Long Post Ciliary Nerves

vi. Analgesics for Post-procedure pain

vii. Local anesthesia for pain during procedure esp retreatments

i. Patient Instructions

i. Expected Decreased vision immediately after the procedure

ii. Possibble mild/moderate Ocular Ache/Discomfort/Pain

iii. Possible Foreign Body Sensation

iv. Gradual improvement of Vision towards pre-treatment Baseline

v. Patient to call in case of Visual worsening/excessive or persistent pain

vi. Possible Positioning/Activity restrictions based on Condition

vii. Laser often does not improve vision or clear the haemorrhage. It stabilizes the disease process and may need multiple sittings and takes a lot of time to show its effects
2) Intravitreal Injections/ paracentesis/ aqueous tap (at least 50 including at least one paracentesis/ AC tap documented in log book)

a. Common Indications for:
   i. Anti-VEGF Agents
      1. CNV
      2. Macular Edema
      3. Proliferative Retinopathies
      4. As adjunct to PDT
      5. As adjunct to NVG treatment
   ii. Corticosteroids
      1. Macular Edema
      2. Uveitis
      3. CNV as adjunct to PDT
   iii. Antibiotics and antifungals for Endophthalmitis
   iv. Antivirals: Ganciclovir. Foscarnet
      1. CMV Retinitis
      2. ARN
      3. PORN
   v. Gas (Perfluoropropane, Sulfurhexfluoride)
      1. Retinal Detachment
      2. Submacular Hemorrhage
      3. Optic Disc Pit with macular detachment
   vi. Methotreaxate
1. Uveitis
2. Ocular Large Cell Lymphoma

vii. Paracentesis

1. CRAO
2. Raised IOP post op or post injection

viii. Aqueous tap
1. Suspected infection
2. Certain Uveitis for PCR etc
3. Possible Lens induced uveitis
4. Rarely for malignancies

Pre-procedure Evaluation

viii. Glaucoma/Allergy/ recent surgery/ sclera thinning disorders
ix. Evaluate Peripheral Retinal Pathology
x. Extra-ocular /Adnexal Infections

b. Options available to the patient
i. For anti-VEGF: PDT/Laser Photocoagulation
ii. Corticosteroids: Subtenon’s Injection/Steroid Implants/Systemic Therapy
iii. Anti Virals: Oral or Intravenous therapy/Ganciclovir Implant
iv. Gas: Scleral Buckle/Pars Plana Vitrectomy

c. Instrumentation and Technique

i. Check patient identity, eye, the exact drug advised and drug expiry dates
ii. Topical Anesthesia one drop at least three times
iii. Preprocedure Topical Povidone Iodine at least two times and allow time out

iv. Use Gloves and mask

v. Clean Lids, Lashes and Ocular surface with Povidone Iodine

vi. Use speculum and isolate all eye lashes. Re-instill Povidone Iodine just before injecting

vii. Inject 3.5-4.0mm posterior to the limbus; avoid horizontal meridian. Use 29 or 30 G new needle

viii. Apply Cotton Bud to the site of Injection after removing Needle

ix. Topical Povidone Iodine and (optional) topical antibiotic after Injection

x. Manage IOP after Injection. If paracentesis is needed, use povidone Iodine again. Press centre of cornea with a cotton bud to stabilize globe and deepen peripheral AC. Put the needle into AC from limbus in a direction away from the lens and iris, with bevel up (alone or with syringe without plunger). Let the aqueous come out. Leave the cornea only after removing the needle. Put Povidone Iodine. Procedure can be repeated and similar procedure is used for CRAO eyes or eyes with raised IOP. For lab study of aqueous fluid (aqueous tap) same procedure is done but with use of plunger to withdraw fluid slowly.

xi. Always check PL after injection. If patient says no PL, give gentle Ocular massage till patient gets good light perception. If needed, do I/O to check central retinal artery. Rarely oral Acetazolamide or I/V Mannitol are needed (esp in pts with optic N Diseases and Ocular ischemia)

d. Follow-up care: Topical Antibiotics optional.

e. Complications

i. Endophthalmitis

ii. Retinal Tear/Detachment

iii. Cataract

iv. Ocular Hypertension /Glaucoma
v. Intraocular Hemorrhage
vi. Wound dehiscence
vii. CRAO

f. Patient Instructions
i. To be aware of the Symptoms suggestive of Endophthalmitis; Blurring/loss of vision
ii. No water in eye or touching eye with unsterile hands for 12 hours
iii. Air Travel and Positioning after Gas Injection

3) Cryoretinopexy
   a. Common Indications
   b. Preprocedure Evaluation
   c. Options available to the patient
   d. Instrumentation and Technique
   e. Follow-up Care
   f. Complications
   g. Patient Instructions

4) Periocular Injections: principles of care same as intravitreal injections. Indications and risks (at least 10 documented in log book)

5) Vitreous and Retinal Biopsy: Basic knowledge and Principles of care

6) Photo Dynamic Therapy: Basic knowledge of principles, indications, parameters and outcomes

E. I. Pharmacology
   i. Systemic steroids and IV methyl prednisolone
   ii. Immuno suppressive agents
iii. Antibiotics

vi. Antifungal agents.

v. Anti viral agents

II Indications for oral and intravitreal drugs

III. Contra indications

IV. Side effects

F. Communication Skills:

a. To develop art of very good history taking skills. Take history of chief complaints and history of present illness. History of disease onset, course, visual difficulties, treatments taken and outcomes of past treatment, retrieve old reports; past and current Medical history, Medications, evaluate visual needs of patient, family history, personal habits and occupational history, birth and development history when relevant.

b. Should develop communication skills to convey with empathy poor outcomes and bad news to patients/ guardians and also show pathway towards low vision and rehabilitation services. Needs to learn to use positive words when conveying bad news and give the positive messages first (example to ARMD patient- you will continue to enjoy the peripheral vision you have. Or, another example, do not say treatment has failed, say treatment did not succeed {former conveys as if one did not try, latter conveys good effort was made and did not succeed} or the retina is not doing as well as we wanted it to be etc rather than saying your retina is damaged! (very poor word to use)

F. Optional Knowledge, Equipment and Skill Sets

a. Fundus Autofluoresence

b. ICG Angiography

c. Swept Source OCT
Textbooks to be followed for the Medical Retina Fellowship Program

1. Ryan Stephen J. Retina: Text with Continually Updated Online Reference. 3Vol. 5th ed. USA: Saunders; 2013


5. Gass J, Aggarwal A. Atlas of Macular Disease. 5th ed. USA;

Saunders: 2012.


8. Sankara Nethralaya atlas of FFA by Nitin Shetty


10. Ultrasonography of eye and orbit. Sandra F. Bryne

11. Diagnostic procedures in Ophthalmology, second edition (jaypee brothers) H V Nema 2009 (for vision and other psychophysical and testing of the additional procedures skills)

12. Ocular trauma Principles and Practice by Pieramici and Kuhn
13. Retinopathy of Prematurity. Dr. RV Azad and co-authors. Jaypee Brothers.


**Journals for the Medical Retina Fellowship Program**

1. American Journal of Ophthalmology
2. Ophthalmology
3. JAMA Ophthalmology
4. Retina
5. Eye
7. Ocular surgery lasers and Imaging
8. Ocular immunology and inflammation
9. Journal of ophthalmic infection and inflammation
10. Indian Journal of Ophthalmology
11. Survey Ophthalmology
12. Current Opinion in Ophthalmology
Infrastructure for Medical Retina Fellowship of AIOS

1. Adequately trained staff as per the guidelines
2. Adequate Patient load
3. Equipment
   a. Direct Ophthalmoscopes
   b. Indirect Ophthalmoscopes with 20 and 25D lenses
   c. Slit Lamps
   d. Biomicroscopy Lenses: 90D, Contact Lens for fundus Examination (both Central and peripheral fundus), Goldmann three mirror lens
   e. Fundus fluorescein Angiography system
   f. Optical Coherence Tomography: preferably spectral domain
   g. Electrophysiology: in the department or have an access to it.
   h. Laser photocoagulator with facility for LIO, slit lamp delivery and endolaser and appropriate Lenses
   i. Operating Microscope with assistant observation system
4. Documentation of all findings with appropriate color coding
5. Library with access to Retina/Uvea textbooks and E Journals

Textbooks

i. Ryan Stephen J. Retina: Text with Continually Updated Online Reference. 3Vol. 5th ed. USA: Saunders; 2013

ii. Williamson Thomas. Vitreoretinal surgery 2nd ed. Germany: Springer; 2013


vii. Gass J, Aggarwal A. Atlas of Macular Disease. 5th ed. USA;


Journals for the Medical Retina Fellowship Program

1. American Journal of Ophthalmology
2. Ophthalmology
3. JAMA Ophthalmology
4. Retina
5. Eye
7. Ocular surgery lasers and Imaging
8. Ocular immunology and inflammation
9. Journal of ophthalmic infection and inflammation
10. Indian Journal of Ophthalmology
MANDATORY PROCEDURES FOR MEDICAL RETINA FELLOWSHIP

1. Fundus Photos 50
2. FFA 50
3. OCT 50
4. Ultrasonography (B scan) 50
5. Intravitreal Injections (including at least one documented paracentesis/AC tap): 50
6. Laser Photocoagulation (PRP/Barrage/Prophylaxis) 50
7. Macular Laser Photocoagulation 10
8. Cryoretinopexy: at least 2-5 documented
9. Electrophysiological Testing: should watch each procedure (VEP, ERG) at least 10 times and EOG at least 2 times. Should examine and participate in reporting at least 25 recordings documented in log book (can do this at an outsourced facility also if not available in-house)
10. CT, MRI and PET in Retinal Diseases: Understand Basic Interpretation, Usage and Limitation
GLAUCOMA
GLAUCOMA

Basic Level Goals:

A. Cognitive Skills

Basic Science

1. Describe with figures the anatomy of the anterior chamber, angle, and ciliary body.

2. Describe the anatomy of the retinal nerve fiber layer, optic nerve head, with figures and visual pathway from the retina to the visual cortex.

3. Describe the mechanisms and dynamics of aqueous humor inflow and outflow.

4. Describe the microscopic anatomy of the retina from inner to outer portions, with attention to the retinal ganglion cell layer and nerve fiber layer.

5. Describe the blood supply of the optic nerve and ciliary body. With figure

6. Describe the apoptotic mechanism of retinal ganglion cell death.

7. Know the physiology underlying visual-field examination and its interpretation.

8. Describe the fundamentals of Goldmann static, kinetic perimetry, and standard automated perimetry.

9. Know basic principles of tonometry and aqueous outflow, and applications of tonometric data (eg, diurnal curve, peak and trough values).

Clinical Science

1. Describe the major clinical features of primary open-angle glaucoma (high and low tension), angle-closure glaucoma, glaucoma suspects, and ocular hypertension.

2. Describe the major risk factors for primary open-angle glaucoma and angle-closure glaucoma.

3. Describe the steps in evaluating primary open-angle glaucoma and angle-closure
glaucoma.

4. Describe the clinical features of glaucomatous optic neuropathy. (with schematic diagrams)

5. Describe the basic features of the major glaucomas: exfoliative glaucoma, and pigmentary glaucoma.

6. Know the role of intraocular pressure (IOP) in the development and progression of glaucoma.

7. Understand the factors that influence IOP.

8. Describe and understand basic principles of Goldmann applanation tonometry.

9. Describe tonometers (eg, Schiotz, Tono-Pen, NCT, Rebound, Dynamic Contour) and recognize artifacts of testing. Feel all tonometry techniques, where available should be basic for a Glaucoma Collegiate

10. Describe principles and basic techniques of gonioscopy (Goldmann type or 4 mirror indentation lenses) to evaluate angle structures. Include classification of each type of gonioscopes

11. Describe normal and abnormal angle findings. With diagram

12. Know non IOP dependent risk factors for primary open- angle glaucoma and NTG

13. Know subtypes of angle-closure glaucoma (eg, pupillary block, plateau iris, PACS, PAC,PACG).

14. Describe corneal pachymetry and how biomechanics and measurements of corneal thickness affect IOP interpretations.

15. Understand the principles of biomicroscopy to evaluate the optic nerve and retinal nerve fiber layer.

16. Describe the most common types of visual field defects in glaucoma. With schematic diagrams

17. Describe principles and mechanisms of medical management of glaucoma.

18. Describe major classes of glaucoma medications, their mechanisms of action,
indications, contraindications, and side effects (topical and systemic).

19. Know drug interactions between systemic drugs and glaucoma drugs.

20. Know basic medical statistics to interpret major glaucoma studies.

21. Describe the major results of large prospective clinical trials in addition to those appropriate to the practice region.
   a. The Glaucoma Laser Trial (GLT)
   b. The Ocular Hypertension Treatment Study (OHTS)
   c. The Collaborative Initial Glaucoma Treatment Study (CIGTS)
   d. The Fluorouracil Filtering Surgery Study (FFSS)
   e. The Normal Tension Glaucoma Study (NTGS)
   f. The Advanced Glaucoma Intervention Study (AGIS)
   g. The European Glaucoma Prevention Study (EGPS)
   h. The Early Manifest Glaucoma Trial (EMGT)
   i. Tube versus Trab study
   j. Ahmed versus Baerveldt Study
   k. The Vellore Eye Study
   l. The Aravind Comprehensive eye study
   m. The Andra Pradesh eye disease study
   n. The Chennai eye study

B. Technical/Surgical Skills

1. Take a relevant patient history and recognize the signs and symptoms of glaucoma.

2. Perform basic slit-lamp biomicroscopy (including peripheral anterior chamber depth evaluation, Van Herick test).
3. Perform basic tonometry (eg, applanation, Schiøtz, Tono-Pen, NCT).

4. When performing basic tonometry, recognize and correct artifacts, and know how to disinfect tonometer and check calibration.

5. Perform basic gonioscopy with Goldmann-type and indentation lenses.

6. Recognize and evaluate angle structures, abnormalities, and appositional and synechial angle closure.

7. Perform central corneal pachymetry and relate to IOP findings.

8. Recognize the common features of the glaucomatous optic nerve including the significance of optic nerve head size, and perform stereo examination, using direct ophthalmoscope, fundus lens, and indirect lenses (ie, 78, or 90 diopter lens).

9. Recognize typical features of glaucomatous optic neuropathy (eg, neuroretinal rim changes, disc hemorrhage, peripapillary atrophy).

10. Recognize optic nerve features of disorders that masquerade glaucoma neuropathy or visual field loss (eg, optic nerve head drusen, optic neuritis).

11. Describe slit-lamp findings of secondary glaucomas (eg, iridocorneal endothelial syndrome, angle recession neovascular, uveitic, pseudophakic, lens induced).

12. Interpret visual field results for Goldmann kinetic perimetry and Humphrey or Octopus standard automated perimetry.


14. Be able to test for relative afferent pupillary defect.

15. Recognize ocular emergencies of acute angle closure, and blebitis/endophthalmitis.

16. To develop ability to conduct screening for Glaucoma in community based camps

**Standard Level Goals:**

**A. Cognitive Skills**

1. Know epidemiology of congenital glaucoma, primary open-angle glaucoma, exfoliation syndrome and exfoliative glaucoma, and angle-closure glaucoma.
2. Know the genetics of:
   a. Primary congenital glaucoma (CYP1B1)
   b. Syndromes associated with congenital/developmental glaucoma
      i. Lowe syndrome
      ii. Nail-patella syndrome
      iii. Aniridia (PAX 6)
      iv. Axenfeld-Rieger syndrome (PITX2, FOXC1, FKHL7)
   c. Primary open-angle glaucoma
      i. GLC1A and the molecular biology of myocilin
      ii. Optineurin
      iii. Other genes as they become identified

3. Describe the features of primary infantile and juvenile glaucomas.

4. Describe etiologies and major risk factors for secondary open-angle glaucomas.

5. Recognize secondary glaucomas (eg, angle recession, inflammatory, steroid induced, pigmentary, exfoliative, phacolytic, neovascular, postoperative, malignant, lens-particle glaucomas, plateau iris, glaucomatocyclitic crisis, iridocorneal endothelial syndrome) with attention to appropriate pathophysiology.

6. Describe the evaluation and treatment of complex secondary glaucomas (eg, exfoliation, angle recession, inflammatory, steroid induced, pigmentary, phacolytic, neovascular, postoperative, malignant, lens-particle glaucomas; plateau iris; glaucomatocyclitic crisis; iridocorneal endothelial syndromes; aqueous misdirection/ciliary block).

7. Describe diurnal fluctuations in IOP and ocular perfusion pressure and their application in the approach to therapy.

8. Recognize and describe more advanced optic nerve and nerve fiber layer anatomy
in glaucoma and typical and atypical features associated with glaucomatous cupping (eg, rim pallor, disc hemorrhage, parapapillary atrophy, rim thinning, notching, circumlinear vessels, central acuity loss, hemianopic or other nonglaucomatous types of visual field loss).

9. Describe tools and techniques for quantitative anterior segment imaging such as ultrasound biomicroscopy and anterior segment optical coherence tomography (OCT).

10. Describe basic principles of tools to analyze optic nerve and retinal nerve fiber layer such as OCT, Heidelberg Retina Tomograph (HRT), and GDx.

11. Interpret HRT, OCT, and GDx scans.

12. Describe and interpret more advanced forms of perimetry (kinetic and automated static), including various perimetry strategies such as threshold testing, suprathreshold testing, and special algorithms.

13. Describe the principles involved in determining glaucomatous progression both clinically and perimetrically and on OCT/HRT.

14. Describe the principles, and more advanced anatomic gonioscopic features of primary and secondary glaucomas (eg, plateau iris, appositional closure).

15. Describe target IOP and its use in glaucoma management.

16. Describe the principles of medical management of more advanced glaucomas (eg, advanced primary open-angle glaucoma, secondary open and closed angle glaucomas, normal tension glaucoma).

17. Describe pitfalls of medical treatment, in particular poor compliance and adherence.

18. Describe and recognize the features of angle-closure glaucomas and aqueous misdirection.

19. Describe the most common clinical features and etiologies of ocular hypotony.


21. Describe and know how to apply the results of major clinical trials in glaucoma to clinical practice (eg, GLT, OHTS, CIGTS, FFSS, NTGS, AGIS, EGPS, EMGT,
TVT,ABC).

22. Describe and apply specific medical treatments in more advanced glaucoma.

23. Describe the principles, indications, and techniques of various types of laser energy, spot size, and laser wavelengths.

24. Describe the principles, indications, and techniques of trabeculectomy (with or without cataract surgery, with or without antimetabolites), glaucoma drainage devices, and cyclodestructive procedures.

25. Describe the major etiologies of dislocated or subluxated lens associated with glaucoma, Phacotopic Glaucoma (eg, trauma, Marfan syndrome, homocystinuria, Weill-Marchesani syndrome, syphilis).

26. Describe the less common causes of lens abnormalities associated with glaucoma (eg, spherophakia, lenticonus, ectopia lentis).

27. Define the relationships of glaucoma and uveitis.

28. Describe diagnostic accuracy, false positive and false negative diagnoses and their significance at individual and societal levels, differences between case-based and community-based screening, including an understanding of sensitivity and specificity, number needed to treat, t tests, life-table analysis, prospective versus retrospective studies, case control and cohort studies.

B. Technical/Surgical Skills

1. Select appropriate drugs and be able to customize or modify medical treatment for open-angle, secondary, and angle-closure glaucomas.

2. Perform argon and selective laser trabeculoplasty for open-angle glaucoma.

3. Perform argon or YAG laser for angle-closure glaucoma. (At least 20 procedure)

4. Perform surgical peripheral irido(ec)tomy for angle-closure glaucoma. ?

5. Perform peripheral iridoplasty for nonpupillary block angle-closure glaucoma.

6. Perform laser suture lysis.
7. Perform cyclodestructive surgery (photocoagulation or cryotherapy).
8. Assist with trabeculectomy and glaucoma drainage device surgery in the operating room.
9. Describe and manage a flat anterior chamber.
10. Perform routine trabeculectomy,
11. learn releasable suture technique (At least 15 during program)
12. Manage special situations like Paediatric glaucoma, pregnancy and lactation

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe the etiology, pathophysiology, and clinical characteristics of the most complex glaucomas (eg, angle recession, multimechanism glaucoma, traumatic glaucoma, neovascular, uveitic glaucoma, iridocorneal endothelial syndrome).
2. Identify the key examination techniques and management of complex medical and surgical problems in glaucoma (eg, complicated or postoperative primary and secondary open-angle and closed-angle glaucoma, uncommon visual field defects).
3. Apply in clinical practice tonometric methods (eg, diurnal curve) in complicated or atypical cases of glaucoma, advanced tonometric methods, and the effect of central corneal thickness (pachymetry) on IOP readings.
4. Apply in clinical practice tonometric methods, such as PASCAL tonometer, pneumotonometry, and rebound tonometry (ICare).
5. Apply the most advanced knowledge of optic nerve and nerve fiber layer anatomy and describe and interpret techniques, methods, and tools for analyzing the nerve fiber layer.
6. Recognize and evaluate atypical or multifactorial glaucomatous cupping (eg, rim pallor) and when to order additional tests to rule out other pathologies (eg, magnetic resonance imaging, computerized tomography scan, carotid Doppler).
7. Know how to diagnose progression using special software available with optic nerve and retinal measurement technologies and know the errors and limitations of the instruments.

8. Describe, interpret, and apply the results of the most complex and advanced forms of perimetry, including special kinetic and automated static perimetry strategies (eg, special algorithms) in atypical or multifactorial glaucoma.

9. Describe visual field damage, progression, rate of progression, caveats, and their use in glaucoma management.

10. Describe medical management of the most advanced and complex glaucoma (eg, advanced primary open-angle glaucoma previously treated with medicine, laser, or surgery; secondary glaucomas).

11. Describe, recognize, and know how to 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).

12. Describe, recognize, and know how to treat primary angle-closure glaucoma and complex glaucomas (eg, postoperative cases, secondary angle closure, aqueous misdirection).

13. Describe the clinical features of ocular hypotony, recognize and know how to treat common and uncommon etiologies (eg, choroidal detachment, leaking trabeculectomy bleb).

14. Describe the results, apply the conclusions, and critically analyze the major clinical trials in glaucoma (eg, GLT, OHTS, CIGTS, FFSS, NTGS, AGIS, EGPS, EMGT), Vellore Eye Study, Aravind Comprehensive eye study, Andra Pradesh eye disease study, Chennai eye study as well as describe and use other publications in the management of glaucoma patients.

15. Describe the features of and know how to evaluate and treat or when to refer the primary infantile, developmental (eg, aniridia, Axenfeld-Rieger), and juvenile glaucomas.

16. Describe and know how to apply specific medical treatments in advanced glaucoma cases.
17. Describe the principles, indications, and complications of laser treatment of more advanced or complex glaucoma (eg, repeat procedures).

18. Describe the more advanced surgical treatment of glaucoma: (eg, trabeculectomy, combined cataract and trabeculectomy, glaucoma drainage devices, and cyclodestructive procedures), including indications, techniques, and complications.

19. Describe use of antimetabolites and antiangiogenic agents and potential complications from their use.


21. Describe and treat intraocular infections resulting from filtering blebs or other glaucoma procedures.

B. Technical/Surgical Skills

1. Perform YAG or argon laser procedures in glaucoma patients (eg, monocular patient, repeat laser, vitreolysis, suture lysis).

2. Perform laser peripheral iridotomy for more advanced glaucoma (eg, monocular patient, acute angle closure, hazy cornea).

3. Perform laser treatments (eg, argon laser trabeculoplasty, iridoplasty) for more advanced glaucoma cases (eg, repeat treatments, monocular patient).

4. Perform cyclophotocoagulation for more advanced cases (eg, prior surgery, monocular patient).

5. Perform routine and repeat trabeculectomy with or without antimetabolites.

6. Manage and treat an anterior chamber as appropriate.

7. Manage and treat medically and/or surgically a flat anterior chamber as appropriate.

8. Perform small incision phaco/intraocular lens surgery combined with trabeculectomy, at the same or different sites. (At least 15 during program)

9. Perform Goniosynechiolysis for Chronic ACG
Very Advanced Level Goals:

Equivalent: a glaucoma collegiate must be able to perform flawless gonioscopy; interpret the most difficult discs; diagnose and treat unusual and rare glaucomas; devise management algorithms throughout care, foreseeing alternatives and potential complications; perform surgery and manage complications of surgery in high-risk glaucoma cases; prepare a thorough consultation letter with instructions for management and future potential difficulties; and teach these skills to residents and general ophthalmologists.

A. **Cognitive Skills**


2. Describe and critically discuss results of the above-mentioned studies on glaucoma prevalence, incidence, and risk factors.

3. Describe rate of progression and use of special algorithms (eg, value function iteration, PROGRESSOR, Garway-Heath map).

4. Describe and critically discuss literature on structure-function correlation.

6. Describe use of other tonometers (eg, ocular response analyzer, dynamic contour tonometry, pneumotonometer).

7. Describe mechanisms of ganglion cell damage and potential pathways for neuroprotection.

8. Describe and know specific medical and surgical treatments in the most complex and most advanced glaucoma cases (eg, refractory glaucoma, monocular patients, noncompliant patients).

9. Describe and know the specific management of complications related to the surgical intervention of the most complex and most advanced glaucomas.

B. **Technical/Surgical Skills**

1. Perform goniotomy, trabeculotomy, and manage complications.
2. Medical and surgical management of hypotony from overfiltration, bleb leak, choroidals, and other causes.

3. Treat malignant glaucoma and manage complications.

4. Treat failing or leaking blebs at slit lamp and manage complications. (esp Needling)

5. Perform advanced techniques for revisions of glaucoma surgery blebs (eg, sliding flap, free graft, amniotic membrane) and manage complications.

6. Perform cyclodestructive procedures and manage complications.

7. Perform trabeculectomy revisions, glaucoma drainage device surgery, and manage complications.

8. Describe and manage cyclodialysis cleft.


11. Perform laser trabeculoplasty and manage surgical complications.

12. Manage end stage and high risk glaucomas.

13. Perform combined implant/phaco/penetrating keratoplasty/vitrectomy.
**General Comments:**

There should be an exit clinical exam where the candidates ability to examine in front of the examiners should be tested (art of history taking and examination, interpretation and analysis of diagnostic tests and their application in the context of the patient, treatment options and outcome)

It is important to strengthen the training program with incentives and disincentives for not following the bare minimum requirements.

It should be mandatory to read all glaucoma publications from India in the last 20 years.

This is to ensure that candidates are aware of what work has been done in India.

Our tendency is to read and be acquainted with western literature and not be aware of the work done from India.

**2. Minimum requirement for accreditation of a hospital in the subspecialty:**

ANS

a) Star Categorisation of institutions as For 1) Glaucoma Fellowship 2) Advanced glaucoma Fellowship

b) Clinical audit to ensure workup in teaching institutions is not being compromised, by an independent body/ AIOS. Candidates only follow what they mentors do,

c) It is however possible to provide quality glaucoma training without these instruments. This must be kept in mind as our country has a huge economic / resource variation. Also it will send a message that without these instruments glaucoma care is not adequate

d) Number of seats for glaucoma fellowship should be based on the number of available slitlamps for fellows to work independently. (Consultant slit lamp not included)

e) Easy access to Imaging tools and a clear understanding of when to use them.
f) Availability and easy access to YAG laser and frequency doubled laser with required lenses for laser procedures

g) Very well equipped operating room including infrastructure to perform neonates and infants surgery

h) Based on number of senior and fellowship trained consultants allocation of number of candidates should be done.

i) Training should include case discussions, journal club, and theoretical teaching of concepts. Self-reporting by the institutions and audits by AIOS to ensure compliance.

3. Minimum number of diagnostic and surgical procedures necessary for a trainee.

a. Number of laser irodotomies to be performed should be increased to 50

b. Should have performed at least a few surgical peripheral irido(ect)omy for angle-closure glaucoma.

c. Should have performed at least 20 procedures for laser suture lysis.

d. Should have done at least 25 cyclo cryo/ diode laser TSCPC

e. Minimum 50 trabs (with / without augmentation) and releasable sutures. Minimum 5 Aqueous drainage devices to be done

f. Must have exposure for a peripheral iridoplasty for nonpupillary block angle-closure glaucoma.

g. Minimum 50 trabs (with / without augmentation) and releasable sutures.

Annexure I

ICO – Ophthalmology Surgical Competency Assessment Rubric

Trabeculectomy

Rating scale 0-Poor 1-Average 2-Good 3 - Excellent
1. Peribulbar block
2. Draping
3. Microscope handling
4. Bridle/Clear corneal traction suture
5. Fornix-based or limbus-based conjunctival flap
6. Scleral access and cauterization
7. Making appropriate partial thickness scleral flap
8. Application of mitomycin C-
   correct placement of soaked
   merocel sponges in appropriate
   concentration for appropriate time
9. Making long tunnel paracentesis with ability to retain anterior chamber
10. Pilocarpine injection if necessary
11. Making the sclerostomy both with punch and manually
12. Making adequate peripheral iridectomy
13. Scleral flap suturing technique
14. Releasable suture application technique
   Suture handling and placement
15. Watertight conjunctival closure-
   Suture handling and placement
UVEAL DISEASES
Basic Level Goals:

A. Cognitive Skills

1. Describe the definition and classification of intraocular inflammation.

2. Describe the basic principles of history taking:
   a. Ocular history
      i. Correlate with possible anatomical diagnosis (e.g., photophobia and anterior uveitis; floaters and posterior uveitis)
      ii. Describe the onset (sudden or insidious)
      iii. Describe the duration (limited or persistent)
      iv. Describe the course (acute, recurrent, chronic)
      v. Investigation and treatment history
   b. Systemic history
      i. Known diseases, including immunosuppressed states, such as HIV, malignancy, diabetes mellitus
      ii. Symptoms of recent onset for (e.g., fever, chills, and rigors may suggest sepsis)
      iii. Systems review, including all medications, past and current

3. List the clinical features of:
   a. Anterior uveitis
   b. Intermediate uveitis
c. Posterior or panuveitis
d. Episcleritis and scleritis (eg, red eye, blurred vision)
e. Anterior segment cell and flare
f. Keratic precipitates (nongranulomatous or granulomatous)
g. Posterior synechiae
h. Vitreous cell and flare
i. Vitreous opacities
j. Snowbank
k. Retinal and/or choroidal lesions
l. Retinal vasculitic
m. Retinal detachment (exudative, tractional, and rhegmatogenous)
n. Optic disc changes (eg, optic disc edema, optic neuritis).

4. Describe the typical demographic features, clinical features, and differential diagnosis of common, rapidly blinding causes for items 3a–3n above (based on local epidemiological data). For example:

a. Anterior uveitis
   i. Infectious (eg, bacterial, viral, protozoal, parasitic)
   ii. Inflammatory (eg, sarcoidosis, HLA B27-associated, juvenile idiopathic arthritis, Behçet disease, collagen vascular disease)
   iii. Postsurgical uveitis
   iv. Posttraumatic
   v. Fuchs uveitis syndrome
   vi. Posner-Schlossman syndrome

b. Intermediate uveitis
i. Pars planitis

ii. Toxocariasis

iii. Sarcoidosis

iv. Multiple sclerosis

c. Posterior or panuveitis

i. Infectious (eg, toxoplasmosis, toxocariasis, tuberculosis, acquired and congenital ocular syphilis, acute retinal necrosis)

ii. Inflammatory (eg, sarcoidosis, Behçet disease, Vogt-Koyanagi-Harada disease, sympathetic ophthalmia)

iii. Postoperative uveitis

iv. Endophthalmitis (eg, postoperative, traumatic, endogenous, fungal, phacoanaphylactic)

d. Episcleritis and scleritis

i. Collagen vascular diseases (eg, rheumatoid arthritis, Wegener granulomatosis)

ii. Infection (eg, syphilis, tuberculosis, fungal, parasitic, bacterial)

5. Describe indications for ancillary testing in the evaluation of uveitis (eg, fluorescein angiography [FA], indocyanine green [ICG] angiography, optical coherence tomography [OCT], B-scan ultrasonography).

6. Describe indications for a tailored approach (based on clinical features) to laboratory investigations, including obtaining tissue and fluid samples for examination and systemic imaging studies (eg, x-ray of chest, sacroiliac joint, chest computerized axial tomography [CT or CAT] scan).

7. Describe the indications and contraindications of topical steroids, nonsteroidal anti-inflammatory drugs (NSAIDs), and cycloplegics.

B. **Technical/Surgical Skills**

1. Perform slit-lamp examination of the anterior segment to detect and evaluate clinical
features of anterior uveitis, including:

a. Corneal pathology (active keratitis or scars, endotheliitis, band keratopathy)
b. Pattern of keratic precipitates (nongranulomatous, granulomatous)
c. Iris changes (rubeosis iridis, gross iris atrophy)
d. Anterior chamber evaluation of cells and flare, including grading according to standardization of uveitis nomenclature (SUN) working group grading system
e. Differentiate episcleritis from scleritis
f. Describe the activity (active or quiescent)

2. Perform dilated examination of the posterior segment with slit-lamp biomicroscopy using noncontact and contact lenses, indirect ophthalmoscopy.

a. Vitreous evaluation for cells and flare, including grading of vitreous haze according to SUN working group grading system
b. Retina/choroid (retinal detachment, choroidal or retinal inflammation)
c. Retinal vasculature (vascular inflammation)
d. Optic disc (swelling, pallor)

3. Describe the regional epidemiology of uveitis and relate this information to the diagnosis.

4. List the following:

a. Uveitis in immunosuppressed individuals with active and recovered acquired immune deficiency syndrome or pharmacologic immunosuppression (eg, cytomegalovirus retinitis, pneumocystis (carinii) jiroveci)
b. Unusual infectious etiologies for uveitis (eg, Lyme disease, West-Nile fever)
c. Masquerade syndromes such as vitreoretinal lymphoma

5. Differentiate infective from noninfective causes of uveitis.

6. Perform pars plana evaluation and sclera depression.
7. Interpret fluorescein angiography, B-scan ultrasonography, and correlate clinically.

8. Provide patient with all relevant information about proposed ancillary testing procedures for uveitis, including risks and complications.

**Standard Level Goals:**

**A. Cognitive Skills**

1. Describe the pathophysiology of intraocular inflammation.

2. Describe the principles of history taking of patients with uveitis according to SUN.

3. Describe the importance of being guided by clinical findings from the ocular examination and taking a more specific history in order to generate a list of differential diagnoses.

4. Describe more advanced principles of examination of patients with uveitis and differential diagnoses of the clinical signs:

   a. Anterior segment (eg, iris nodules, pupillary membrane, peripheral anterior synechiae, iris bombe)

   b. Posterior segment (eg, pars plana signs of inflammation [snowballs], retinal detachment, retinal vasculitis, optic swelling [differentiate optic neuritis from hyperemia], macula [macular edema])

5. Describe the regional epidemiology of uveitis and relate this information to the diagnosis.

6. Describe the typical demographic feature, clinical features, and differential diagnosis of:

   a. Common uveitis in immunosuppressed individuals (eg, cytomegalovirus retinitis, endogenous endophthalmitis)

   b. Masquerade syndromes such as vitreoretinal lymphoma

7. Differentiate serious infective from noninfective causes of uveitis. (eg, recognize an endogenous endophthalmitis and differentiate this from an immune-mediated
uveitis, such as Behçet disease).

8. Describe angiographic features of retinitis, choroiditis, and vasculitis.

9. Describe the B-scan features of certain retinal, choroidal, and scleral diseases.

10. Describe the OCT features of macular edema.

11. Describe the common complications of common uveitis syndromes (eg, intraocular pressure elevation, cataract, band keratopathy, macular edema).

12. Describe indications and contraindications for corticosteroid treatment of uveitis (eg, topical, local, systemic), including risks and benefits of therapy.

13. Describe the management of common uveitic syndromes.

B. Technical/Surgical Skills

1. Perform a more advanced examination of the anterior and posterior segment in addition to that described for.

   a. Anterior segment (eg, iris nodules, pupillary membrane, peripheral anterior synechiae, iris bombe)

   b. Posterior segment (eg, pars plana signs of inflammation [snowballs], retinal detachment, retinal vasculitis, optic swelling [differentiate optic neuritis from hyperemia], macula [macular edema])

2. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of common, rapidly blinding causes of uveitis (based on local epidemiological data), as described in the curriculum of.

3. Administer topical steroids, NSAIDs, and cycloplegics in the treatment of uveitis.

4. Interpret the results of ancillary tests (eg, fluorescein angiography, OCT, B-scan ultrasonography) for diagnosis.

5. Perform a major investigational work up (eg, laboratory testing, radiologic testing) according to epidemiologic data, history, and clinical examination.
6. Evaluate uveitis associated with immunosuppressed individuals (e.g., active and recovered acquired immune deficiency syndrome, pharmacologic immunosuppression).

7. Interpret indocyanine green angiography findings and correlate clinically.

8. Perform posterior subtenon or transseptal injection of corticosteroids.


10. Manage side effects of immunosuppressive therapy.

11. Perform an anterior chamber and vitreous tap for diagnostic purposes and administer intravitreal injection antibiotics in cases of bacterial endophthalmitis.

**Advanced Level Goals:**

**A. Cognitive Skills**

1. Describe the more complex complications of common uveitis syndromes in addition to that mentioned in (e.g., retinal vascular occlusion, retinal neovascularization and vitreous hemorrhage, inflammatory choroidal neovascularization, hypotony).

2. Describe indications and contraindications for corticosteroid treatment of uveitis (e.g., topical, local, systemic), including risks and benefits of therapy.

3. Describe the management of common uveitic syndromes.

4. Describe the techniques of anterior chamber and vitreous tap and of intravitreal injection of antibiotics in cases of bacterial endophthalmitis.

5. Describe more advanced examination principles for patients with more subtle signs of uveitis, such as:

   a. Anterior segment (e.g., conjunctival ulcer, iris transillumination defects, granuloma)

   b. Posterior segment (e.g., pars plana signs of inflammation [snowbanks and snowballs], retinal detachment [exudative, tractional, rhegmatogenous], retinal vasculitis [periphlebitis or arteritis, occlusive or nonocclusive], optic nerve [optic disc granuloma, optic neuritis, disc neovascularization], macula [macular
edema, choroidal neovascularization])

6. Describe in greater detail the angiographic features of retinitis, choroiditis, and vasculitis.

7. Describe indications and contraindications for commonly used immunotherapy for uveitis in addition to corticosteroid therapy (eg, azathioprine, cyclosporine A), including risks and benefits of therapy.

8. Describe the clinical features and differential diagnoses for less common forms of uveitis (eg, Whipple disease, Crohn disease).

B. Technical/Surgical Skills

1. Perform a more advanced examination of the anterior and posterior segment, for example:
   a. Anterior segment (eg, conjunctival ulcer, iris transillumination defects, granuloma)
   b. Posterior segment (eg, pars plana signs of inflammation [snowbanks and snowballs], retinal detachment [exudative, tractional, rhegmatogenous], retinal vasculitis [periphlebitis or arteritis, occlusive or nonocclusive], optic nerve [optic disc granuloma, optic neuritis, disc neovascularization], macula [macular edema, choroidal neovascularization])

2. Differentiate active from inactive disease and arterial from venous side disease.

3. Recognize serious infective causes from noninfective causes of uveitis.

4. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of uveitis common in the region via the process of history taking, clinical examination, and the use of investigative tools (such as FA, ICG, B-scan, OCT).

5. Recognize and evaluate the typical demographic features, clinical features, and differential diagnosis of uveitis in:
   a. Immunosuppressed individuals (eg, cytomegalovirus retinitis, endogenous
endophthalmitis)

b. Masquerade syndromes, such as vitreoretinal lymphoma

6. Evaluate the common complications of common uveitic syndromes (eg, glaucoma, cataract, band keratopathy, macular edema).

7. Administer periocular corticosteroid injections in addition to topical corticosteroids in the treatment of uveitis.

8. Perform an anterior chamber and vitreous tap for diagnostic purposes and to give intravitreal injection of antibiotics in cases of bacterial endophthalmitis.


12. Provide patient with relevant information about possible side effects of medications and proper monitoring of medications.

Very Advanced Level Goals:

A. Cognitive Skills

1. Describe the clinical features and differential diagnoses for less common forms of uveitis (eg, Whipple disease, Crohn disease, bilateral acute depigmentation of the iris [BADI], diffuse unilateral subacute neuroretinitis [DUSN], onchocerciasis).

2. Describe the global epidemiology of uveitis and relate this information to the diagnosis.

3. Describe the management of the more complex complications of uveitis.

4. Describe indications for ultrasound biomicroscopy (eg, assess state of ciliary body in hypotony), laser flare photometry and electrophysiology in the evaluation of uveitis.

5. Describe indications, contraindications, and complications for immunosuppressive therapy in uveitis (eg, use of antimetabolites, cyclosporine, alkylating agents, biologic
agents).

6. Describe indications, contraindications, and complications of retinal laser photocoagulation in uveitis.

7. Describe indications, contraindications, and complications of intravitreal injection of medications (eg, corticosteroids, antiviral therapy, antibiotics, anti-VEGF, antimitotic agents) and drug delivery systems (eg, for corticosteroid, ganciclovir).

B. Technical/Surgical Skills

1. Integrate history, clinical examination, and investigations in order to recognize and evaluate the less common uveitis entities.

2. Administer corticosteroids in the treatment of uveitis by various routes (eg, topical, periocular, systemic, and intravitreal injection).

3. Perform retinal laser photocoagulation for retinal vasculitis complicated by retinal capillary nonperfusion and associated retinal or optic disc neovascularization.

4. Regulate perioperative management of the uveitic eye for cataract removal.

5. Perform intravitreal injection of medications (eg, corticosteroids, antiviral therapy, antibiotics, anti-VEGF, antimitotic agents) and drug delivery systems (eg, for corticosteroid, ganciclovir).

6. Co-manage with other as appropriate:
   a. Biopsy of the vitreous, retina, or choroid to confirm/exclude vitreoretinal lymphoma or other tumors/infectious causes
   b. Immunosuppressive therapy in uveitis including biologics (with or without the aid of an immunologist) and monitor for side effects
   c. Intravitreal implants containing antiviral or corticosteroid medications
   d. Ocular complications of uveitis (eg, macular edema, cataract, glaucoma, retinal detachment, band keratopathy, choroidal neovascularization, hypotony)
Minimum Facilities for Accreditation of Uvea Fellowships

**Out patient department:**

- Slit lamp
- Indirect ophthalmoscope
- Fluorescein Angiography
- Indocyanine Angiography
- Autofluorescence
- Optical coherence tomography
- B scan ultrasound
- Ultrasound biomicroscope
- Laser treatment for posterior segment- choroidal neovascular membrane, Eales disease, occlusive retinal vasculitis etc.

**Investigations facilities:**

- Blood investigations
- Complete blood count
- Erythrocyte sedimentation rate
- ELISA for toxoplasma, HIV I and II.
- Antinuclear antibody
- Rheumatoid factor
- Serum angiotensin converting enzyme (sarcoidosis)
• Serum lysozyme (sarcoidosis)
• VDRL, TPHA (syphilis)
• Quantiferon TB gold test
• HLA B27

**Skin tests:**

1. Mantoux test

• Polymerase chain reaction of intraocular fluid to isolate herpes simplex virus, herpes zoster virus, cytomegalovirus, mycobacterium tuberculosis, eubacteria genome, panfungal genome, propionobacterium acne.

**Microbiology investigations:**

1. Grams staining
2. KOH mount
3. Calcoflour white staining
4. Geimsa staining
5. Acid fast stain
6. Blood agar culture
7. Chocolate agar culture
8. MacConkey agar culture
9. Brucella blood agar culture
10. Sabouraud dextrose agar
11. Non nutrient agar culture
12. Brain heart infusion broth
13. Thyoglycolate broth

**Operation theatre facilities:**

- Cataract surgery set up for uveitic/complicated cataract
- Vitreoretinal surgery set up
- Anterior chamber tap
- Vitreous tap
- Anti VEGF injections
- Ozurdex implant
- IVTA
- Intravitreal antibiotics and sustained release implants.

**List of reference books:**


OUTLINE OF CURRICULUM FOR UVEAL DISEASES

Immunology of uveitis

Basic Immunology

Humoral & Cell mediated immunity

Immunology related to uveitis

Retinal autoimmunity

HLA associations and uveitic entities

Clinical approach to uveitis
  ✦ Classification of uveitis
  ✦ Anterior uveitis
  ✦ Intermediate uveitis
  ✦ Posterior uveitis
  ✦ Panuveitis
  ✦ Symptoms of uveitis
  ✦ Signs of uveitis
  ✦ Anterior uveitis
  ✦ Intermediate uveitis
  ✦ Posterior uveitis
  ✦ Review of patient’s health and other associated factors
  ✦ Differential diagnosis of uveitic entities
  ✦ Epidemiology of uveitis in India

Laboratory and medical evaluation
Therapy of uveitis

Medical management of uveitis

- Mydriatic and cycloplegic
- NSAIDs
- Corticosteroid
- Immunosuppression
- Biologicals

Surgical management of uveitis

- Aqueous paracentesis
- Vitreous biopsy
- Chorioretinal biopsy
- Retinal biopsy

Non infectious (Auto immune) uveitis

- Anterior uveitis
- Acute nongranulomatous uveitis
- Chronic Anterior Uveitis

Intermediate uveitis

- Parsplanitis

Posterior uveitis

- Collagen vascular diseases (Systemic Lupus Erythematosus)
- Inflammatory chorioretinopathy of unknown etiology

Panuveitis
Sarcoidosis
Sympathetic Ophthalmia
Vogt Koyanagi Harada disease
Adamantiades – Behcet’s disease

Infectious uveitis
Viral
Herpes viridae family
Rubella
Measles
West nile virus
Chikunguniya
Dengue
Fungal
Candidiasis
Aspergillosis
Cryptococcus
Protozoal
Toxoplasmosis

Helmenthic
Toxocarisis
Cysticercosis
Diffuse unilateral subacute neuroretinitis (DUSN)
Bacterial

Tuberculosis

Syphilis

Lyme Disease

Leptospirosis

Ocular bartonellosis

Rickettsia

Retinal vasculitis

Endophthalmitis

Signs and symptoms

Types of infectious endophthalmitis

Postoperative

Post traumatic

Endophthalmitis associated with filtering bleb

Endogenous endophthalmitis

Prophylaxis

Diagnosis

Differential diagnosis

Obtaining intraocular specimen

Culture and laboratory evaluation of intraocular specimens

Treatment

Surgical management of acute post operative endophthalmitis
Medical management of acute post operative endophthalmitis

Other consideration for treatment of endophthalmitis

Outcome of treatment

Masquerade syndromes

Non neoplastic masquerade syndrome

Retinitis Pigmentosa

Ocular Ischemic Syndrome

Chronic Peripheral Rhegmatogenous Retinal Detachment

Intra Ocular Foreign Body

Pigment Dispersion Syndrome

Other syndromes

Neoplastic

Primary CNS Lymphoma

Neoplastic masquerade syndrome secondary to systemic lymphoma

Neoplastic masquerade syndrome secondary to systemic leukemia

Neoplastic masquerade syndrome secondary to uveal lymphoid proliferation

Non lymphoid malignancy

Metastatic tumour

Bilateral diffuse uveal melanocytic proliferation

Complications of uveitis

Band shaped keratopathy

Cataracts
- JRA/JIA associated uveitis
- Other Uveitis entities
- Combined phacoemulsification with pars plana vitrectomy
- Glaucoma
- Uveitic ocular hypertension
- Uveitic glaucoma
- Hypotony
- Cystoid macular edema
- Vitreous opacification and vitritis
- Retinal detachment
- Retinal and Choroidal neovascularization

Ocular involvement in AIDS
- Virology of HIV
- Pathogenesis
- Natural history
- Transmission
- Diagnosis
- Management of HIV infection
- Systemic condition
- Medical therapy
- Ophthalmic Complications
- External eye manifestation
The ophthalmologists’ role

Precaution in health care setting

Precaution in ophthalmic practice

Laboratory investigations in uveitis

Blood investigations :

Complete blood count

Erythrocyte sedimentation rate

ELISA for toxoplasma, HIV I and II.

Antinuclear antibody

Rheumatoid factor

Serum angiotensin converting enzyme (sarcoidosis)

Serum lysozyme (sarcoidosis)

VDRL, TPHA (syphilis)

Quantiferon TB gold test

HLA B27 positivity

Skin tests : Mantoux test

Polymerase chain reaction of intraocular fluid to isolate herpes simplex virus, herpes zoster virus, cytomegalovirus, mycobacterium tuberculosis, eubacteria genome, panfungal genome, propionobacterium acne.
Ancillary tests in Uveitis

- Fundus Fluorescein Angiography
- Indocyanine green Angiography
- Optical Coherence tomography
  - Spectral domain
  - Swept source
    - Ultrasonography B scan
    - Ultrasound biomicroscopy
NEURO OPHTHALMOLOGY
Sections:
Anatomy and Physiology
Ocular and Neurologic Evaluation
Neuro-Ophthalmic Symptoms and Signs
Disorders of the Afferent and Efferent Visual Pathways
Systemic, Neurologic, and Ophthalmic Disorders Commonly Associated with Neuro-Ophthalmic Manifestations
Procedures Commonly Performed/Obtained in Neuro-Ophthalmology
Research, Administration, Education Resources

A) Anatomy and Physiology
1. Bony anatomy
   1. Orbit
   2. Bony communications
      1. Superior orbital fissure
      2. Optic canal
      3. Inferior orbital fissure
      4. Ethmoidal foramina
   3. Skull
      1. Anterior cranial fossa
      2. Middle cranial fossa
      3. Posterior cranial fossa
2. Anatomy of the orbit, the eyelids, and the lacrimal pathways
3. Neuroanatomy

4. Afferent visual pathways
   1. Anatomy and physiology of the eye
   2. Retina
      1. Macula
   3. Optic nerve
   4. Optic chiasm
   5. Optic tract
   6. Lateral geniculate
   7. Optic radiations
   8. Calcarine cortex
   9. Association areas

5. Efferent visual pathways
   1. Supranuclear input
   2. Cerebellar connections
   3. Nuclear centers
   4. Ocular motor nerves
      1. Abducens (VI)
      2. Trochlear (IV)
      3. Oculomotor (III)
   5. Extraocular muscles
   6. Vestibular pathways
6. Facial motor anatomy
7. Sensory anatomy (trigeminal system)
8. Autonomic anatomy
   1. Sympathetic
   2. Parasympathetic
      1. Lacrimal
      2. Pupil

GOOD TO KNOW:

9. Vascular anatomy
   1. Arterial anatomy
      1. Internal carotid arteries and their branches
      2. Circle of Willis
      3. External carotid arteries and their branches
      4. Vertebrobasilar system
      5. Aortic arch
      6. Blood supply of the orbit, eye and optic nerve
   2. Venous anatomy
      1. Cerebral venous sinuses and deep venous system
      2. Cortical veins
      3. Venous drainage in the neck
      4. Venous drainage of the eyes and orbits
B) Ocular and Neurologic Evaluation- MUST KNOW

1. Ocular evaluation
   1. Evaluation of visual function
      1. Visual acuity testing
      2. Stereopsis
      3. Color vision testing
      4. Contrast sensitivity
      5. Basics of refraction
      6. Confrontation visual fields
      7. Amsler grid
      8. Photostress testing
   2. Ocular examination, intraocular pressure, resistance to retropulsion, exophthalmometry
   3. Pupillary examination
      1. Measuring the RAPD Swinging flashlight test
      2. Approach to Anisocoria
   4. Funduscopic examination
      1. Normal optic disc
         1. Disc anatomy
         2. Vascular features-Venous pulsations
      2. Use of instruments in examination
1. Lensometer
2. Slit lamp
3. Transillumination
4. Direct ophthalmoscopy
5. Indirect ophthalmoscopes and Biomicroscopy of the fundus

3. Ocular motility, use of prisms, cover testing, red glass, maddox rod, forced duction test, sensory testing

1. Normal eye movements

1. Saccades - Volitional, visually guided, response to auditory target, antisaccades, memory guided, reflexive
2. Optokinetic Nystagmus (OKN) Drum
3. Pursuit
4. Cover Testing

5. Red glass
6. Maddox rod
7. Use of prisms

Ocular and Neurologic EvaluationGOOD TO KNOW:

8. Vestibular Testing

1. Vestibulo-Ocular Reflex (VOR)
2. Vestibulo-Ocular Reflex (VOR) Cancellation
3. Dix-Hallpike Maneuver
4. Horizontal Head Impulse Test
5. Penlight-Cover Test for spontaneous nystagmus examination of the young child

4. Neurologic evaluation
   1. Neurologic examination (adult and child)
   2. Basic cognitive evaluation (mini mental status)

5. Neuro-ophthalmic evaluation of the comatose patient

6. Examination of children
   1. Developmental milestones for children
   2. Visual maturation of children

C) Ancillary tests obtained in neuro-ophthalmology MUST KNOW

   Visual field testing

   Automated perimetry (familiarity with current perimeters and different testing strategies)

   Goldmann perimetry (should be able to perform)

   Tangent screen (should be able to perform)

   Measure the Relative Afferent Pupillary Defect (RAPD)

   Electrophysiology

   Visual evoked responses

   Electroretinogram

   Multifocal electroretinogram

   Dark adaptation

   Eye movement recordings
Ocular and orbital ultrasound

Retinal fluorescein angiography

Ancillary tests obtained in neuro-ophthalmology GOOD TO KNOW

7. Nerve fiber layer analysis
   1. Optical coherence tomography (OCT), HRT, GDX

8. Imaging
   1. Computed tomography
   2. Magnetic resonance imaging
   3. Vascular imaging (ultrasonography, CTA, MRA, CTV, MRV, conventional angiogram)
   4. Functional neuro-imaging (MRI, SPECT, PET)

9. Lumbar puncture with opening pressure

D) Neuro-Ophthalmic Symptoms and Signs - MUST KNOW:
   - Visual Loss
     Transient
     Permanent
     Unexplained visual loss
     Non organic visual loss

Positive Visual Phenomena

Visual hallucinations

Visual Field Loss
Higher cortical dysfunction

Normal and abnormal optic nerve

Edema (disc swelling, papilledema, pseudotumor cerebri) and pseudopapilledema/anomalous nerves

Optic atrophic

Optociliary shunt vessels

Shunt Vessels (Glaucoma)

Shunt Vessels (CRVO)

Shunt Vessels (Congenital)

Shunt Vessels (Meningioma)

Cupped optic nerve

Optic disc anomalies/pseudopapilledema

1. Oscillopsia, nystagmus, ocular oscillations
2. Double vision (diplopia)
3. Abnormal extraocular movements
4. Ptosis
5. Lid findings
   1. Lid retraction
   2. Lid lag
   3. Lag ophthalmos
   4. Lid twitch
6. Orbital signs
   1. Proptosis
2. Enophthalmos
3. Pulsating exophthalmos

7. Pupillary changes
   1. Anisocoria
   2. Dilation Lag
   3. RAPD

8. Abnormal facial movements
9. Facial weakness
10. Ocular pain, facial pain and headaches
11. Speech disturbances

3. Disorders of the Afferent and Efferent Visual Pathways
   1. Diseases of the retina
      1. Cone
      2. Rod
      3. Ganglion cell
      4. Macula
   2. Diseases of the optic nerve
      1. Ischemic optic neuropathy
         1. Anterior
         2. Posterior
      3. Diabetic papillopathy
      4. Optic Neuropathy with Retinopathy
2. Inflammation
   1. Non infectious
      1. Idiopathic optic neuritis
      2. Optic neuritis and multiple sclerosis
      3. Periphlebitis in Optic Neuritis
      4. Other inflammatory optic neuritides
         1. Sarcoidosis, orbital inflammation, lupus, etc.
   5. Leber’s Optic Neuropathy
      2. Infectious
      3. Compression/Infiltration
      4. Paraneoplastic
      5. Traumatic
      6. Toxic
      7. Nutritional
      8. Metabolic
      9. Hereditary
     10. Congenital
     11. Raised intracranial pressure (papilledema, pseudotumor cerebri)
     12. Decreased intraocular pressure (hypotony)
   3. Orbital pathology causing neuro-ophthalmic manifestations
      1. Trauma
      2. Mass lesions
1. Neoplasms

3. Inflammation/Infection
   1. Myositis
   2. Orbital inflammation
   3. Thyroid orbitopathy
   4. Orbital cellulitis
   5. Abscess

4. Orbital manifestations of dural fistulas

4. Diseases of the chiasm
   1. Chiasmal visual field defects
   2. Compression/infiltration
   3. Inflammation
   4. Trauma
   5. Ischemia/hemorrhage

5. Diseases of the retrochiasmal visual pathways
   1. Optic tract
   2. Lateral geniculate
   3. Radiations
   4. Calcarine cortex
   5. Association areas
   6. Specialized syndromes
      1. Anton’s syndrome (cerebral blindness)
2. Riddoch’s phenomena: Statico-kinetic dissociation
3. Balint syndrome
4. Gerstmann syndrome
5. Cerebral achromatopsia
6. Alexia without agraphia
7. Acalculia
8. Agraphia (with associated alexia)
9. Agnosias
10. Visual neglect
11. L-R confusion
12. Akinetopsia
13. Blindsight”

6. Pupillary pathology
   1. Normal pupillary responses
   2. Effects of drugs on the pupils
   3. Congenital pupillary abnormalities
   4. Pupillary changes secondary to ocular diseases
      1. Traumatic, foreign body
      2. Inflammation
      3. Neovascularisation
   1. Ocular surgery, laser
5. Traumatic pupillary changes
6. Evaluation and management of anisocoria

7. Evaluation and management of a large or a small pupil

8. Evaluation and management of specific pupillary disorders
   1. Adie’s tonic pupil
   2. Tadpole pupil
   3. Argyll-Robertson pupil
   4. Correctopia
   5. Physiologic anisocoria
   6. Horner’s syndrome
   7. Third nerve palsy
      1. Cyclical
      2. Subnuclear
   8. Afferent pupillary defect
   9. Light near dissociation
   10. Flynn Phenomenon, paradoxical pupillary reflex (not in UMLS)

7. Eye movement systems pathology
   1. Vestibular ocular system
   2. Optokinetic nystagmus
   3. Saccades
   4. Pursuit
   5. Convergence
   6. Divergence
7. Titubation
8. Specific ocular motor syndromes

1. Cranial nerve palsies
   1. Third (Oculomotor)
      1. Cyclical
      2. Subnuclear
      3. Ophthalmoplegic Migraine
   2. Fourth (Trochlear)
   3. Sixth (Abducens)
   2. Nuclear/Supranuclear palsies
      1. Internuclear ophthalmoplegia
      2. One and half syndrome
      3. Horizontal gaze palsy
      4. Monocular elevation deficit
      5. Vertical gaze palsy
      6. Skew deviation
      7. Ocular tilt reaction
      8. Upgaze palsy
      9. Downgaze palsy
      10. Lateropulsion
3. Ocular motor apraxia
4. Spasm of the near triad
5. Convergence insufficiency
6. Divergence insufficiency
7. Decompensation of phorias
8. Restriction syndromes
9. Ocular neuromyotonia
10. Cyclic oculomotor paresis

9. Classical brain stem syndromes
   1. Foville
   2. Millard-Gubler
   3. Duane’s syndrome
   4. Möbius syndrome
   5. Locked In syndrome
   6. Nothnagel
   7. Benedickt
   8. Weber
   9. Claude syndrome
   10. Wallenberg syndrome

11. Syndrome of the anterior inferior cerebellar artery

10. Ocular motility disturbance by location
   1. Medulla
   2. Pons
   3. Mesencephalon
4. Dorsal midbrain syndrome
5. Cerebellar pathology
8. Nystagmus and disorders of ocular stability
   1. Jerk nystagmus
   2. Pendular nystagmus (binocular & monocular)
   3. Congenital vs acquired nystagmus
   4. Central vs peripheral nystagmus
      1. Vestibular nystagmus
5. Specific types of nystagmus and their localizing value (1 if common & 2 if rare)
   1. Downbeat nystagmus
   2. Upbeat nystagmus
   3. Left beat nystagmus
   4. Rebound nystagmus
   5. Brun’s nystagmus
   6. Periodic alternating
   7. Convergence retraction nystagmus
   8. See saw nystagmus
   9. Divergence nystagmus
   10. Sensory nystagmus
   11. Congenital motor nystagmus
   12. Spasmus nutans/dissociated nystagmus/monocular nystagmus
   13. Rotary nystagmus
14. Abducting nystagmus
15. Latent nystagmus
16. Vestibular nystagmus
17. End-gaze nystagmus
18. Voluntary nystagmus

6. Induced nystagmus
   1. Valsalva
   2. Sounds (Tullio’s phenomena)
   3. Calorics: hot or cold water in ear

7. Ocular oscillations
   1. Superior oblique myokymia
   2. Square wave jerks
   3. Opsoclonus
   4. Flutter
   5. Ocular bobbing
   6. Oculopalatal myoclonus
   7. Oculomasticatory myorhythmia

9. Eyelid position abnormalities
   1. Eyelid retraction
   2. Ptosis
      1. Pseudoptosis
      2. Congenital
3. With elevator palsy
4. Marcus Gunn Jaw Wink
5. Blepharophimosis
6. Levator dehiscence
7. Myopathic
8. Neuro-muscular transmission
9. Ocular myasthenia

9. Neuropathic
   1. Apraxia of eyelid opening
   2. Third nerve dysfunction
   3. Aberrant reinnervation of third nerve
   4. Horner’s syndrome

10. Blepharospasm
   3. Eyelid nystagmus
   4. Lid twitch
   5. Lid bobbing

10. Facial nerve dysfunction
   1. Central and peripheral facial palsy
   2. Blepharospasm
   3. Hemifacial spasm
   4. Facial myokymia
   5. Oculomasticatory myorhythmia (Whipple’s)
6. Facial tics
7. Facial myotonia
8. Facial dystonia (Meige’s syndrome)

4. Systemic, Neurologic, and Ophthalmic Disorders Commonly Associated with Neuro-Ophthalmic Manifestations

1. Developmental and congenital anomalies with neuro-ophthalmologic consequences
   1. Visual maturation
   2. Complications of prematurity
   3. Cerebral palsy
   4. Complications of birth injuries
   5. Congenital hydrocephalus
   6. Cranial dysostoses (craniosynostosis)
   7. Amblyopia
   8. Other disc anomalies

1. Congenital optic nerve anomalies
   1. Bergmeister papilla
   2. Basal encephaloceles
   3. Optic nerve dysplasia and aplasia/hypoplasia
   4. Septo-optic dysplasia
   5. Optic nerve coloboma
   6. Optic nerve pit
   7. Morning glory syndrome
8. Optic nerve drusen
9. Tilted disc
10. Myelinated nerve fibers
11. Staphyloma
12. Congenital Optic Atrophy
13. Laurence-Moon-Biedl Syndrome
   2. Optic disc anomalies/pseudopapilledema
9. Common malformations of the eye and orbit
10. Skull base malformations. Chiari malformation
11. Fibrous dysplasia
12. Ocular manifestations of child abuse
   2. Systemic disorders commonly associated with neuro-ophthalmologic manifestations
      1. Specific hereditary ocular and neurologic diseases with neuro-ophthalmic presentation
         1. Pseudoxanthoma Elasticum
         2. Factor V Deficiency
         3. Bassen-Kornzweig Syndrome
         4. Ehlers-Danlos Syndrome
         5. Olivopontocerebellar Degeneration
      2. Neurocutaneous syndromes
         1. Neurofibromatosis
         1. NF-1
2. NF-2
   2. Tuberous sclerosis
   3. von Hippel-Lindau
   4. Sturge-Weber
   5. Ataxia telangiectasia
   6. Wyburn-Mason

3. Vascular disease
   1. Vascular risk factors
   2. Prevention of vascular disease
   3. Neuro-ophthalmic manifestations of vascular diseases
      1. Temporal arthritis
      2. Carotid Oclusive Disease
      3. Vasospastic Amaurosis Fugax
      4. Central/Branch Retinal Artery Occlusion
      5. Saturday Night Retinopathy
      6. Carotid Dissection
      7. Moyamoya Disease
      8. Dolichoectasia

4. Hypercoagulable states
   4. Systemic hypertension

5. Metabolic diseases including diabetes mellitus
   1. Diabetic Retinopathy
6. Autoimmune diseases, classification of vasculitides

1. Specific vasculitides with ocular and neurologic manifestations
   1. Giant cell arteritis (Temporal arteritis)
   2. Sarcoidosis
   3. Lupus
   4. Antiphospholipid Antibody Syndrome
   5. Wegener granulomatosis

7. Complications of cancers, paraneoplastic syndromes; principles of treatment (2)

1. Leukemia
2. Lymphoma
3. Histiocytosis
4. Metastatic Carcinoma
5. Multiple Myeloma
6. Paraneoplastic Disease
7. Lymphomatoid Granulomatosis

8. Neuro-ophthalmic complications of chemotherapy, and radiation therapies

1. Radiation retinopathy

9. Complications of infections

1. Specific infections with common neuro-ophthalmic complications
   1. AIDS
   2. Syphilis
   3. Presumed Ocular Histoplasmosis
4. Toxoplasmosis

3. Neurologic disorders commonly associated with neuro-ophthalmologic manifestations
   1. Head and ocular injury
      1. Recognize and evaluate neurological complications of head injury
      2. Neuro-ophthalmic complications of brain injury (acute and late)
      3. Traumatic optic neuropathies (direct and indirect)
      4. Traumatic cranial nerve palsies (III, IV, and VIth)
      5. Diagnose and evaluate orbital and facial fractures
      6. Recognized the complications of ocular trauma
      7. Evaluate post-traumatic visual loss
      8. Diagnosis of post-concussion syndrome

2. Increased intracranial pressure
   1. Differential diagnosis and management of intracranial hypertension (1)
      1. Intracranial mass, infection or bleed
      2. Meningitis
      3. Subarachnoid hemorrhage
      4. Hydrocephalus
      5. Cerebral venous thrombosis
      6. Idiopathic intracranial hypertension

2. Neuro-ophthalmic manifestations and complications

3. Vascular disease of the brain and the eye
   1. Classification of stroke
1. Thalamic infarct
2. Pontine infarct
3. Midbrain infarct

2. Mechanisms
1. Vein vs artery
2. Hemorrhage vs ischemia
3. Embolism vs thrombosis vs hemodynamic
4. Large artery vs small artery

3. Diagnosis and evaluation of stroke
1. Vascular evaluation of stroke
2. Cardiac evaluation of stroke
3. Hypercoagulable states

4. Basics of acute treatment and secondary prevention of stroke

5. Neuro-ophthalmologic manifestations of stroke
1. Pituitary apoplexy

6. Ocular ischemia
1. Transient visual loss
2. Central and branch retinal artery occlusions
3. Ocular ischemic syndrome
4. Central and branch vein occlusions

7. Venous sinus thrombosis
1. Superior Ophthalmic Vein Thrombosis
8. Hemorrhage
   1.  Subarachnoid
   2.  Thalamic hemorrhage
   3.  Pontine hemorrhage
   4.  Midbrain hemorrhage

9. Intracranial vascular malformations, diagnosis and neuro-ophthalmologic manifestations
   1.  Aneurysms
   2.  Ophthalmic Artery Aneurysm
   3.  Arteriovenous malformations
   4.  Dural fistulas
   5.  Carotid cavernous fistulas (direct, indirect)
   6.  Cavernous hemangiomas

4. Seizures with neuro-ophthalmologic manifestations
   1.  Occipital seizures
   2.  Pupillary changes, ocular movement changes during seizures

5. Neuro-ophthalmic manifestations of neoplasms
   1.  Intracranial tumors
   2.  Skull base tumors
   3.  Chordoma
   4.  Orbital tumors
   5.  Choroidal Folds From Orbital Mass

6. Optic nerve tumors
7. Benign vs malignant neoplasm
8. Primary vs secondary
9. Pediatric vs adult tumors
6. Demyelinating disease
   1. Multiple sclerosis
      1. Relationships between optic neuritis and multiple sclerosis
      2. Treatment strategies
      3. Vision assessment in multiple sclerosis
   2. Devic’s disease
   3. Acute disseminated encephalomyelitis
7. Infections (neuro-ophthalmic manifestations of localized and systemic infections)
   1. Intracranial infections
      1. Abscess
      2. Cerebritis
      3. Empyema
      4. Meningitis
      5. Meningo-encephalitis
   2. Whipple’s disease
   3. Orbital infections (cellulitis)
   4. Optic nerve infection (infectious optic neuritis and neuroretinitis)
   5. Creutzfeld-Jacob disease
   6. Toxoplasmosis
7. Lyme disease

8. Metabolic diseases
   1. Wilson’s disease
   2. Vitamin deficiencies (vitamin A, B1, B12)
   3. Metabolic storage diseases
   4. Amyloidosis

9. Neuro-degenerative diseases
   1. Parkinson syndromes
      1. Parkinson’s disease
      2. Progressive supranuclear palsy
   2. Alzheimer, Frontotemporal dementia
   3. Vascular dementias
   4. Amyotrophic lateral sclerosis
   5. Ataxia
      1. Hereditary ataxias
   6. Tauopathy

10. Polyradiculopathies
    1. Guillain-Barry
    2. Miller Fisher variant

11. Neuro-muscular transmission deficits
    1. Physiology of the neuromuscular transmission
    2. Myasthenia gravis
3. Lambert-Eaton myasthenic syndrome
4. Toxic neuromuscular transmission defect (Botulism, medications)

12. Myopathies (involving the extraocular muscles)
   1. Congenital myopathies/oculopharyngeal muscular dystrophy
      1. Dystrophies/Ion Channel Disorders (Myotonia)
   2. Mitochondrial diseases
      1. Chronic progressive external ophthalmoplegia (CPEO)
   3. Ischemic
      1. Giant cell arteritis (Temporal arteritis)
      2. Orbital ischemic syndrome

4. Metabolic - Toxic
   1. Drug induced, toxic

5. Inflammatory
   1. Thyroid orbitopathy
   2. Orbital inflammatory disease

6. Neoplasm/infiltration

13. Headache and facial pain
   1. Classification of headaches and facial pain proposed by the International Headache Society (IHS)
   2. Migraine
      1. Migraine without aura
      2. Migraine with visual aura
3. Hemianopia after migraine

3. Tension headaches
   1. Episodic
   2. Chronic

4. Cluster headache

5. Headache associated with increased intracranial pressure

6. Headache and facial pain of vascular origin

7. Ocular pain related to ocular or optic nerve disease

8. Trigeminal neuralgia (Fifth nerve)

9. Herpes zoster (zoster ophthalmicus)

10. Referred ocular pain
   1. Vascular (i.e. dissection)
   2. Ocular ischemic syndrome
   3. Cavernous sinus syndrome

14. Psychiatric illness

4. Ocular diseases commonly associated with or mimicking neuro-ophthalmologic disorders
   
   1. Ocular neoplasms
      1. Benign vs malignant
      2. Primary vs secondary
      3. Pediatric vs adult neoplasms
   
   2. Ocular infections
      1. External
2. Endophthalmitis
3. Neuroretinitis

3. Ocular inflammation (uveitis)
   1. Classification of uveitis
   2. Neuro-ophthalmic disorders associated with uveitis
   3. Optic neuritis and uveitis

4. Meningo-uveitis

5. Neuro-ophthalmic manifestations of iatrogenic diseases
   1. Radiation
   2. Chemotherapy
   3. Various drugs with specific neuro-ophthalmologic complications, including
      1. Cyclosporine
      2. Amiodarone
      3. Hydroxychloroquine (Plaquinil)
      4. Ethambutol
      5. Vasoconstrictors
      6. Steroids
      7. Facial and orbital injections

4. Alcohol
   1. Thiamine deficiency
   2. Wernicke encephalopathy

5. Neuro-ophthalmic complications of surgical procedures
1. Post operative visual loss
2. Epidural anesthesia
3. Ocular and orbital surgery
4. Neurosurgery
5. Endovascular procedures
6. Functional disorders

E) Surgical skills in Neuro-Ophthalmology:

GOOD TO KNOW

Surgical and endovascular procedures and their complications

Temporal artery biopsy

Principles and complications of strabismus surgery

Canthotomy, cantholysis

Approaches for orbital biopsies and orbital tumors

Principles of Optic nerve sheath fenestration, Orbital decompression, CSF shunting procedures, Pituitary surgery (transphenoidal adenomectomy), Interventional neuroradiology techniques

Tensilon test

Botulism toxin therapy

F) SOCIAL ASPECTS NEURO OPHTHALMOLOGY - MUST KNOW:

1. Definition of legal blindness
2. Legal requirements for driving (visual) in the state in which you practice neuro-ophthalmology
3. Counseling of the visually impaired patient
4. Genetic counseling

Large previous and ongoing studies addressing specific neuro-ophthalmic issues

- Optic Neuritis Treatment Trial (ONTT)
- Longitudinal Optic Neuritis Study (LONS)
- CHAMPS study
- Ischemic Optic Neuropathy Decompression Trial (IONDT)

Neuro-ophthalmologic resources

Organizations

- NANOS
- INOS
- EUNOS
- AAN
- ANA
- AAO
- ARVO
References:


EDUCATIONAL PROGRAM

The program director is responsible for the structure and content of the educational program and must provide a statement of objectives, methods of implementation, and procedures for assessment of the program by the faculty and the fellows. (See section III A Fellowship Program Director.)

A. Clinical Components

1. Neuro-Ophthalmology Examination Skills

The fellowship must be organized to permit fellows to regularly perform evaluations, including medical history and examination, basic refraction, prism measurements, indirect ophthalmoscopy, slit lamp and refraction, tonometry, exophthalmometry, Maddox rod exam, basic sensorimotor, and cerebellar function assessment.

2. Technical Clinical Examinations

Fellows must understand the indications for, and the interpretation of, diagnostic technology in neurology and ophthalmology. These technologies include, but are not limited, to:

a. Tests of visual function: manual perimetry, automated perimetry, contrast sensitivity, and color vision

b. MRI, magnetic resonance angiography, CT, and optical coherence tomography

c. Ocularelectrophysiology, including visual evoked potentials and electroretinography

d. The role of ocular motor recordings and their utilization in the documentation and monitoring of neurological disease

e. Ultrasound, including A-scan, B-scan, and duplex Doppler ultrasonography examinations, as they may apply to neuro-ophthalmology.
3. Therapeutics

Fellows are required to be knowledgeable about the indications for, use of, and limitations of pharmacological, radiological, and surgical therapies that may be recommended for patients with neuro-ophthalmological disorders.[M]

4. Clinical Experiences

It is recommended that fellows perform a sufficient number of procedures to achieve competence. Individual programs utilizing these guidelines should determine what the minimum numbers should be, based on local need and resources available.

Fellows are required to be exposed to a broad variety of neuro-ophthalmological disorders. The following minimum number of cases/procedures is required to be performed over a 12-month period:

a. Neuro-ophthalmology cases: 2400 [M]

b. Complete neuro-ophthalmic examination: 1000[M]

c. Visual fields and OCT (manual or automated): performed 20[M]/Interpret 50

d. Surgical experiences are optional

The list of topics that a fellow should be proficient in has been mentioned in Annex. 1
Minimum requirements for accreditation of institutions for Neuroophthalmology fellowship

Centre wishing to start Fellowship should have at least one dedicated Neuro-Ophthalmology faculty with a dedicated clinic for Neuro Ophthalmology. Minimum patient load of the clinic was pegged at 200 patients per month. The team felt that for Indian scenario, the faculty can be somebody who has a minimum 5 years experience in managing Neuro Ophthalmology patients.

The centre and a fellow should have an easy access to Strabismologist, Neurologist, Neuro radiologist and Neurosurgeon. While it was deemed desirable to have these specialists on board or on panel of the organization it was not made a mandatory criterion.

The centre must have a field machine, OCT, FFA, Color and Contrast acuity charts. There should be an easy access to Orthoptics clinic, LVA clinic and electrophysiology set up.
ANNEXURES
Annexure I

Ophthalmology Surgical Competency Assessment Rubric (OSCAR)

Example of Extracapsular Cataract Extraction (ICO-OSCAR: ECCE) for development of Rubrics for appropriate surgery

Rating scale
- 0-Poor
- 1-Average
- 2-Good
- 3 - Excellent

Peribulbar block
Draping
Microscope handling
Bridle suture
Scleral access and cauterization
Viscoelastic: Appropriate
use and safe insertion

Anterior capsulotomy
Wound enlargement
Nucleus hydrodissection
Nucleus extraction
Irrigation and aspiration technique
with adequate removal of cortex

Lens insertion, Rotation and
final position of intraocular lens

Wound closure: Suture handling and placement
Wound closure: Suture tying and knot rotation
Wound closure: Viscoelastic removal,
wound hydration and wound security

Overall speed and Fluidity of procedure
Annexure II

Assessment of Presentations (Seminars, journal clubs, case presentations)

Rating Scale
0-poor
1-average
2-good
3. Excellent

Presentation
Body language
Voice Modulation
Quality of slides
Confidence
Clarity

Subject content
Basics
Definition
Relevance
Advances
References

Discussion and Question-answers
Annexure III

OCEX (Ophthalmic clinical evaluation exercise) - Total marks-50

Given here as an example

Rating Score  0- Poor
1- Average
   2- Good
   3 - Excellent

History taking    (maximum score of 14)
Obtained chief complaint
History of present illness
Preent Systemic Illness, Medications
Pertinent negatives
Pain inquiry
Allergies
Past medical history
Relevant family and social history

Examination    (maximum score of 14)
Best corrected visual acuity
Hirschberg’s test
Motility/proptosis
Anterior Segment Examination

Slitlamp examination (including gonioscopy)

Pupils / RAPD

Intraocular pressure

Fundoscopy

Professionalism (maximum score of 12)

Respectful and courteous

Used language the patient understands

Explained technique before examining the patient

Explained findings

Explained diagnosis/prognosis

Explained plan /options

Answered patient’s questions

Case presentation (maximum score of 10)

Concise and clear

Pertinent facts

Appropriate diagnosis and differential diagnosis

Appropriate plan of management including investigations and treatment

Response to examiner’s questions
Annexure IV

Ethics and Professionalism in Ophthalmology

Some of the goals listed below are specific to the requirements of the United States or other nations. They are included here as a guideline only.

Basic Level Goals:

1. Provide the definition and basic concepts behind the following terms used in medical ethics:
   a. Morality versus ethics (intent-based standards versus conduct-based standards)
   b. Autonomy and surrogacy
   c. Beneficence
   d. Nonmaleficence
   e. Truth telling
   f. Distributive justice
   g. Fiduciary responsibility to patients
   h. Compassion

2. Describe the ethical principles listed in the following key medical documents:
   a. Hippocratic Oath
   b. Declaration of Geneva
   d. Code of Ethics, American Academy of Ophthalmology

3. Describe the basics of ophthalmic practice management:
   a. Partnership arrangements
b. Income distribution methods
c. Contractual negotiations
d. Hiring and supervising of employees
e. Basic accounting
   i. Profit/loss statements
   ii. Billing
   iii. Collections
f. Financial management

4. Describe the basics of the health care system and reimbursement for services as appropriate to the local, regional, and national market of the trainee (eg, medical documentation, third party payers, managed care, Medicare [USA], Medicaid [USA], private insurance, nationalized health care systems [United Kingdom, Canada, and others]).

Standard Level Goals:

1. Describe basic medical ethics in the ophthalmic practice, including:
   a. Confidentiality of health information
   b. Professional competence and maintenance of competence
   c. Informed consent
   d. Responsibility to report the unethical conduct of others
   e. Adequate patient assessment and avoidance of under/over treatment and under/over testing

2. Identify elements of effective physician-patient communication, including:
   a. Relevant cultural and linguistic differences that potentially influence ethical delivery of services

3. Describe advanced aspects of practice management (eg, business models,
documentation requirements and coding, privacy requirements, accommodating patients or employees with disabilities).

4. Describe advanced aspects of health care reimbursement (eg, physicians’ role in managed care organizations, administrative role, third-party reimbursement, capitated programs).

5. Describe the framework of patient-care quality as it relates to patient safety, patient advocacy, effectiveness, efficiency, timeliness, and equity.

6. Describe how ophthalmologists are responsible for ensuring that all those in the service area of the practice have access to affordable eye care, and define how ophthalmologists are uniquely trained and certified to do so.

7. Identify the various missions of ophthalmology organizations with respect to service to members, patients, clinical education, quality of care. Define and mitigate the consequences of conflicting missions.

8. Identify how participation of ophthalmologists in ophthalmology organizations serves the profession and society.

9. Identify the responsibilities of ophthalmologists and ophthalmology societies to ensure that everyone has the right to sight.

Advanced Level Goals:

1. Recognize and use advanced medical ethics in the ophthalmic practice:
   a. Applicable informed consent documents (eg, clinical research, off-label use disclosures)
   b. Management (offering and rendering) of second opinions
   c. Individual and institutional responsibilities regarding impaired physicians
   d. Responsibility for postoperative care, including appropriate transfer of care to other physicians
   e. Appropriate delegation to limited license auxiliaries
   f. Fairness of fees
g. Management of conflicts of interest (clinical and nonclinical)
   i. Disclosures
   ii. Gifts to physicians
h. Appropriate advertising (and applicable laws)
i. Appropriate conduct as a medical-expert witness in litigation

2. Describe the ethical principles listed in the following key medical documents regarding research involving human subjects:
   a. Nuremburg Code5
   b. Declaration of Helsinki6
   c. Belmont Report7

3. Identify applicable insurance coverage responsibilities in a practice situation.


5. Work within integrated eye care delivery systems (both within eye care specialties and within general medicine and surgery).

6. Participate in all of the foregoing aspects of practice management to the best ability within a medical education setting.

7. Utilize all of the foregoing ethical principles and knowledge in direct patient care.

8. Describe the responsibility of ophthalmologists to share their knowledge of clinical arts and sciences for the benefit of patients, the profession, and society.