

PAN-AMERICAN COUNCIL OF UNIVERSITY

PROFESSORS OF OPHTHALMOLOGY



MINIMUM REQUIREMENTS FOR THE OPHTHALMOLOGY RESIDENCY



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Training for a specialist in ophthalmology must be provided at an Institution accredited in the country, and should be based on a complete curriculum (cognitive and technical skills) of a minimum length of 3 years. The resident must work full time for the training institution.

The candidates will be medical doctors – surgeons with a degree. A public selection process is recommended.

Training institution: This institution must be accredited under the regulations of the country (by the university authority or ophthalmology society). Ideally, it should rely on the academic support of a university. There must be a teaching team of experienced ophthalmologists renowned as experts by the ophthalmology society. Ideally, there should be a specialist in each basic subspecialty field (anterior segment and glaucoma, vitreoretina, plastics, pediatric ophthalmology).

The training institution must have the basic examination instruments (lensmeter, trial lens set, optotype chart or projector, retinoscope, trial frames, indirect and direct ophthalmoscope, 90-diopter magnifying lens, slit-lamp biomicroscopes, 3-mirror Goldmann lens, 20-diopter magnifying lens, prisms box). An automated refractometer is advisable.

It should also have basic diagnostic equipment such as a fundus camera, visual field analyzer, ultrasound. If the institution does not have other equipment such as a corneal topographer, OCT, specular microscope, it is advisable it associates with institutions that do have such equipment.

Surgery Areas: These areas should have an operating microscope providing coaxial observation (ideally with XY displacement, co-observation oculars for the assistant and video recording). It should also have phacoemulsification equipment, bipolar cautery, cryo equipment, and vitrectomy and endolaser equipments.

The institution should have an argon laser (or diode or green laser) and YAG laser equipments.

All training centers must have a Library. At least the library should include the collection of manuals published in the country or, otherwise, the Basic Course of the American Academy of

Ophthalmology, besides the traditional textbooks.

The Institution must offer a complete curriculum based on seminars, lectures, etc. to cover all the items in the curriculum. If there are several training programs in the same city, it is recommended to unify the theoretical training. Another option is an Internet-based course approved or sponsored by the national society, with periodic assessments.

The institution must assess the residents with practical and theoretical exams on a periodic basis.

A. CURRICULUM

- I. Basic Sciences in Ophthalmology: A 6-week continued course is recommended. Otherwise, teaching should be distributed throughout the residency for an equivalent period of time.
 - a) Anatomy. Orbit and paranasal sinuses. Eyelids, lacrimal glands, eye globe, extrinsic muscles. Vascularization of the eye and orbit. Neuroanatomy (visual pathway, oculomotor system, nucleus and pathways, associations). Autonomic nervous system. Sensitive system of the eye and orbit.
 - b) Histology. Cornea, iris, anterior chamber angle. Sclera, uvea, retina, vitreous. Conjunctiva, eyelids, lacrimal system.
 - c) Embryology. Organogenesis, optic vesicle. Differentiation of surface neuroectoderm (eyelids, cornea, lens). Bulbar mesoderm (uvea, extrinsic muscles, anterior chamber angle). Vascular system.
 - d) Physiology and biochemistry. Lacrimal film. Physiology of the cornea and its endothelium. Dynamics of aqueous humor (composition – production – drainage). Physiology of the iris, myosis and mydriasis. Metabolism of the lens. Vitreous (changes related to age). Retina (vision photochemistry), exchange of external segments, neurotransmitters, ERG-EOG principles. Retinal pigment epithelium (role in photochemistry, external barrier, phagocytosis and autophagia). Muscular physiology.
 - e) Pharmacology. Cholinergic and adrenergic agents (alpha-adrenergic and beta-adrenergic, agonists and antagonists). Carbonic anhydrase inhibitors. Osmotic agents. Prostaglandines. Anti-inflammatory agents, steroid and non-steroid. Antibiotics, antifungal, antiviral. Anesthetics.
 - f) Genetics. Genes and chromosomes. (DNA-RNA biochemical bases, codon, exon, intron, base pairs, transcription, alleles). Types of inheritance.
 - g) Optics. Physical optics (the light and its properties). Geometric optics (reflection, refraction, prisms, spherical lenses, Sturm conoid, cylindrical and toric lenses. Optical aberrations. Clinical optics (eye optics, transmission of light through optical media, ametropies).
 - h) Microbiology and immunology. Bacteria, Chlamydia, prevailing virus in ophthalmic pathology. Parasitology (protozoa, helminths). Immunology principles. Cell-mediated and humoral immunity, hypersensitivity. Immunosuppressors.

II. Clinical Ophthalmology

1. Refraction: The resident must have theoretical knowledge of physical optics, optical lenses and clinical refraction; he/she must master retinoscopy and subjective refraction techniques,

cycloplegic refraction, prism prescription, prismatic effect of decentered lenses, prescription of monofocal, multifocal lenses in children. The resident must know how to handle the following instruments: lensmeter, automated refractometer, keratometer. He/She should know the methods and equipment for intraocular lens calculation. He/She must be aware of the optical aids for poor vision and the principles on which they are based.

2. **Semiology:** At the beginning of his/her clinical training the resident must be trained in the external examination of the eye, adnexa and orbits. Schirmer test. Biomicroscopic examination of the anterior and posterior segment. Gonioscopy. Ocular motility examination and measurements with prisms. Direct and indirect ophthalmoscopy, since the beginning. Exophthalmometry. He/she must know how to obtain a complete history, measure visual acuity, perform confrontation and perimetric visual fields.

3. **Cornea and conjunctiva:**

Knowledge: inflammatory and infectious diseases of the cornea and conjunctiva (herpes simplex, adenovirus, bacterial, fungic, trachoma, *Acanthamoeba*). Differential diagnosis of acute and chronic conjunctivitis. Congenital abnormalities, degenerations and dystrophies. Early diagnosis of keratoconus. Corneal and conjunctival neoplasms. Know how to evaluate consequences of anterior segment trauma and penetrating wounds. Indications for keratoplasty, knowledge of technique and complications. Basic knowledge of refractive surgery. Know the principles of ocular surface grafts (auto-graft, conjunctival flap, amniotic membrane transplantation, limbal cells transplantation). Know how to interpret corneal topography.

Skills: He/She must be able to perform the following examination methods: fluorescein dye testing, rose bengal dye, Schirmer and Jones tests. Sampling for bacterial and viral tests. Familiarity with keratometry, corneal topography, pachymetry.

Removal of corneal foreign bodies. Bandage contact lenses application. Pterygium surgery, conjunctival grafts. Anterior chamber paracentesis.

4. **Glaucoma:**

Knowledge: classification and pathologic mechanisms of different types of glaucoma. Risk factors for glaucoma. Pharmacology of anti-glaucomatous drugs, secondary glaucomas, pediatric glaucomas. Interpretation of visual fields (Goldmann's and computerized), diurnal curve, corneal pachymetry. Indications for medical and surgical treatment. Knowledge on surgical techniques and its complications. He/She must know and understand the most important clinical trials in glaucoma (Glaucoma Laser Trial, Normal Tensión Glaucoma Study, Advanced Glaucoma Intervention Study).

Skills: tonometry, gonioscopy, visual fields: automated and manual. Interpretation of visual fields. Perform argon or YAG laser iridotomies; laser trabeculoplasty. Cyclodestructive procedures. Perform trabeculectomy with or without antimetabolites. Manage complications.

5. **Cataracts:**

Knowledge: Identify the most frequent causes and different types of cataract. Know the different types of lens opacities. Preoperative examination. Know basic principles of

anesthesia (periocular, retrobulbar, topical). Knowledge of surgical techniques, operating microscope, phacoemulsification machine. Know complications of surgery and its management (including endophthalmitis).

He/she must know the different kinds of intraocular lenses. Know ocular and systemic diseases associated with cataracts.

Skills: Recognize the different types of lens opacities with the slit-lamp biomicroscope. Be able to perform biometries for intraocular lens calculation. Practice extracapsular extraction and phacoemulsification surgery in the wet lab. Perform extracapsular cataract extraction and phacoemulsification.

6. Vitreous and retina:

Knowledge: Basic principles of histology, physiology and histopathology of the retina. Basic principles of fluorescein and indocyanine green angiography in the normal subject and in most common diseases. Diagnosis, treatment and complications of retinopathy of prematurity. Retinal vascular diseases (diabetic retinopathy and diabetic macular edema, artery and vein occlusions, hypertensive retinopathy and choroidopathy, peripheral vascular occlusive diseases). Macular diseases (age-related macular degeneration and other maculopathies with choroidal neovascularization, dystrophies, cystoid macular edema, central serous chorioretinopathy, macular holes, epiretinal membranes). Inflammatory and autoimmune retinal disease. Knowledge of blunt and penetrating trauma with posterior segment involvement. Recognize retinal pathology associated with myopia. Know the different types of retinal detachment and its causes, management and surgical techniques. Understand the principles of laser photocoagulation and vitreoretinal surgery in simple and complex diseases. Knowledge of characteristics, differential diagnosis and management of retinal tumors (retinoblastoma, vascular tumors) and uveal tumors (melanoma, hemangioma, metastasis, osteomas).

Recognize inherited retinal and choroidal diseases (retinitis pigmentosa, choroideremia, cone dystrophies, Stargardt's disease, Best's disease, etc).

Know the most important prospective randomized clinical trials (DRS, DVS, ETDRS, DCCT, UKPDS, EVS, AREDS, BVOS, CVOS). Know chloroquine/hydroxychloroquine retinopathy, tamoxifen. Basic principles of electrophysiology. Interpretation of ERG, EOG and visual evoked potential.

Skills: Demonstrate dexterity in the use of the indirect ophthalmoscope, +90 and +78 lenses, Goldmann and wide angle contact lenses and examination of retinal periphery with scleral depression. Be able to perform detailed fundus drawings. Interpret angiographies. Perform B ultrasound in vitreoretinal, uveal and scleral pathology. Be able to interpret an ERG and OCT. Perform panretinal photocoagulation and other kinds of laser photocoagulation (retinal breaks, selected vasculopathies and maculopathies). Qualify for conventional retinal detachment surgery.

Know how to make a differential diagnosis of ocular tumors and pseudotumors.

7. Pediatric ophthalmology and strabismus:

Knowledge: Anatomy and physiology of ocular motility (ductions, versions and vergencies, Herring's and Sherrington's laws, neuroanatomy of ocular motility). Physiology of binocular vision (diplopia – confusion – suppression – normal and anomalous retinal correspondence). Amblyopia, pseudostrabismus. Different types of strabismus. Know the etiology of esotropia (congenital, comitant and incomitant, accommodative and non-accommodative, sensory, neurogenic, myogenic, restrictive, monofixation syndrome). Know etiology of exotropia (congenital, comitant and incomitant, accommodative and non-accommodative, decompensated, sensory, neurogenic, myogenic, restrictive, divergence excess, exophoria, convergence insufficiency). A and V patterns. Vertical strabismus evaluation (neurogenic, myogenic, neuromuscular junction, oblique overaction and underaction, dissociated vertical deviation, restrictive). Nystagmus. Complex disorders of ocular motility. He/she must know the most common types of pediatric ocular tumors and congenital malformations. He/She must know the differential diagnosis of retinoblastoma, and management of this disease. He/She must know the most common pediatric retinal diseases: retinopathy of prematurity, inherited retinopathies. Leukocorias. Infantile glaucoma and its treatment. Pediatric cataract and its treatment. Congenital corneal opacification. Lacrimal obstruction. Eyelid ptosis and other eyelid deformities. He/She must know the indications of most of the surgical techniques for strabismus (resection, recession, displacement, transpositions, use of adjustable sutures, in horizontal and oblique muscles. He/She must know the indications and complications of chemodenervation (Botulinum toxin). He/She must know the non-surgical treatment of strabismus. He/She must know techniques for assessing visual acuity in pre-verbal children.

Skills: Visual acuity assessment in children. Basic measurements in strabismus (Hirschberg – Krimsky – cover/uncover or alternate cover testing, prism cover testing, forced ductions testing, ocular motility study. Cycloplegic refraction, test of binocularity and retinal correspondence. Special motor tests.

He/She must be able to perform strabismus surgery (recession, resection, rectus muscles displacements, (¿adjustable sutures?). He/she must know how to examine, diagnose and refer patients with congenital glaucoma – congenital cataract – eyelid ptosis – retinopathy of prematurity – retinoblastoma and other types of leukocoria (Coats' disease, persistent hyperplastic primary vitreous, etc.).

8. Neurophthalmology:

Knowledge: Neuroanatomy of the visual pathways, cranial nerves, pupillary pathways. Optic neuropathies (optic neuritis, ischemic, inflammatory, infectious, infiltrative, compressive, inherited optic neuropathy). Optic disc swelling: etiology, management. Congenital abnormalities of the optic disc. Features, evaluation and management of ocular motor palsies. Supranuclear and internuclear palsies. Pupillary abnormalities: differential diagnosis and management. Superior orbital fissure and cavernous sinus syndromes. Nystagmus: differential diagnosis. Know visual field defects due to lesions on different portions of the visual pathways. Differential diagnosis of eyelid ptosis. Myasthenia gravis. Carotid-cavernous fistula. Know the Optic Neuritis Treatment Trial.

Skills: Perform a pupillary examination. Detect the relative afferent pupillary defect. Diagnose Adie's tonic pupil, Horner's syndrome, Argyll Robertson's pupil. Know pharmacological testing. Know how to diagnose ocular motor palsies (ocular motility evaluation, diplopia testing, Maddox rod, eyelid motility), explore sensitivity. Know how to perform a confrontation visual field and Goldmann's perimetry. Know how to differentiate pathological optic discs with the ophthalmoscope. Know how to use tests to rule out simulation. Interpret visual fields, localize the involved portion of the optic pathway. Basic interpretation of neuro-radiological images of the orbits and brain.

9. Orbits, oculoplastics and lacrimal system:

Knowledge:

- a) Orbits: causes of uni/bilateral proptosis. Knowledge of orbital vascular pathology (hemangioma, lymphangioma, carotid-cavernous fistula), endocrine pathology, thyroid ophthalmopathy (symptoms/signs, imaging, differential diagnosis, treatment and its complications), inflammatory (cellulitis, pseudotumor), infectious, neoplastic (glyoma, meningioma, lymphoma, lacrimal gland fossa), congenital malformations, anophthalmic socket problems.
- b) Plastics: Know eyelid diseases (ectropion, entropion, distiquiasis, blepharospasm, types of ptosis, floppy eyelid).
- c) Lacrimal system: (Pre-sacular and sub-sacular obstructions) dacryoadenitis, dacryocystitis.
- d) Eyelid and orbital trauma.

Skills: Diagnosis and measurement of exophthalmos. Evaluation of ocular and eyelid motility, eyelid eversion, levator function. Orbital palpation. Radiological and ecographic evaluation of the orbit. Lacrimal system exploration. Repair of eyelid lacerations. Tarsorrhaphy, canthotomy. Enucleation. Dacryocystorhinostomy. Ectropion and entropion surgery (acting as a surgeon). Identify orbital fractures.

10. Uveitis:

Knowledge: Know symptoms and signs of anterior and posterior uveitis. Describe acute and chronic, granulomatous and non-granulomatous, anterior, intermediate and posterior uveitis. Features, differential diagnosis and treatment of toxoplasmosis, sarcoidosis, tuberculosis, pars planitis, Vogt-Koyanagi-Harada syndrome, acute retinal necrosis, large cell non-Hodgkin's lymphoma, TORCH syndrome, Behçet's disease. Ocular manifestations of AIDS, opportunistic retinitis. Retinal vasculitis associated with systemic disease (lupus, Behçet, syphilis, etc.), associated with ocular disease (herpes, pars planitis, Eales, IRVAN), primary retinal vasculitis. Masquerade syndroms. Endophthalmitis (postoperative, traumatic, endogenous, fungal, phacoanaphylactic). Sympathetic ophthalmia. Indications, contraindications and complications of corticosteroid treatment and immunosuppressive agents.

Skills: Know how to diagnose and evaluate cells in aqueous humour and vitreous cavity. Know how to perform indirect ophthalmoscopy with scleral depression for evaluation of posterior uveitis. Know how to interpret fluorescein and indocyanine green angiography, ultrasound. Know how to inject subconjunctival, subtenon and intravitreal corticosteroids. Know how to obtain samples from the aqueous humor and vitreous cavity and inject

intravitreal antibiotics for endophthalmitis.

11. Ocular pathology: If there is no ocular pathology laboratory at the institution, a microscope and a didactic collection are recommended for the resident to get familiarized with the most frequent pathologies. The resident is also advised to examine the slides of his/her own cases at the laboratory where the test was performed.
12. Blindness prevention: The trainee must know perfectly well the causes of blindness in his/her country and its prevention or treatment. The trainee must participate in the activities for the prevention of blindness organized in his/her country.

B. Minimum number of surgeries to be performed by the resident as first surgeon:

Cataracts: 5 extracapsular surgeries – 40 phacoemulsification surgeries

Glaucoma: 10 filtering surgeries. Peripheral iridotomies argon – YAG: 5

Strabismus: 10 resection/recession procedures of rectus muscles.

Laser for diabetic retinopathy, tears, other pathologies: 25

Conventional retinal detachment: 5 (optional).

Vitrectomy: Only as assistant.

Dacryocystorhinostomy: 4

Eyelid (ectropion – entropion - wounds): 4

Enucleation: 2

Chalazion, minor palpebral surgery: 15

Repair of corneal penetrating wounds (cornoscleral): 2

As assistant surgeon:

Keratoplasties: 2

Orbit surgery: 2

RECOMMENDATIONS

1. Trainees are recommended to work on a research paper during the residency.
2. Community work. Trainees are recommended to work for a center or location where low-income patients without expedite access to ophthalmologic care are served.