

# Klinische Monatsblätter für Augenheilkunde

November 2006 · Page S1 – S23 · Volume 223 · Supplement 7

11 · 2006

S3	<b>I. Preamble</b> <i>Mark O.M. Tso, MD</i>	S15	<b>VI. Pediatric Ophthalmology and Strabismus</b> <i>Zbigniew Zagorski, MD</i>
S5	<b>II. Principles of CME Development</b> <i>Brian Chua, MD, Frank Martin, MD, Shayne Brown, MAppSc</i>	S15	1. Basic Level
S6	Principles of CME Programs	S16	2. Standard Level
S6	Elements of a CME Program	S16	3. Advanced Level
S6	Categorization of CME Activities	S17	<b>VII. Vitreoretinal Diseases</b> <i>Zbigniew Zagorski, MD</i>
S7	Administration and Management of the CME Program	S17	1. Basic Level
S7	Ophthalmology Society Approved CME Activities	S17	2. Standard Level
S8	Appendix I: Personal Learning Plan Template	S18	3. Advanced Level
S8	Appendix II: Clinical Audit Template	S19	<b>VIII. Uveitis</b> <i>Zbigniew Zagorski, MD</i>
S8	Appendix III: References	S19	1. Basic Level
S9	<b>III. Cornea, External Diseases, and Refractive Surgery</b> <i>Zbigniew Zagorski, MD</i>	S19	2. Standard Level
S9	1. Basic Level	S20	3. Advanced Level
S10	2. Standard Level	S20	<b>IX. Glaucoma</b> <i>James Standefer, MD</i>
S11	3. Advanced Level	S20	1. Basic Level
S11	<b>IV. Cataract</b> <i>Marko Hawlina, MD</i>	S21	2. Standard Level
S11	1. Basic Level	S22	3. Advanced Level
S12	2. Standard Level	S22	Major Glaucoma Clinical Trials
S12	3. Advanced Level	S23	<b>X. Useful Websites</b>
S13	<b>V. Neuro-Ophthalmology</b> <i>Marko Hawlina, MD</i>		
S13	1. Basic Level		
S13	2. Standard Level		
S14	3. Advanced Level		

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## Preface

In 1999 and 2000, the International Council of Ophthalmology and the Academia Ophthalmologica Internationalis developed an International Ophthalmology Strategic Plan to preserve and restore vision – Vision for the Future.

This strategic plan involved a multi pronged approach to reduce visual impairment and blindness worldwide, and the following actions have been completed or are underway to make this plan a reality:

- ▶ IFOS/ICO fellowships have been established under the leadership of Professor Balder Gloor to provide overseas educational opportunities for junior ophthalmic faculty in ophthalmology departments in developing countries.
- ▶ The International Assessment for Ophthalmologists in both clinical and basic sciences has been successfully implemented by Professor Peter Watson.
- ▶ Eye care guidelines to develop evidence-based eye care delivery, are being developed under the leadership of Professor Richard Abbott.
- ▶ Advocacy for preservation and restoration of vision to increase public awareness of blindness prevention is being headed by Professor Hugh Taylor.
- ▶ Research in ophthalmology and vision, for development of new and improved therapies for blinding diseases, is being led by Professor Alfred Sommer.

The ICO Strategic Planning Group also decided that ophthalmic education is the cornerstone to improve eye care globally. As part of this Strategic Plan, four International Task Forces were established to develop curricula for training of the ophthalmic specialist, para-ophthalmic personnel, medical students, and for continuing medical education.

After years of hard work by multiple international panels, the four curricula are being presented for publication in this issue of Klinischen Monatsblätter für Augenheilkunde as supplements.

The curricula are presented, not as mandatory standards of training or practice, but as an educational tool and consensus example to stimulate multi-levels of training including basic, standard, and advanced programs. The International Council of Ophthalmology realizes the wide variability of educational standards, patterns and prevalence of diseases, and social structures for provision of eye care in geographic regions, and therefore encourages continuous modification of these curricula according to the needs of different global communities.

Traditionally, ophthalmology residency training runs on an "Apprenticeship System" where the teaching contents and format for trainees frequently depend on the whims of the trainers. In recent decades, there is a general movement to shift the apprenticeship system of education to a curriculum-based system of

education in which goals, expectation, knowledge base, competencies and technical training are carefully defined. The four international curricula are prepared with this general direction in mind.

The panels, which drafted these curricula, understand the importance of accessibility of the educational materials and availability of mentorship. The International Task Forces encourage the donation of good teaching material to be included in these curricula and to be available for teachers and students worldwide. The ICO also proposes the twinning of training programs of industrialized and developing countries to encourage the exchange of mentors. It is recognized that competency in the practice of medicine depends on factors other than medical knowledge as outlined in these curricula. Inter-personal communication skills, professionalism, system-based factors, surgical skills, a solid ethical foundation, and others contribute substantially to the expertise and competence of eye care specialists. These curricula only provide a framework to initiate the training process.

Efficiency of eye care in the modern practice of ophthalmology depends on teamwork, consisting of ophthalmic physician specialists, ophthalmic nurses, orthoptists, optometrists, clinic managers, and others. The balance and composition of an eye care team is critical for maximum productivity of the care provided. So in these curricula, training of the eye care team is being covered.

The rapid development of medical technology in the 21<sup>st</sup> Century has resulted in greater discrepancies in the levels of medical care in various geographic locations of the world. However, the world does not work unless the world works together. These international curricula of ophthalmic education are attempts to encourage different players in the international ophthalmic educational arena to work together to develop a forward movement for improved eye care worldwide.

The International Council of Ophthalmology and the International Task Forces on Ophthalmic Education would like to thank the editors, Professors Gerhard K. Lang and Gabriele E. Lang, Project Manager, Katrin Stauffer of Klinischen Monatsblätter für Augenheilkunde, for their gracious assistance in publishing these curricula.

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# Principles and Guidelines of a Curriculum for Continuing Medical Education in Ophthalmology

Presented by International Task Force on Continuing Medical Education (CME) in Ophthalmology – On Behalf of The International Council of Ophthalmology (ICO)

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## Bibliography

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## I. Preamble

The rapidly developing medical and surgical technologies in ophthalmology during recent decades demand continuous maintenance of clinical skills for practicing ophthalmologists in both developed and developing countries. Continuing Medical Education (CME) was initially developed as a stimulus for practicing ophthalmologists to address their own personal, educational, and professional needs, but in recent years, CME has evolved to become a necessary tool for maintaining licensure to practice medicine or re-certification of specialty competency.

At a planning session for *Vision for the Future* organized February 24 – 27, 1999 in Egypt, the International Council of Ophthalmology (ICO) and the Academia Ophthalmologica Internationalis (AOI) established an international ophthalmology strategic plan to restore and preserve vision entitled,

“Vision for the Future” which considered ophthalmic education to be an essential part of the plan to eliminate avoidable vision loss and improve eye care worldwide. To assist in planning CME programs worldwide, an International Task Force on Continuing Medical Education in Ophthalmology was established. The International Task Force goals are threefold: to promote commitments from ophthalmologists and ophthalmic societies for ongoing CME as a career-long necessity; to improve ophthalmic practice globally; and to identify high quality educational materials for global use.

## History of the International Task Force on CME

Dr. H. Dunbar Hoskins led this International Task Force, consisting of: David Green, MD (USA), Volker Klauss, MD (Germany), Gullapalli N. Rao,

**Acknowledgement:** \*Past and present members of the International Task Force on Continuing Medical Education: Sivaguru Selvarajah, MD, Chair (Malaysia); Neil Bressler, MD (USA); Barbara Biziorek, MD (Poland); Shayne Brown, MAppSc (Australia); Brian Chua, MD (Australia); David Green, MD (USA); H. Dunbar Hoskins, MD (USA); Anselm Kampik, MD (Germany); Volker Klauss, MD (Germany); Dennis Lam, MD (Hong Kong); Thomas Liesegang, MD (USA); Luc Missotten, MD (Belgium); Pran Nath Nagpal, MD (India); Gullapalli N. Rao, MD (India); Joanna Starling,

MSc (Australia); Juan Verdaguer, MD (Chile). The ICO gratefully acknowledges the editorial efforts of Jenni Anderson and Lenalee Fulton in coordinating and assembling these curricula.

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**Manuscript Editor:** Tina-Marie Gauthier

MD (Italy), Juan Verdaguer, MD (Chile), and Zbigniew Zagorski, MD (Poland). Dr. Hoskins surveyed all national ophthalmological societies regarding their CME activities, and in December 2000, a questionnaire was sent to 105 national ophthalmological societies. 55.25% of the societies completed and returned the questionnaire. 52% of the responding societies organized and sponsored CME activities, programs, and material. 40% of these, organized yearly meetings and provided courses and symposiums on eye care. Some of the societies produced monthly scientific journals as well as regular educational television programs. Many societies had a website in which they displayed educational material. Of the societies responding, 32 different languages were listed as the language of instruction. In addition, 17 countries had an accreditation system which was administered by an organization other than the society. Credits or points were based on the educational value of the activity as well as for the duration of educational activities. In some countries, credits, points, or a combination of the two, were used for re-certification purposes. 59% of the participating societies identified specific needs among their members. High priorities included: educational material, skills transfer, information on new surgical techniques, training and courses on general topics, subspecialty training, and re-certification for therapeutic treatments. A number of societies suggested that the ICO initiate and sponsor a visiting faculty program.

In January 2002, Professor Sivaguru Selvarajah took over as Chair of the International Task Force on Continuing Medical Education. Additional Task Force members were added, including: Neil Bressler, MD (USA); Anselm Kampik, MD (Germany); Dennis Lam, MD (Hong Kong); and Thomas Liesegang, MD (USA). This committee developed the format of CME programs, determined accreditation authority for CME, and collected educational course materials. They advised that CME activities should be easily accessible, conducted by qualified faculty members, and repeatedly evaluated in order to improve presentations. It was also determined that while commercial sponsorship of CME is considered acceptable, it must be disclosed on the CME courses, and that CME courses should be organized independently of commercial sponsors.

The subject of an international registry for CME was raised, and there was consideration that for some developing countries, CME might be achieved by self-assessment programs, thus eliminating the expense of traveling for CME activities.

On July 24, 2003, Professor Frank J. Martin of Sydney, Australia took over as Chair of the International Task Force on Continuing Medical Education. With the help of Dr. Brian Chua, Ms. Shayne Brown, and RANZCO Eye Foundation (Australia), Professor Martin generated a manuscript entitled, "Principles and Guidelines for Continuing Professional Development (CPD)."

In February 2005, Professor Zbigniew Zagorski of Poland took over as the Chair of the International Task Force on Continuing Medical Education. Professor Zagorski detailed guidelines for planning CME programs at three levels of skills and knowledge, and for multiple ophthalmic subspecialties. The three levels consist of Basic, Standard, and Advanced curricula. It is recommended that the Basic and Standard levels be mastered before moving to the Advanced level. These curricula provide concrete subject matters, which planners of CME programs in developing countries may implement in their local programs. Patterns of diseases in different regions of the world (with distinct reference to regional variations) were emphasized. In addition, Professor Zagorski requested the help of Professor Marko Hawlina (Slove-

nia) and James Standefer, MD (USA) to contribute on various subjects of the curricula.

The Executive Committee of the ICO is most grateful for the above leaders who have contributed their expertise to the Principles and Guidelines of a Curriculum for Continuing Medical Education in Ophthalmology.

### Special Features of CME Curriculum

As the International Task Force developed the CME curriculum, it became apparent that special consideration must be given to some aspects of CME program planning.

1. The clinical practice of ophthalmology varies greatly among the different continents. In some developed countries, eye care is provided along ophthalmic subspecialties such as vitreoretinal surgery, glaucoma, neuro-ophthalmology, corneal surgery, and others. In these communities, CME should engage advanced educational programs on subspecialty development. In other developed countries, general ophthalmologists who have completed an ophthalmology residency, provide general eye care as well as ophthalmic subspecialty care. In some developing countries, there may not be enough adequately trained ophthalmologists, so family practitioners need to be able to provide primary eye care and referral to specialists. In these communities, CME should be developed along the lines of general eye care. In other developing countries, ophthalmic technologists (such as community-based "mid" level eye care personnel) practice primary eye care in the rural areas and refer the more complicated cases to medical doctors with ophthalmic training. For these practitioners, CME would be directed toward the basic knowledge of eye care. Because of this great spectrum in the practice of eye care, the CME curriculum should contain basic, standard, and advanced levels to address the needs of para-ophthalmic personnel, general ophthalmologists, and ophthalmic subspecialists respectively.
2. In many countries, CME activities are frequently planned by national organizations with abundant human and financial resources. Many of these programs are well planned with good faculty and attendance. The supranational organizations such as the Asia-Pacific Academy of Ophthalmology, the Pan-American Congress of Ophthalmology, the Middle East African Council of Ophthalmology, formerly known as the Pan-Arab African Council of Ophthalmology, and the European Society of Ophthalmology have centralized CME programs on a large scale within their continents. However, CME should also be carried out in local settings, such as county hospitals, village clinics, or the private offices of ophthalmologists. These practitioners may not have the resources or time to travel for CME activities. As a result, local ophthalmic societies should plan CME activities as support of local educational programs.
3. CME programs have been set up under an ophthalmic or medical society based on readings of published articles in journals. These types of self-assessment programs must be carefully monitored and attendees should return a report after reading an article to validate their effort in self-learning.
4. Ophthalmology is, in a large part, a surgical subspecialty. It is important that CME programs teach ophthalmic surgery, especially new surgical procedures, which have been established as an acceptable and effective course of treatment.

Ophthalmic surgery is best taught by mentors. As a result, faculty may need to be recruited to demonstrate and mentor eye surgery. During the survey of CME activities in different ophthalmic societies, a number of societies requested that a list of senior faculty, or retired professors willing to teach both medical and surgical eye care, may be made available through the ICO.

5. CME programs need accreditation so that the teaching programs may be effective in teaching new knowledge and techniques to attendees. Most accreditation is done through national organizations. Smaller communities have requested that the ICO be involved in this accreditation process. Methods of accreditation have been considered. Most societies record the time of the CME activities in number of hours and points. Others cover passive as well as active modes of CME. Passive mode includes listening to lectures, watching media, and reading journals, while active mode includes giving lectures, publication of papers, and demonstration of techniques.
6. Medical ethics must also be taught in connection with many of the new and advanced technologies. Commercial support of CME activities has generally been allowed, but balanced and unbiased presentations must be established. Instructors are required to identify the financial support given by commercial enterprises.
7. CME programs, in contrast to other educational programs, focus on developing technologies and new treatments. With this in mind, a forward-looking attitude, ever searching for new developments in the field, should be the basic approach of CME planners. It is expected that CME curriculum must continuously evolve so that the latest approach to eye care is taught.
8. Questions have been raised as to the goals and purposes of CME programs in contrast to those of a "Preferred Practice Plan" (PPP). PPP is directed toward individual ophthalmologists and practitioners concerning established clinical procedures and treatment of different well-recognized ophthalmic entities. CME programs are directed towards individual practitioners who are planning their own educational program as a lifelong learning process, and toward leaders of ophthalmic communities such as directors of hospitals, chairs of university departments, and national and regional eye societies, who will plan CME activities for their community in order to educate residents and fellow ophthalmic practitioners for a lifelong learning process. PPP addresses evidence-based medical practice, while CME programs are directed not only towards the current medical practices, but also include developing ophthalmic technologies and new therapeutic approaches which may or may not be proven to be effective over time. PPP is the basic common denominator for therapeutic approaches to *established* ophthalmic entities, while CME guidelines address pathologic, patho-genetic, diagnostic, and therapeutic approaches of *current* and *newly recognized* ophthalmic entities. PPP is for the present, while CME addresses the present and future development of ophthalmic practice.
9. Professor Frank Martin and his colleagues have boldly outlined the basic principles for planning CME programs. They describe the basic objectives, principles, and various categories of CME programs. They emphasize the practice of professional and research development, and further describe the administration and management of the CME program,

including the accreditation process. They point out that CME may be a personal learning template as well as a clinical learning template. We appreciate their contribution to this curriculum.

10. Professors Zbigniew Zagorski, Marko Hawlina, and James Standefer have gone into great detail regarding the CME programs for the following ophthalmic subspecialties: Cornea, External Diseases and Refractive Surgery; Cataract; Neuro-ophthalmology; Pediatric Ophthalmology and Strabismus; Vitreoretinal Diseases; Uveitis; and Glaucoma. They present a large volume of material on theoretical knowledge as well as technical and surgical skills, with a list of references pointing to the source of material for teaching. Each curriculum is divided into Basic, Standard, and Advanced levels for the different educational levels of eye care personnel. We hope this curriculum will encourage ophthalmic societies and individual ophthalmologists to gain insight for their lifelong career of learning in this modern era of exciting medical technological advancement.

## II. Principles of CME Development



### A. Objectives

The purpose of Continuing Professional Development (CPD) is to maintain, improve, and broaden professional and personal abilities, including attitudinal competencies, using a continuous process of updating knowledge and skills. All ophthalmologists are encouraged to identify and address their own educational, personal, and professional needs. The aim of the CME program is to achieve the highest standard of professional practice to impact positively on patient outcomes.

Increasingly, international best practice has dictated that CME be included as a requirement for continued registration or re-appointment of practicing certificates. However, these guidelines are not intended to interfere or override local or national guidelines, but may be used by nations that do not have formal CME programs in place.

### B. Introduction

The underlying principle of CME is to extend the concepts of traditional CME programs where the focus has mainly been on maintaining or upgrading clinical, scientific, and educational knowledge. It is now widely acknowledged that traditional CME practices of attending lectures, conferences, and simple journal or textbook reading insufficiently meet the lifelong learning requirements of the medical professional.[1 – 5]

CME emphasizes development of both clinical and non-clinical domains of any medical professional, with an aim to achieve the highest standard of professional practice to impact positively on patient outcomes. Increasingly, international best practice has dictated that CME be considered as a requirement for ongoing registration or re-appointment of physician practicing certificates as part of one's professional accountability.

A CME program should encourage continued learning and development in the seven key competencies identified by the Royal College of Physicians and Surgeons of Canada CanMEDS 2000 project.<sup>6</sup> These competencies should be considered as benchmark qualities for all practicing specialist physicians. They include such attributes as:

- ▶ Medical Expert/Clinical Decision Maker.
- ▶ Communicator.

- ▶ Collaborator.
- ▶ Manager.
- ▶ Health Advocate.
- ▶ Scholar.
- ▶ Professional.

Studies on adult learning have consistently found that formalized didactic teaching has low educational value and often fails to alter performance or professional practice. [1,2,5] CME activities should therefore balance passive learning exercises with opportunities for self-directed active learning.

The Royal College of Ophthalmologists CPD program, recognized a need for the physician to formulate a personal learning plan (PLP). [7] The Royal College identified two components for consideration:

1. Professional development requirements relevant to fulfilling the individual's current practice profiles; and
2. Professional development relevant to the individual's career aspirations.

The PLP allows each physician to tailor CME activities to provide opportunity to change in their professional practice while also meeting their career objectives.

It is strongly advised that a PLP should be a compulsory element in any CME program.

### Principles of CME Programs

Ophthalmology societies should make efforts to facilitate and accommodate participation of CME activities.

Each ophthalmology society should set up a CME Committee, which is responsible for designing, monitoring, and auditing the society's CME program and include the following principles:

1. CME schemes should be available at a reasonable cost to all ophthalmology society members and affiliated members practicing in the relevant specialty.
2. CME activities should include a balance of activities both within and outside the practitioner's workplace and include a component of active learning.
3. CME activities should be relevant to and reflect the professional practice and performance profile of the individual, and should include development in areas outside the individual's specialty interests. CME should support and encourage changes in practice and career development.
4. Credit for CME is usually based on hours of participation, with a minimum of 50 points per year. Coordinators of the CME scheme may award CME points to endorsed non-timed CME activities such as writing of peer-reviewed articles or textbooks. Activities that require active participation should be weighted more heavily than passive activities.
5. To successfully comply with the CME program, it is strongly advised that participants are required to:
  - a. Develop a personal learning plan (PLP).
  - b. Choose activities that meet individual needs identified in the PLP and include activities from Categories 1 and 2 (see Categorization of CME Activities).
  - c. Submit a final report that outlines what has been learned, and what changes, if any, have been made in clinical/surgical practice or attitude.
6. Most ophthalmology societies, colleges, or registration boards undertake a three or five year monitoring cycle, with a minimum annual requirement of approximately 50 points. CME points accumulated in excess of the minimum require-

ment for each cycle cannot be carried forward to the next cycle.

7. Part-time practitioners must meet the same CME requirements as those working full-time.
8. Ophthalmology societies should undertake peer-based audits of participant activities on a random basis or whenever concerns about an individual's professional performance are raised. Through the use of a diary, catalog-based system, or online system, participants are required to collect evidence of their CME activities to enable this audit.
9. The proportion of participants involved in a random audit each year should be representative of the participants in a given scheme.
10. Formal endorsement of educational activities for CME by ophthalmology societies should be achieved with minimum bureaucracy.
11. Participation at approved CME activities should be acknowledged by a summary statement of CME points participants have been allocated.
12. Self-accreditation of relevant activities and reflective learning should be allowed and encouraged. Formal certificates of attendance at these activities are not required, but other forms of evidence showing participation (e.g., registration receipts, signed registers, name badges, list of delegates, programs) would be acceptable.
13. Falsification of evidence of claimed CME credits may result in referral to the relevant medical board or council.

### Elements of a CME Program

The standard used in many international CME programs is to allocate one point per hour of participation in a CME activity. The current consensus is that a "point" system provides the easiest method to monitor participation of CME programs, but program coordinators must be aware of a point system's limitation in measuring the relevance and quality of CME undertaken by the individual. It is therefore recommended that Category 1 activities that require more active participation be weighted more heavily than Category 2 activities that are more passive.

When considering elements of a CME program and CME guidelines, it is recommended that the Basic and Standard levels be mastered before moving to the Advanced level.

It is strongly recommended that development of a personal learning plan (PLP) be a compulsory element of any CME program. Refer to Appendix 1: Personal Learning Plan Template.

### Categorization of CME Activities

#### I. Category 1 Activities

- A. Practice Improvement.
  1. Clinical audit.
  2. Surgical audit.
  3. Mortality and morbidity meetings.
  4. Quality assurance meetings.
  5. Participation in accreditation of a practice.
- B. Independent Professional Development.
  1. Clinical or surgical traineeship or fellowship.
  2. Postgraduate study relevant to ophthalmology.
  3. Risk-management courses (e.g., communication, ethics).
  4. Self-development courses (e.g., business management, computer skills).

5. Personal learning project (e.g., derived from the personal development plan).
- C. Research, Publications, and Presentations.
  1. Principal investigator of approved clinical trial or research project.
  2. Preparation of grant proposals.
  3. Author of peer-reviewed journal article.
  4. Author of a textbook or book chapter.
  5. Presentation of a paper or poster to peers at a recognized scientific meeting.

## II. Category 2 Activities

- A. Meetings and Courses.
  1. Participant at a local/regional/international seminar, conference or workshop.
  2. Grand rounds, journal clubs, case-conferences.
  3. Radiology or pathology meeting.
- B. Independent Professional Development.
  1. Presenter at a workshop or course related to ophthalmology.
  2. Supervising or mentoring ophthalmology residents/registrars or fellows.
  3. Lecturing residents/registrars or medical students.
  4. Examiner to residents/registrars or medical students.
  5. Supervisor of postgraduate students.
  6. Development of CME materials.
  7. Reviewer for journals.
  8. Editor of a multi-authored textbook.
  9. Reviewer for scientific research grants.
- C. Self Education.
  1. Self-assessment activities (e.g., reading journals or interactive online courses).
  2. Audio-visual educational activities.
  3. College-approved educational visits to other institutions.

## Administration and Management of the CME Program

1. The CME program would be best administered by the local/regional ophthalmology society.
2. A CME committee should be established with responsibility for designing, monitoring, auditing, as well as defining and approving ophthalmology society endorsed CME activities.
3. Ophthalmology societies should make all efforts to facilitate and accommodate participation of CME activities by all its members or affiliated members.
4. The ophthalmology society should provide a paper or on-line diary to help members record participation of CME activities.
5. Members must respond to an annual CME points call from the ophthalmology society. Failing to submit the return on time will be regarded as non-compliance.
6. Members or affiliated members who fail to meet the minimum annual requirement will be notified by the ophthalmology society, the notification stating that they have not met the minimum requirements of the program. Members will then be offered the opportunity to provide a written commitment stating intent to satisfy the requirements of the program. Members, who fail to provide a written commitment, or fail to satisfy the requirements following the remediation period, will be considered non-compliant.
7. Exemptions from minimum CME requirements will be offered to retired members or members with an acute/

prolonged disabling illness. There are no exemptions for those working part-time.

8. Every three years, the ophthalmology society should ensure compliance of CME, by conducting peer-based audits on a random sample of its members and affiliated members. The audits are to verify participation in CME activities and points accrued as claimed in member diaries and annual returns.
9. CME non-compliance or falsification of evidence of claimed CME credits may result in referral to the relevant medical board or council.
10. Colleges should recognize members who have met the requirements of the program by issuing a "CME certificate of participation" at the completion of each cycle, valid for the ensuing cycle.
11. Colleges must undertake regular audits of their CME program to update and refine processes to ensure ease of administration, ease of compliance, and relevance to the needs of its members.

## Ophthalmology Society Approved CME Activities

Ophthalmology society approved CME activities should serve to maintain, improve, or broaden the personal and professional knowledge and skills of participants.

All activities for which CME points can be earned must meet CME educational standards. To gain approval for industry-sponsored meetings, courses, and seminars, the meeting organizer should make an application to the ophthalmology society's CME Committee well in advance.

The Royal College of Ophthalmologists has suggested a series of questions that CME activities should satisfy before CME Committees endorse such events:

1. What are the educational objectives of the proposed event?
  2. Is there a clear educational need for such an activity?
  3. Are the location, timing, and duration of the proposed meeting appropriate?
  4. Is the proposed meeting likely to meet the educational needs of the intended audience?
  5. Are the content and learning methods of the meeting appropriate to the educational objectives?
  6. Is the proposed meeting free of undesirable commercial influence?
  7. Are the proposed teachers appropriate?
  8. Is any evaluation of the relevance of the program, such as its quality and effectiveness, included in the proposed activity?
- Furthermore, the following rules have been adopted from guidelines by the International Council of Ophthalmology (ICO), American Academy of Ophthalmology (AAO), and American Medical Association (AMA), and should be applied when CME activities are sponsored by a commercial organization:
1. The organizer of the CME activity is responsible for the scientific integrity of the activities certified for credit.
  2. The organizer is responsible for the choice of the topics and their evaluation.
  3. The representatives of the sponsoring commercial organization should not interfere with the choice of moderators, lecturers, or other presenters, nor in the choice or content of the topics.
  4. Sponsorship by a commercial organization must be acknowledged.
  5. The sponsoring commercial organization will not use the CME activities to engage in sales activities.

6. Proprietary interests of the organizers should be disclosed.
7. The CME activity must be free of commercial bias for or against any product.
8. It is appropriate for presenters of CME activities to accept reasonable honoraria and reimbursement for reasonable travel, lodging, and meal expenses.
9. The organizer of a CME activity may ask for help from the sponsoring commercial organization in preparation of educational materials and in the planning and marketing of the activity. However, the information must identify the CME activity as produced by the responsible organizer. When commercial exhibits are part of the overall program, arrangements for these exhibits should not influence planning or interfere with the presentation of CME activities.
10. Commercially supported social events of CME activities should not compete, nor take precedence over educational events.
11. When sponsored by a commercial organization, the sponsoring company sends details of speakers and materials to the ophthalmology society's CME Committee for use by the ophthalmology society's membership.

### Appendix I: Personal Learning Plan Template

Development of a personal learning plan (PLP) requires the physician to actively reflect on their current personal and professional practice and determine what aspects may require improvement. PLPs are based on self-motivated, goal-driven, adult-learning Principles. [9,10] Successful learners are those who reflect on their own practice and see a personal relevance to the learning task. PLPs formalize learning processes that take place in every physician's daily practice.

We propose a template using a series of questions adapted from the Royal College of Ophthalmologists CPD Guidelines [7], the Royal Australian and New Zealand College of Ophthalmologists CPD Program [11], and the Royal Australian College of General Practitioners Learning Plan and Portfolio Module [12] to guide physicians who intend to undertake a PLP as part of their professional development.

#### Step 1 – Development of a Personal Learning Plan

- ▶ What do I need to learn?
  - ▶ What stimulated this learning task?
  - ▶ How was this knowledge gap identified?
- In developing a learning plan, participants are required to think about what they need to learn and why, whether it be some new technique or to improve skills or knowledge.

#### Step 2 – Completion of the Activities

- ▶ How will I learn it?
- ▶ What resources or information sources are available?
- ▶ How am I going to access these resources?
- ▶ What is my time frame for this project?

Participants should choose activities that meet the needs identified in their Personal Learning Plan. Category 1 activities that require more active participation and Category 2's more passive activities are outlined in a previous section, Categorization of CME Activities.

#### Step 3 – Submission of a Report

- ▶ How do I evaluate this process and improve on future learning tasks?

- ▶ Have I met my learning needs posed at the beginning of the learning task?
- ▶ What will I do with my learning?
- ▶ How will it impact on my professional practice?

An essential part of the learning process is for the "learner" to reflect on what has been learned. Participants will be required to write a report that outlines what has been learned. In doing so, the participants should answer the questions posed above.

### Appendix II: Clinical Audit Template

A clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria allowing the implementation of change. [13] The criteria against which an audit takes place must be evidence-based best practice. The audit process should provide for opportunity of continual future improvement following audit recommendations and conclusions.

Clinical audits have increasingly become an important component of the professional accountability expected of physicians. We propose a simplified clinical audit cycle adapted from guidelines of the National Institute of Clinical Excellence [13], the National Health Service [14], and the Royal Australian College of General Practitioners [15] that will aid planning of clinical audits.

1. Determine the rationale for a clinical audit.
2. Undertake literature review for evidence explicitly defining current best professional practice.
3. Perform data collection analysis and report on audit findings.
4. Provide suggestions for change and a proposed action plan.
5. Re-audit to monitor progress of improvements.

### Appendix III: References

- 1 Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. *Jama* 1995; 274: 700–705
- 2 Davis D, O'Brien MA, Freemantle N, et al. Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? *Jama* 1999; 282: 867–874
- 3 Aherne M, Lamble W, Davis P. Continuing medical education, needs assessment, and program development: theoretical constructs. *J Contin Educ Health Prof* 2001; 21: 6–14
- 4 Manning PR, DeBaey L. Continuing medical education: the paradigm is changing. *J Contin Educ Health Prof* 2001; 21: 46–54
- 5 Evans A, Ali S, Singleton C, Nolan P, Bahrami J. The effectiveness of personal education plans in continuing professional development: an evaluation. *Med Teach* 2002; 24: 79–84
- 6 CanMEDS 2000 Project. The Royal College of Physicians and Surgeons of Canada's [Canadian Medical Education Directions] for Specialists 2000 Project. Societal Needs Working Group Report. Skills for the new millennium: report of the societal needs working group. 1996. [http://www.rcpsc.medical.org/canmeds/CanMEDS\\_e.pdf](http://www.rcpsc.medical.org/canmeds/CanMEDS_e.pdf)
- 7 The Royal College of Ophthalmologists. Continuing Professional Development Program. Jan 2004. <http://www.rcophth.ac.uk/docs/education/CPDtext.pdf>

- 8 International Council of Ophthalmology. Continuing Medical Education (CME) Requirements. 2003. <http://www.icoph.org/pdf/icocmereq.pdf>
- 9 Mathers NJ, Challis MC, Howe AC, Field NJ. Portfolios in continuing medical education – effective and efficient? *Med Educ* 1999; 33: 521 – 530
- 10 Collins J. Education techniques for lifelong learning: principles of adult learning. *Radiographics* 2004; 24: 1483 – 1489
- 11 The Royal Australian and New Zealand College of Ophthalmologists. Continuing Professional Development Program Members Handbook. [http://www.ranzco.edu/CPD2/download-manual-CPD-forms/CPD\\_members\\_handbook.pdf/view](http://www.ranzco.edu/CPD2/download-manual-CPD-forms/CPD_members_handbook.pdf/view)
- 12 The Royal Australian College of General Practitioners. Quality Assurance and Continuing Professional Development Program Learning Plan and Portfolio Module. Triennium 2005 – 2007. <http://www.racgp.org.au/document.asp?id+14919>
- 13 National Institute for Clinical Excellence. Principles for Best Practice in Clinical Audit. 2002. <http://www.nice.org.uk/page.aspx?o-29058>
- 14 Huntingdonshire NHS Primary Care Trust. Clinical Audit Advice Pack. 2003. [http://www.cgsupport.nhs.uk/Resources/Clinical\\_Audit/1@Introduction\\_and\\_Contents.asp](http://www.cgsupport.nhs.uk/Resources/Clinical_Audit/1@Introduction_and_Contents.asp)
- 15 The Royal Australian College of General Practitioners. Quality Assurance and Continuing Professional Development Program Standard Clinical Audit Explanatory Notes, 2002 – 2004 Triennium. 2004. <http://www.racgp.org.au/downloads/pdf/20020426caexplanatory.pdf>
- g. Diagnosis and treatment of lid margin disease (e.g., Staphylococcal blepharitis, meibomian gland dysfunction).
- h. Diagnosis and treatment of vitamin A deficiency (e.g., Bitot's spot, dry eye, slowed dark adaptation) and neurotrophic corneal disease.
- i. The basic differential diagnosis of acute and chronic conjunctivitis or "red eye" (e.g., scleritis, episcleritis, conjunctivitis, orbital cellulitis, gonococcal, and chlamydial conjunctivitis).
- j. The epidemiology, differential diagnosis, evaluation and management of common benign and malignant lid lesions, including pigmented lesions of the conjunctiva and lid (e.g., nevi, melanoma, primary acquired melanosis).
- k. Diagnosis and treatment of parasitic infections of external eye (e.g., phthiriasis, onchocerciasis, Loa loa).
5. The basic mechanisms of traumatic and toxic injury to the anterior segment (e.g., alkali burn, lid laceration, orbital fracture, etc.).
6. Key features of trachoma, including epidemiology, clinical features and staging, and its complications (e.g., cicatrization), prevention (e.g., facial hygiene), and topical and systemic antibiotic treatment (especially in hyperendemic regions), and indications for surgery.
7. Diagnosis of corneal lacerations (perforating and non-perforating), corneal and conjunctival foreign bodies.
8. Diagnosis and treatment of corneal exposure (e.g., lubrication, temporary tarsorrhaphy).
9. The epidemiology, classification, pathology, indications for surgery, and prognosis of common malpositions of the eyelids (e.g., blepharoptosis, trichiasis, distichiasis, essential blepharospasm, entropion, ectropion) and their relationship to secondary diseases of the cornea and conjunctiva (e.g., exposure keratopathy).
10. The treatment for a chemical burn (e.g., types of agents, medical therapy).

### III. Cornea, External Diseases, and Refractive Surgery

#### I. Basic Level (Para-ophthalmic Personnel)

##### A. Theoretical Knowledge

1. Information on anatomy, physiology, pathology, microbiology, epidemiology, and pharmacology of the cornea, conjunctiva, sclera, eyelids, lacrimal apparatus, and ocular adnexa, necessary to understand and achieve the basic diagnostic and therapeutic goals.
2. General evaluation of the cornea and external eye.
3. Basic laboratory investigations.
4. Differential diagnosis of common corneal and external eye diseases
  - a. Congenital abnormalities of the cornea, sclera, and globe (e.g., microphthalmos, birth trauma, buphthalmos).
  - b. Common corneal and conjunctival degenerations (e.g., pterygium, pinguecula, senile plaques of the sclera, keratoconus).
  - c. Features of the common corneal and conjunctival inflammations and infections (e.g., simple microbial keratitis and conjunctivitis, trachoma, ophthalmia neonatorum, herpes zoster ophthalmicus, herpes simplex keratitis).
  - d. Presentations of ocular allergy (e.g., phlyctenules, seasonal hay fever, vernal conjunctivitis, allergic and atopic conjunctivitis, giant papillary conjunctivitis).
  - e. Corneal edema.
  - f. Toxic medication injury of the conjunctiva and cornea.

##### B. Technical/Surgical Skills

1. To perform external examination (illuminated and magnified).
2. To administer topical anesthesia, as well as special topical stains of the cornea (e.g., fluorescein dye).
3. To perform simple tests for dry eye (e.g., Schirmer test).
4. To perform punctal occlusion (temporary or permanent).
5. To perform simple corneal sensation testing (e.g., cotton tip swab).
6. To perform tonometry (e.g. Schiötz, Tonopen, pneumotonometry).
7. To perform techniques of sampling for viral, bacterial, fungal, and protozoal ocular infections (e.g., corneal scraping and appropriate culture techniques).
8. To manage corneal epithelial defects (e.g., pressure patching and bandage contact lenses).
9. To perform removal of a conjunctival or corneal foreign body.
10. To perform an isolated lid laceration repair.
11. To perform epilation.

12. To incise, drain, or remove a primary chalazion/stye.
13. To perform irrigation of chemical burn to the eye.

### Learning Activities

Passive learning: studying of available references, recommended by a local supervisor.

### References for Basic Level

- 1 Newmark E. Ophthalmic medical assisting: an independent study course. 4th ed. San Francisco: American Academy of Ophthalmology, 2006; xvii: 350
- 2 Bradford CA. Basic ophthalmology for medical students and primary care residents. 8th ed. San Francisco, CA: American Academy of Ophthalmology, 2004; xv, 175
- 3 Blomquist PH, Wilson FM. Practical ophthalmology: a manual for beginning residents. 5th ed. San Francisco, CA: American Academy of Ophthalmology, 2005; xix: 396
- 4 American Academy of Ophthalmology. Introducing ophthalmology: a primer for office staff. 2 ed. San Francisco: American Academy of Ophthalmology, 2002
- 5 Kanski JJ, Nischal KK, Milewski SA. Ophthalmology: clinical signs and differential diagnosis. London; Philadelphia: Mosby, 1999
- 6 Kanski JJ, Bolton A. Illustrated tutorials in clinical ophthalmology. Oxford; Boston: Butterworth-Heinemann; 2001 with accompanying CD-ROM.
- 7 Wilson FM, Gurland JE. Practical ophthalmology: a manual for beginning residents. 5th ed. San Francisco, Calif.: American Academy of Ophthalmology, 2005
- 8 Rhee DJ, Pyfer MF, Wills Eye Hospital (Philadelphia Pa.). The Wills eye manual: office and emergency room diagnosis and treatment of eye disease. 3rd ed. Philadelphia: Lippincott Williams xxiii: 563

## II. Standard Level (Residents and Ophthalmologists)

### A. Theoretical Knowledge

1. Anatomy, embryology, physiology, pathology, microbiology, immunology, genetics, epidemiology, and pharmacology of the cornea, conjunctiva, sclera, eyelids, lacrimal apparatus, and ocular adnexa (including the basic concepts of ocular surface physiology and pathology).
2. The differential diagnosis and management of corneal and external eye diseases, including:
  - a. Congenital abnormalities of the cornea, sclera, and globe.
  - b. Peripheral corneal thinning (e.g., inflammatory, degenerative, dellen-related, infectious, immunologic).
  - c. Common conjunctival neoplasms (e.g., benign, malignant tumors) corneal or conjunctival presentations of degenerations.
  - d. Thygeson's superficial punctate keratitis.
  - e. Corneal and conjunctival infections (including complex, mixed, or atypical bacterial, fungal, Acanthamoeba, viral, or parasitic keratitis).
  - f. Scleritis, episcleritis, orbital cellulitis.
  - g. Benign and malignant lid lesions.
  - h. Corneal thinning or ulceration (e.g., Terrien's marginal degeneration, Mooren's ulcer, rheumatoid arthritis-related corneal melt).

- i. Ocular surface diseases (e.g., limbal insufficiency, fibrosing conjunctivitis).

### B. Technical/Surgical Skills

1. Perform basic and advanced techniques for examining and imaging the cornea and external eye including:
  - a. Corneal pachymetry.
  - b. Detection of altered structure and differentiation of any signs of inflammation that affect the eyelid margin, conjunctiva, cornea, sclera, and iris.
  - c. Diagnostic techniques for infectious diseases of the cornea and conjunctiva, including specimen collection methods for microbiologic testing and diagnostic assessment of the normal ocular flora.
  - d. Diagnostic techniques for neoplasia of the cornea, conjunctiva, and eyelid margin, including specimen collection methods for histopathological testing.
  - e. Measurement of corneal topography, keratometry, keratoscopy, computerized corneal topography, retinoscopy, wave front analysis, scanning slit topography.
  - f. Slit lamp biomicroscopy: examination procedures and recording of observation.
  - g. Tear film evaluation: static and dynamic assessments; tear breakup time, Schirmer test.
2. Perform basic corneal and external eye surgical procedures.
  - a. Basic ocular surface reconstructive procedures including:
    - i. Amniotic membrane transplantation.
    - ii. Anterior stromal puncture.
    - iii. Application of corneal tissue adhesive.
    - iv. Conjunctival and corneal biopsy.
    - v. Corneal epithelial debridement.
    - vi. Pterygium excision including conjunctival grafting.
    - vii. Punctal occlusion.
    - viii. Repair of corneal laceration and suture closure of corneal wound.
    - ix. Superficial keratectomy.
    - x. Tarsorrhaphy.
  - b. Perforating keratoplasty, keratoplasty "à chaud".
  - c. Complex lid laceration repair.
  - d. Complex corneal laceration repair (e.g., stellate perforating laceration).
  - e. Repair lacerations of the lacrimal drainage apparatus (e.g., perform intubations and primary closure).

### References for Standard Level (in addition to Basic Level)

1. Sutphin JE. Basic and clinical science course section 8, 2005–2006, external disease and cornea. San Francisco: American Academy of Ophthalmology, 2005; xiv: 324
2. Mandelbaum S, Chew EY, Christmann LM et al. Preferred Practice Pattern, Bacterial Keratitis. Prepared by the American Academy of Ophthalmology Cornea/External Disease Panel: American Academy of Ophthalmology, 2005: [http://www.aao.org/education/library/ppp/upload/Bacterial\\_Keratitis.pdf](http://www.aao.org/education/library/ppp/upload/Bacterial_Keratitis.pdf)
3. Caprioli J, Bateman B, Chew EY, et al. Preferred Practice Pattern, Blepharitis, Corneal Opacification and Ectasia, and Dry Eye Syndrome. Prepared by the American Academy of Ophthalmology Cornea/External Disease Panel: American

Academy of Ophthalmology, 2003: [http://www.aao.org/aao/education/library/ppp/upload/Blepharitis\\_.pdf](http://www.aao.org/aao/education/library/ppp/upload/Blepharitis_.pdf)

4. Krachmer JH, Mannis MJ, Holland EJ. Cornea. 2nd ed. Philadelphia: Elsevier Mosby, 2005; 2 v. (xxii, 2087, I-2064)
5. Smolin G, Foster CS, Azar DT, Dohlman CH. Smolin and Thoft's The cornea: scientific foundations and clinical practice. 4th ed. Philadelphia: Lippincott Williams & Wilkins, 2005: xviii: 1323, [1336] of plates
6. Current opinion in ophthalmology. In. Philadelphia, PA: Current Science; 1990: <http://gateway.ovid.com/ovidweb.cgi?T=JS&MODE=ovid&NEWS=n&PAGE=toc&D=ovft&AN=00055735-000000000-000000000>

### III. Advanced Level (Experienced Ophthalmologists and Specialists in Cornea, Ocular Surface, and External Diseases)

#### A. Theoretical Knowledge

1. Complex corneal optics and refraction (e.g., post-keratoplasty).
2. Complex ocular surface disorders.
3. Complicated corneal and conjunctival infections.
4. Differential diagnosis of the Immune-Mediated Disorders including:
  - a. Atopic keratoconjunctivitis.
  - b. Conjunctival inflammation with scarring.
  - c. Contact lens-induced conjunctivitis.
  - d. Marginal corneal infiltrates associated with blepharoconjunctivitis.
  - e. Non-ulcerative keratitis.
  - f. Ocular cicatricial pemphigoid.
  - g. Peripheral keratitis.
  - h. Peripheral ulcerative keratitis associated with systemic immune-mediated diseases, including rheumatoid arthritis, Wegener's granulomatosis, systemic lupus erythematosus, and inflammatory bowel disease.
- i. Stevens-Johnson syndrome (erythema multiforme major).
- j. Ulcerative keratitis.
5. Advanced principles of ocular pharmacology of anti-infective, anti-inflammatory, and immune modulating agents.
6. Fundamentals of ocular surface transplantation, including: conjunctival autograft/flap, amniotic membrane transplantation, limbal stem cell transplantation.
7. The surgical indications, surgical techniques, recognition, and management of postoperative complications (especially immunological-mediated rejection) of corneal transplantation (e.g., penetrating, lamellar).
8. Current lamellar keratoplasty techniques: deep anterior lamellar keratoplasty (DALK); deep lamellar endothelial keratoplasty (DLEK); (Descemet stripping endothelial keratoplasty (DSEK).
9. Pre-operative assessment, patient selection, surgical management, and postoperative care of refractive surgical techniques, including keratotomy (radial, astigmatic), photoablation (photorefractive, phototherapeutic, LASIK, LASEK), corneal wedge resection, thermokeratoplasty, intracorneal rings, phakic intraocular lens, and clear lens extraction.

#### B. Technical/Surgical Skills

1. Performance and interpretation of the most advanced corneal evaluation techniques.

2. Understanding and performing specialized and complicated contact lens fitting.
3. Performing more complex corneal surgery (e.g., penetrating and lamellar keratoplasty – DALK, DLEK, DSEK).
4. Performing complex ocular surface reconstructive surgery.
5. Performing basic non-laser and laser refractive surgery techniques.
6. Manage and treat more complex neoplasms of the conjunctiva (e.g., carcinoma, melanoma).

### References for Advanced Level (in addition to Basic and Standard Level)

1. Review of current journal articles (see Useful Websites).

## IV. Cataract

### I. Basic Level (Para-ophthalmic Personnel)

#### A. Theoretical Knowledge

1. Methods of assessment of lens opacities.
2. Basic anatomy and physiology of the lens.
3. Characteristics of visual loss in cataract.
4. Basic information on pupil reactions and innervations.
5. Types of mydriatics and cycloplegics, and their mechanism of action.
6. Classification of cataracts.
7. Importance of history taking (e.g., previous trauma, uveitis, glaucoma, high myopia and hypermetropia, keratitis, keratopathies, etc.).
8. Influence of medications on elderly patients (e.g., anticoagulants, antiaggregation therapy, antihypertensives, digitalis, amiodarone, drugs against prostatic hypertrophy, etc.).
9. Importance of control of blood pressure and sugar levels in diabetics and signs associated with poor regulation of these.
10. Psychological and intellectual aspects of elderly and disabled.
11. Fundamentals of organization of a surgical unit.
12. Basic knowledge of asepsis and micro-organisms.
13. Methods of sterilization in cataract surgery.
14. Different methods of anesthesia and related complications.
15. Types of cataract surgical procedures.
16. Early and delayed complications and side effects of cataract surgery.

#### B. Technical/Surgical Skills

1. Preparation of patient for cataract surgery (topical mydriatics, anesthetics, antiseptics).
2. Explanation and obtaining of informed consent.
3. Surgeon's preparation for cataract surgery.
4. Cleaning, sterilization, and preparation of instruments.
5. Gloves and their related complications (latex allergy, talc-related complications, perforation).
6. Correct positioning of patient and surgeon.
7. Correct preparation of surgical field (antisepsis, surgical drapes, insertion of speculum).
8. Assisting the surgeon.
9. Care necessary for correct functioning of instruments and equipment.
10. Correct aftercare of the operating room.

**Learning Activities**

Passive learning: studying of available references, recommended by a local supervisor.

**II. Standard Level (Residents and Ophthalmologists)****A. Theoretical Knowledge**

1. Functional assessment of patients with different forms of cataracts.
2. Basic and advanced examination techniques.
3. Clinical estimation of impact of cataract on visual acuity and type of visual field defect.
4. Characteristics of lens-related visual loss.
5. Advanced anatomy and physiology of the lens.
6. Congenital cataracts – hereditary and transplacental damage (e.g., rubella, mumps, hepatitis).
7. Developmental abnormalities of the lens.
8. Traumatic cataract.
9. Choice of optimal time to perform surgery.
10. Advanced understanding of color vision alterations and loss of contrast sensitivity in patients with cataracts.
11. Risk of cataract-related amblyopia and recognition of cataract-related strabismus.
12. Conditions that may aggravate the outcomes of delayed surgery (e.g., diabetic retinopathy).
13. Conditions that may aggravate the outcomes of early surgery (e.g., early AMD).
14. Advanced knowledge about types of anesthesia.
15. Indications, advantages, and disadvantages of extra capsular cataract extraction (ECCE).
16. To know contemporary remaining indications for intracapsular cataract extraction (ICCE).
17. Basic and advanced knowledge on phacoemulsification (PHACO).
18. Assessment of patients with cataract and glaucoma.
19. Intraoperative complications (e.g., posterior capsular tear, dropped nucleus/fragments, vitreous prolapse, zonulolysis, Descemet detachment, endothelial damage).
20. Early postoperative complications (e.g., IOP pressure spikes, hypotony, corneal edema, hyphema, iris prolapse, IOL dislocation, infection, inflammation).
21. Late postoperative complications (e.g., posterior capsular opacification [PCO], opacification of the IOL, subluxation of IOL, secondary glaucoma, inflammation, cystoid macular edema, corneal decompensation, hemorrhages, retinal detachment).
22. Basic knowledge of different IOL designs and materials and their relationship to PCO.
23. Anterior chamber lens implantation (correct IOL choice and implantation).
24. Pseudophakic dysphotopsias (glare, halos, shadows).

**B. Technical/Surgical Skills**

1. Judge cataract density by retro illumination.
2. Perform biometry, keratometry, and IOL power calculation.
3. Make correct incisions (scleral tunnels, clear corneal incisions).
4. Capsulorhexis with a cystotome and/or forceps.
5. Wound closure techniques (self-sealing incisions, sutures).
6. Basic phacoemulsification techniques.

7. Being able to convert to ECCE.

8. Correct management of complications of cataract surgery.

**Learning Activities**

Active learning:

- ▶ Learning courses in a wet lab supervised by a trained surgeon, followed by supervised elements of operations on patients.
- ▶ Learning about complications in clinical setting with supervisor.

**References for Standard Level (in addition to Basic Level)**

1. Rosenfield S. Basic and clinical science course section 11. 2005 – 2006, lens and cataract. San Francisco: American Academy of Ophthalmology, 2005
2. Foss AJE. Essential ophthalmic surgery. Oxford ; Boston: Butterworth-Heinemann, 2001; ix: 320
3. Brown NAP, Bron AJ. Lens disorders: a clinical manual of cataract diagnosis. Oxford ; Boston: Butterworth-Heinemann, 1996; vii: 268, [264] of plates

**III. Advanced Level (Experienced Ophthalmologists and Cataract Surgery Specialists)****A. Theoretical Knowledge**

1. Advanced biometry techniques (optical biometry, immersion biometry), and IOL power calculation methods in complicated cases (e.g., high myopia, high hypermetropia, post refractive surgery, postoperative malposition – Haigis formula).
2. Cataract associated with systemic diseases (e.g., diabetes, galactosemia, dialyzed patients, myotonic dystrophy, skin diseases, tetany).
3. Complicated cataract associated with other ocular diseases (e.g., uveitis, retinitis pigmentosa, glaucoma).
4. Cataract associated with toxic effects of drugs and environment (e.g., steroids, infrared radiation, electric ionizing radiation).
5. Causes and types of lens displacement (e.g., ectopia lentis, Marfan's and Weill-Marchesani syndromes, homocystinuria, trauma, advanced pseudo exfoliation).
6. Capsular dyes and their potential toxicity.
7. White cataract: presentations with high intracapsular pressure and zonular weakness.
8. Different presentation of traumatic cataract with or without vitreous loss.
9. Presentation of cataract after vitrectomy and choice of IOL (e.g., contraindicated silicone IOLs).
10. Surgical approach to congenital cataracts (e.g., decision-making regarding when to operate, timing of IOL implantation, vitrectomy, IOL implantation with optic capture).
11. Surgical techniques in management of:
  - a. Subluxated cataract (e.g., use of intracapsular rings and segments with or without suturing, use of capsular hooks).
  - b. Small pupil (e.g., techniques of viscomydriasis, stretching, iris retractors, dilating rings, pupillary membrane peeling).
  - c. Uveitic cataract (e.g., indications for surgery, pupil management, zonular weakness, pre- and post-operative medical management).

- d. Posterior polar cataract and posterior lenticonus.
- e. Cataract in aniridia.
- f. Cataract associated with corneal dystrophies.
- g. Cataract in nanophthalmus and microphthalmus.
- 12. Diffractive and pseudoaccommodative IOLs.
- 13. Intraoperative astigmatism management (steep axis incision and limbal relaxing incisions).
- 14. Indications and hazards of IOL removal.
- 15. Indications and types of secondary IOL implantation.
- 16. Indications for suture fixation of IOLs to sclera or iris.
- B. Technical/Surgical Skills
  - 1. Techniques on how to operate challenging cases (listed above).
  - 2. Ability to operate with extreme fluid dynamics (low or high), and palette of different viscoelastics in challenging cases.
  - 3. Small incision.
  - 4. Techniques to implant different intracapsular rings and segments.
  - 5. Techniques of secondary IOL implantation and scleral or iris fixation.
  - 6. Posterior capsulorhexis.
  - 7. Techniques of anterior vitrectomy with assistance of intracameral and intravitreal triamcinolone.
  - 8. Bimanual phaco and I/A.
  - 9. Multifocal IOL implantation.
  - 10. Techniques of IOL removal (bisection, folding).

#### References for Advanced Level (in addition to Basic and Standard Level)

- 1 Por YM, Lavin MJ. Techniques of intraocular lens suspension in the absence of capsular/zonular support. *Surv Ophthalmol* 2005; 50: 429–462
- 2 Osher R. Complications during phacoemulsification. Continuing Skills Video, number 0251128CS. San Francisco: American Academy of Ophthalmology, 1999
- 3 Albert DM. Ophthalmic surgery: principles and techniques. Malden: Blackwell Science, 1999; 2 v. xxi: 1658

## V. Neuro-Ophthalmology

### I. Basic Level (Para-ophthalmic Personnel)

- A. Theoretical Knowledge
  - 1. Basic examination of a neuro-ophthalmic patient.
  - 2. Fundamentals of anatomy and physiology of visual system, including visual acuity, color vision, peripheral vision, contrast vision, and stereo acuity of ocular and lid motility and sensation on pupil reactions; sympathetic and parasympathetic innervations necessary to understand the physiology of the neurological aspect of the eye, its adnexa, and the related central nervous system.
  - 3. Visual field defects, their etiologies and mechanisms.
  - 4. Types of color vision loss, their etiologies and mechanisms.
  - 5. Causes of photophobia related to neuro-ophthalmic disorders.
  - 6. Different levels of urgency and related basic knowledge.
  - 7. Pathologies which cause eye movement problems, including cranial nerve palsies/disorders, and nystagmus.

- 8. Basic knowledge of relationship between ocular and potentially incapacitating neurologic and systemic disorders, with emphasis on appropriate interaction with patient.

### B. Technical/Surgical Skills

- 1. Assess visual acuity, refraction, color vision, and contrast sensitivity.
- 2. Carry out pinhole test for diplopia and best visual acuity.
- 3. Clinical examination of ocular motility, lid function, and sensation.
- 4. Basic visual field examination techniques (confrontational, Amsler test).
- 5. Extraocular muscle examination and tests (e.g., Hess-Lees screen test).
- 6. Assessment of exophthalmos or enophthalmos by exophthalmometry (e.g., Hertel test).
- 7. Kinetic and static visual field examination.
- 8. Perform basic color vision tests (Ishihara, D-15, anomaloscope, Farnsworth 100 Hue).
- 9. Perform Random-Dot-Stereotest and Titmus test.
- 10. Perform optokinetic nystagmus testing.
- 11. Ability to recognize urgent neuro-ophthalmic situations.

### Learning Activities

Passive learning: studying available references, recommended by a local supervisor.

### II. Standard Level (Residents and Ophthalmologists)

#### A. Theoretical Knowledge

- 1. Complex anatomy and physiology of visual system, including the optic nerve, central visual pathways, and higher visual systems.
- 2. Complex anatomy and physiology of ocular motor system, including the cranial nerves, and central ocular motor pathways.
- 3. Comprehensive anatomy of the orbit, cavernous sinus, sella turcica, and skull.
- 4. Comprehensive anatomy of the vascular system of the eye and brain concerning neuro-ophthalmology.
- 5. Functional assessment of the neuro-ophthalmic patient.
- 6. Basic and advanced examination techniques of ocular motility, orbital disorders, and the cranial nerves.
- 7. Etiologies and possible causes of neuro-ophthalmic visual loss.
- 8. Common and rare causes of unexplained visual loss.
- 9. Neuro-ophthalmic causes of blindness in infants.
- 10. Congenital and developmental optic disc abnormalities.
- 11. Techniques used to recognize different types of amblyopia.
- 12. Differential diagnosis of paralytic and non-paralytic strabismus and amblyopia.
- 13. Correlation of the lesion site and visual field defect.
- 14. Advanced understanding of color vision defects and loss of contrast sensitivity.
- 15. Principles of generation of saccades, and slow pursuit mechanisms.
- 16. The principles of vestibulo-ocular reflex mechanisms.
- 17. Mechanisms of motility disturbances (versions and ductions).

18. Basic and advanced understanding of different forms of peripheral motility disturbances (III, IV, VI nerve palsies).
  19. Differences between III nerve palsy with and without pupil involvement.
  20. Causes and pathophysiology of horizontal and vertical diplopias.
  21. Different forms of congenital and acquired nystagmus and synkinesias.
  22. Different forms of ptosis with various etiologies.
  23. Differential diagnosis of acutely dilated and constricted pupil.
  24. Diagnosis and significance of Adie's pupil syndrome.
  25. Different forms of nuclear, inter-nuclear, and supra-nuclear motility disturbances.
  26. Urgent neuro-ophthalmic situations (e.g., painful ophthalmoplegia, painful Horner's syndrome, pituitary apoplexy, cavernous sinus syndrome, giant cell arteritis).
  27. The comprehensive knowledge of relative afferent pupillary defect and atypical pupil abnormalities.
  28. Recognition and comprehensive knowledge of myopathic forms of motility disturbances.
  29. Recognition and differential diagnosis between maculopathy and optic neuropathy.
  30. Recognition and comprehensive knowledge of different forms and etiologies of optic neuropathies.
  31. Recognition, etiology, and differential diagnosis and management of optic neuritis.
  32. Relationship between optic neuritis and multiple sclerosis.
  33. Recognition, etiology, type of inheritance, systemic manifestations, and management of Leber's hereditary optic neuropathy (LHON).
  34. Recognition, etiology, and management of neuroretinitis (e.g., Leber's stellate neuroretinitis) and differential diagnosis with demyelinating optic neuritis.
  35. Recognition and comprehensive knowledge of toxic and nutritive optic neuropathy.
  36. Side effects of drugs (e.g., etambutol, tamoxifen, resochin, digitalis, amiodarone, etc.).
  37. Recognition and differential diagnosis of papillophlebitis.
  38. Etiology and management of nonarteritic ischemic optic neuropathy.
  39. Hypertensive and diabetic optic neuropathy in different age groups.
  40. Recognition, basic knowledge, and urgent management of arteritic optic neuropathy.
  41. Signs and symptoms of thromboembolic diseases.
  42. Transient monocular visual loss (amaurosis fugax).
  43. Pseudopapilloedema (e.g., hypermetropia, disc drusen).
  44. Etiology and pathogenesis of papilledema.
  45. Recognition, etiology, and differential diagnosis of idiopathic intracranial hypertension.
  46. Optic nerve tumors and idiopathic intracranial hypertension.
  47. Recognition and causes of axial proptosis.
  48. Etiology and recognition of restrictive motility disturbances and compressive optic neuropathy in Graves' disease.
  49. Vascular malformations of the eye, orbit, and brain.
  50. Etiology and differential diagnosis of blepharospasm.
  51. Comprehensive recognition of non-organic visual loss.
  52. Stroke prevention and therapy (treatment window times).
  53. Specificity and sensitivity of different neuro-imaging techniques and their indications in different disorders.
- B. Technical/Surgical Skills**
1. Perform routine neurological clinical exam, and interpret localization of the neurological defect with ocular lesions.
  2. Advanced neuro-ophthalmic examination techniques.
  3. Clinical testing of ocular motility.
  4. Bielschowsky head tilt test and doll's head phenomenon test.
  5. Perform systematic examination of pupils and discern simple anisocoria.
  6. Swinging flashlight test, fast and slow, causes of RAPD.
  7. Pharmacologic pupil testing.
  8. Forced duction test.
  9. Use and prescription of prisms.
  10. Ice test in myasthenia gravis.
- III. Advanced Level (Experienced Ophthalmologists and Neuro-ophthalmic Specialists)**
- A. Theoretical Knowledge**
1. Advanced clinical assessment of the neuro-ophthalmic patient.
  2. Advanced knowledge and management of complicated urgent neuro-ophthalmic situations.
  3. Newer and advanced examination techniques (neuroradiologic imaging, electrophysiology, microperimetry, and pupillometry).
  4. Latest knowledge on pupil abnormalities and light-near dissociation.
  5. Advanced knowledge of neurologic and ophthalmic manifestations in hereditary metabolic diseases (e.g., Kayser-Fleischer ring).
  6. Complex recognition and management of dorsal midbrain syndromes.
  7. Recognition and advanced knowledge about aberrant regeneration and its meaning.
  8. Recent knowledge and management of myopathic forms of motility disturbances.
  9. Understanding and management of restrictive motility disturbances and compressive optic neuropathy in Graves' disease.
  10. Advanced information and management of myositis.
  11. Advanced knowledge and management of granulomatous inflammatory neuro-ophthalmic diseases.
  12. Advanced clinical and instrumental differential diagnosis between maculopathy and optic neuropathy.
  13. Advanced familiarity with genetics, systemic manifestations, and management of Leber's hereditary optic neuropathy.
  14. Atypical forms and management of giant cell arteritis.
  15. Advanced knowledge about mimics of typical optic neuritis (Devic's disease, chronic relapsing inflammatory optic neuropathy (CRION), compressive, infiltrative, infectious, granulomatous inflammation, autoimmune, vasculitic, toxic, paraneoplastic).

16. Acute demyelinating encephalomyelitis (ADEM), and acute hemorrhagic encephalomyelitis (AHM).
  17. Etiopathogenesis and management of ocular and optic nerve trauma.
  18. Recognition and management of Purtscher's retinopathy and Terson's syndrome.
  19. Diagnosis and management of idiopathic intracranial hypertension and differential diagnosis with sinus thrombosis.
  20. Atypical presentations of optic nerve tumors and pseudotumor.
  21. Phakomatoses and secondary neoplasms (e.g., neurofibromatosis and von Hippel-Lindau disease).
  22. Hearing loss and tinnitus in association with neuro-ophthalmic diseases.
  23. Advanced knowledge on migraine, TIA, and their relation to strokes.
  24. Headaches related to neuro-ophthalmic diseases.
  25. Recognition of Balint's syndrome and Anton's syndrome.
  26. Diagnosis and treatment of Neuro-Behçet's disease.
  27. Advanced information on visual agnosias, illusions, and hallucinations.
  28. Differential diagnosis of retinal vs. cerebral achromatopsias.
  29. Hereditary maculopathies and neuropathies.
  30. Recognition and advanced knowledge on radiation optic neuropathy.
  31. Specific aspects of neuro-ophthalmic diseases in infants and children.
  32. Most recent techniques for assessment of visual development in complicated or non-cooperative (e.g., pediatric, malingering) patients.
  33. Understand and recognize the most complex forms of childhood nystagmus (e.g., sensory, and spasmus nutans) associated with neurologic or systemic diseases.
  34. Understand and recognize more complex hereditary ocular syndromes (e.g., bilateral Duane's syndrome, Möbius syndrome).
  35. Management of blepharospasm and lagophthalmus.
  36. Advanced experience on botulinum toxin treatment in neuro-ophthalmology.
  37. Recognize and treat orbital diseases (e.g., orbital cellulitis, ethmoiditis, and differential diagnosis with orbital tumors).
- B. Technical/Surgical Skills**
1. Perform most advanced neuro-ophthalmic clinical testing.
  2. Perform most advanced instrumental morphometric tests (OCT, HRT, NFA, auto fluorescence).
  3. Tensilon test in myasthenia.
  4. Biopsy of temporal artery.
  5. Perform appropriate treatment using botulinum toxin in neuro-ophthalmology.
  6. Perform and interpret electrophysiological testing.
  7. Perform and interpret pupillography.
  8. Indicate and understand most advanced types of neuroradiologic testing.
  9. Indicate and understand most advanced types of ultrasound diagnostics (Duplex-Scan, transcranial Doppler, ultrasound diagnostics of the heart).
  10. Indicate and understand CSF-tap results and opening pressure.
- References for Standard and Advanced Level**
1. Kline LB. Basic and clinical science course section 5. 2005–2006, neuro-ophthalmology. San Francisco: American Academy of Ophthalmology; 2005:400
  2. Miller NR, Newman NJ. Walsh & Hoyt's clinical neuro-ophthalmology. 6th ed. Baltimore: Williams & Wilkins, 2004
  3. Burde RM, Savino PJ, Trobe JD. Clinical decisions in neuro-ophthalmology. 3rd ed. St. Louis: C.V. Mosby, 2002; xi: 380
  4. Electrophysiologic testing in disorders of the retina, optic nerve, and visual pathway. Ophthalmology Monographs 2. 2nd ed. San Francisco: American Academy of Ophthalmology, 2001: 85–88
  5. Schiefer U, Wilhelm H, Zrenner E, Burk A. Praktische neuroophthalmologie. Heidelberg: Kaden Verlag, 2003
  6. Yanoff M, Duker JS, MD Consult LLC. Ophthalmology. 2nd ed. St. Louis: Mosby, 2004
  7. Von Noorden GK, Campos EC. Binocular vision and ocular motility: theory and management of strabismus. 6th ed. St. Louis: Mosby, 2002; xvi: 653, [651] leaf of plate
  8. Mumenthaler M, Mattle H. Neurology. 4th rev. enl. ed. Stuttgart; New York: George Thieme Verlag, 2004; xvi: 992
  9. Digre KB, Corbett JJ. Practical viewing of the optic disc. Amsterdam; Boston: Butterworth-Heinemann, 2003; xii: 660
- VI. Pediatric Ophthalmology and Strabismus**
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- I. Basic Level (Para-ophthalmic Personnel)**
- A. Theoretical Knowledge**
1. Basic information on visual development and visual assessment of the pediatric ophthalmology patient.
  2. Basic information on anatomy and physiology of strabismus.
  3. Basic examination techniques for strabismus.
  4. Etiologies of amblyopia.
  5. Non-surgical treatment of strabismus.
  6. Features and treatment indications for retinopathy of prematurity.
  7. Etiologies and types of pediatric cataracts.
  8. Ocular findings in child abuse.
  9. Ocular tumors in childhood.
  10. Pediatric infectious ocular diseases (e.g., ophthalmia neonatorum, conjunctivitis, keratitis, and orbital infections).
  11. Anomalies of lacrimal drainage.
  12. Most common diseases of the cornea and anterior segment.
  13. Clinical manifestations of pediatric glaucomas.
- B. Technical/Surgical Skills**
1. Perform assessment of vision in the neonate, infant, and child.
  2. Perform an examination of anterior and posterior segment of the eye.
  3. Perform tonometry.
  4. Perform an extraocular muscle examination and basic measurement of strabismus (e.g., cover testing).
  5. Recognize and apply in a clinical setting the following skills in the ocular motility examination:

- a. Stereoacuity testing.
- b. Tests of binocularity and retinal correspondence.
- c. Cycloplegic refraction (retinoscopy).
6. Recognize and apply non-surgical treatment in the congenital nasolacrimal duct obstruction (digital massage).

### Learning Activities

Passive learning: studying available references, recommended by a local supervisor.

## II. Standard Level (Residents and Ophthalmologists)

### A. Theoretical Knowledge

1. Basic and more advanced visual development and visual assessment of the pediatric ophthalmology patient.
2. Basic and more advanced strabismus examination techniques.
3. Advanced anatomy and physiology of strabismus.
4. Basic and advanced sensory adaptations for binocular vision (e.g., normal and anomalous retinal correspondence, suppression, horopter, Panum's fusion area, stereopsis, anomalous head position) and binocular sensory testing.
5. Describe and recognize different etiologies of amblyopia.
6. Etiologies of esotropia, exotropia, and vertical strabismus.
7. Strabismus patterns (e.g., A or V pattern).
8. Non-surgical treatment of strabismus and amblyopia.
9. Different forms of childhood nystagmus.
10. Retinopathy of prematurity (e.g., stages, treatment indications).
11. Etiologies and types of pediatric cataracts.
12. Ocular findings in inherited, metabolic disorders (mucopolysaccharidoses, lipidoses, aminoacidurias).
13. Ocular findings in chromosomal abnormalities.
14. Main features of dyslexia and its relationship to vision.
15. Causes of blindness in infants.
16. Etiology, evaluation, and management of congenital infections.
17. Common causes of uveitis in children.
18. Typical features of ocular tumors in childhood (orbital, eyelid, epibulbar, and intraocular).
19. Anomalies of the lacrimal drainage system.
20. Childhood diseases of the cornea and anterior segment.
21. Clinical manifestations and diagnosis of pediatric glaucomas.
22. Childhood diseases of the vitreous and retina.
23. Childhood optic disc abnormalities.
24. Systemic and ocular manifestations of phakomatoses.
25. Ocular manifestations in craniofacial syndromes.
26. Ocular trauma in childhood (child abuse, blunt and penetrating injury).

### B. Technical/Surgical Skills

1. Advanced extraocular muscle examination.
2. Measurements of strabismus.
3. Assessment of vision and cycloplegic refraction in more difficult strabismus patients.

4. Indications and contraindications for strabismus surgery, pre-operative assessment, and intraoperative and postoperative complications.
5. Techniques of recession, resection, muscle weakening and strengthening, muscle transposition, and use of adjustable sutures.
6. Management of the complications of strabismus surgery.
7. Examination of anterior and posterior segment of the eye in a child.
8. Application of non-surgical and surgical treatment in the congenital nasolacrimal duct obstruction.

## III. Advanced Level (Experienced Ophthalmologists, Pediatric Ophthalmologists, and Strabismus Specialists)

### A. Theoretical Knowledge

1. Most advanced strabismus examination techniques.
2. Most advanced techniques for assessment of visual development in complicated or non-cooperative pediatric ophthalmology patients.
3. Apply the most advanced knowledge of strabismus anatomy and physiology in evaluation of patients.
4. Describe clinical application of the most advanced sensory adaptations (e.g., anomalous head position, anomalous retinal correspondence).
5. Recognize and treat the most complicated etiologies of amblyopia (e.g., refraction noncompliance, patching failures, and pharmacologic penalization).
6. Recognize and treat the most complex etiologies of esotropia.
7. Recognize and treat the most complex etiologies of exotropia.
8. Recognize and treat the most complex strabismus patterns (e.g., aberrant regeneration, postsurgical, thyroid ophthalmopathy, and myasthenia gravis).
9. Recognize and treat the most complex etiologies of vertical strabismus (e.g., skew deviation, postsurgical, dissociated vertical deviation, restrictive).
10. Recognize and appropriately evaluate the more complex hereditary ocular syndromes (e.g., bilateral Duane's syndrome, Moebius' syndrome).
11. Recognize, evaluate, and treat the most complex forms of childhood nystagmus (e.g., sensory, spasmus nutans, associated with neurologic or systemic diseases).
12. Recognize and treat complex retinopathy of prematurity (e.g., stages, treatment indications, retinal detachment).
13. Recognize and treat various types of pediatric cataracts (e.g., congenital, traumatic, metabolic, and inherited).
14. Recognize and treat patients with retinoblastoma.
15. Recognize and evaluate the less common congenital ocular anomalies (e.g., unusual genetic syndromes).
16. Recognize and treat complex pediatric retinal diseases (e.g., inherited retinopathies).
17. Recognize and treat pediatric glaucoma.
18. Recognize and treat pediatric anterior segment abnormalities.
19. Recognize and treat pediatric eyelid disorders (e.g., congenital deformities, lid lacerations, and lid tumors).

20. Recognize and treat pediatric orbital diseases (e.g., orbital cellulitis, orbital tumors, orbital fractures, rhabdomyosarcoma, and severe congenital orbital malformations).
  21. Recognize and treat lacrimal drainage system disorders.
  22. Recognize and treat anterior, intermediate, and posterior uveitis in children.
- B. Technical/Surgical Skills**
1. Perform more complex extraocular muscle surgery (e.g., vertical and horizontal muscle surgery and reoperations).
  2. Application of botulinum toxin in the treatment of strabismus: indications, contraindications, and methods.
  3. Complicated strabismus surgery (e.g., reoperations and slipped muscle): preoperative assessment, intraoperative techniques, and postoperative complications.
  4. Describe indications for and perform adjustable sutures in more complicated cases (e.g., thyroid ophthalmopathy).
  5. Describe and manage complex complications of strabismus surgery (e.g., globe perforation, endophthalmitis, and overcorrection).

#### References for Standard and Advanced Level

1. Simon JW. Basic and clinical science course section 6. 2005 – 2006, pediatric ophthalmology and strabismus. San Francisco: American Academy of Ophthalmology, 2005: 482
2. Albert DM, Jakobiec FA. Principles and practice of ophthalmology. 2nd ed. Philadelphia: W.B. Saunders Co., 2000
3. Cibis GW, Tongue AC, Stass-Isern ML. Decision making in pediatric ophthalmology. 1st ed. Philadelphia: B.C. Decker, 1993; xx: 328
4. Del Monte MA, Archer SM. Atlas of pediatric ophthalmology and strabismus surgery. New York: Churchill Livingstone, 1993; viii: 232
5. Duane's clinical ophthalmology on CD-ROM. In. Philadelphia: Lippincott Williams & Wilkins: computer optical disc, 2002
6. Helveston EM, Helveston EM. Surgical management of strabismus: an atlas of strabismus surgery. 4th ed. St. Louis: Mosby-Year Book, 1993; xii: 579
7. MacEwen CJ, Gregson R. Manual of strabismus surgery. Oxford: Butterworth-Heinemann, 2003; viii: 196
8. Rosenbaum AL, Santiago AP. Clinical strabismus management: principles and surgical techniques. Philadelphia: Saunders, 1999; xv: 569
9. Von Noorden GK, Campos EC. Binocular vision and ocular motility: theory and management of strabismus. 6th ed. St. Louis: Mosby, 2002; xvi: 653, [651] leaf of plate
10. Wright KW, Wright KW, Spiegel PH. Pediatric ophthalmology and strabismus. 2nd ed. New York: Springer, 2002; xxiii: 1084
11. Wright KW, Ryan SJ. Color atlas of ophthalmic surgery. Philadelphia: Lippincott, 2000
12. Yanoff M, Duker JS, MD Consult LLC. Ophthalmology. 2nd ed. St. Louis: Mosby, 2004

## VII. Vitreoretinal Diseases



### I. Basic Level (Para-ophthalmic Personnel)

- A. Theoretical Knowledge**
1. Basic information on retinal anatomy and physiology to describe fundamentals and demonstrate basic understanding of fluorescein angiography and ultrasonography.
  2. Macular anatomy and function, and typical features of common macular diseases (e.g., age-related macular degeneration, macular hole, macular dystrophies, and macular pucker).
  3. Etiologies and mechanisms of retinal detachment.
  4. Basic principles of laser photocoagulation.
  5. Features of commotio retinae, traumatic choroidal rupture, and Purtscher's retinopathy.
  6. Common forms of retinal vascular diseases (e.g., branch or central retinal vein and artery occlusion).
  7. Typical features of retinitis pigmentosa.
  8. Symptoms and signs of posterior vitreous detachments and retinal detachments.
  9. Features and causes of vitreous hemorrhage.
- B. Technical/Surgical Skills**
1. Check visual acuity (distance and near).
  2. Perform direct transillumination and/or ophthalmoscopy.
  3. Check visual field (confrontation method).
  4. Check intraocular pressure.

#### References for Basic Level

1. Newmark E. Ophthalmic medical assisting: an independent study course. 4th ed. San Francisco: American Academy of Ophthalmology, 2006; xvii: 350
2. Bradford CA. Basic ophthalmology for medical students and primary care residents. 8th ed. San Francisco, CA: American Academy of Ophthalmology, 2004; xv: 175
3. Kanski JJ, Nischal KK, Milewski SA. Ophthalmology: clinical signs and differential diagnosis. London; Philadelphia: Mosby, 1999

### II. Standard Level Goals (Residents and Ophthalmologists)

- A. Theoretical Knowledge**
1. Advanced retinal anatomy and physiology.
  2. More advanced concepts of fluorescein and indocyanine green (ICG) angiography (e.g., indications and phases of the angiogram).
  3. Principles of retinal detachment recognition, various types of retinal detachment, and their evaluation, management, and repair.
  4. Typical features of less common macular diseases (e.g., cone dystrophies, inherited macular dystrophies, fundus flavimaculatus, and toxic maculopathies).
  5. Indications and complications of laser photocoagulation.
  6. Conclusions of major studies in retinal diseases, including the following:
    1. Diabetic Retinopathy Study (DRS).
    2. Diabetic Vitrectomy Study (DVS).
    3. Early Treatment of Diabetic Retinopathy Study (ETDRS).
    4. Macular Photocoagulation Study (MPS).
    5. Diabetes Control and Complications Trial (DCCT).

6. Branch Vein Occlusion Study (BVOS).
7. Central Vein Occlusion Study (CVOS).
8. United Kingdom Prospective Diabetes Study (UKPDS).
9. Age-Related Eye Disease Study (AREDS).
10. Verteporfin in Photodynamic Therapy Study (VIP).
11. Treatment of Age-Related Macular Degeneration with Photodynamic Therapy Study (TAP).
7. Fundamentals, evaluation, and treatment of peripheral retinal diseases and vitreous pathology (e.g., vitreous hemorrhage, retinal breaks).
8. Evaluation and treatment of choroidal detachments and uveal effusion syndrome.
9. Features of retinoschisis (e.g., juvenile, senile).
10. Complications of retinopathy of prematurity.
11. Diagnosis, evaluation, and treatment of more common retinal vascular diseases (e.g., arterial and venous obstructions, diabetic retinopathy, hypertensive retinopathy, peripheral retinal vascular occlusive disease, sickle cell retinopathy, and retinal pigment epithelial detachment).
12. Diagnosis and treatment of macular disorders (e.g., age-related macular degeneration (ARMD), choroidal neovascularization, high myopia, macular dystrophies, epiretinal membranes, macular holes, cystoid macular edema, and central serous choroidopathy).
13. Fundamentals of retinal electrophysiology.
14. Evaluation of hereditary retinal and choroidal diseases (e.g., gyrate atrophy, choroideremia, retinitis pigmentosa, cone dystrophies, Stargardt's disease, Best's disease, and congenital stationary night blindness).
15. Toxic retinopathies.
16. Techniques for retinal detachment repair (e.g., pneumatic retinopexy, scleral buckling, and vitrectomy).
17. Basics of surgical vitrectomy (e.g., indications, mechanics, instruments, technique, and endotamponade with intraocular gases and liquids).
18. Indications and techniques of laser treatment for diabetic retinopathy and maculopathy.
19. Diagnosis and treatment of posterior uveitis and endophthalmitis.
- B. Technical/Surgical Skills
  1. Indirect ophthalmoscopy with scleral indentation.
  2. Slit-lamp fundus biomicroscopy (with +78, +90 lenses, 3-mirror contact lens, etc.).
  3. Interpretation of basic fluorescein angiography in common retinal disorders.
  4. Indications for and interpretation of retinal imaging technology (e.g., ocular coherence tomography, and retinal thickness analysis).
  5. Posterior segment photocoagulation.
  6. Focal and grid macular laser treatment.
  7. Panretinal scatter photocoagulation.
  8. Laser retinopexy (demarcation) for isolated retinal breaks.
  9. Interpretation of basic electrophysiological tests.
  10. Interpretation of basic ocular imaging techniques (e.g., B-scan echography, OCT, nerve fiber layer analysis).
  11. Fundus drawings of the retina, showing complex vitreoretinal relationships and findings.
  12. Cryotherapy of retinal holes and other pathology.
  13. Scleral buckling procedures.

### III. Advanced Level Goals (Experienced Ophthalmologists, Medical and Surgical Retina and Vitreous Specialists)

#### A. Theoretical Knowledge

1. Evaluation and treatment of the most complex retinal detachments (e.g., recurrent retinal detachment and proliferative vitreoretinopathy).
2. Evaluation and treatment of the most complex macular diseases, including intravitreal injections of steroids and anti-VEGF factors (e.g., subfoveal or recurrent neovascular membranes, macular edema).
3. Indications for laser photocoagulation, including photodynamic therapy for the most complex retinal pathology (e.g., subfoveal neovascular membranes).
4. Understanding of the most complex peripheral retinal diseases and vitreous pathology (e.g., Goldmann-Favre syndrome, incontinentia pigmenti, and familial vitreoretinopathy).
5. Evaluation and treatment of complications of retinal photocoagulation.
6. Diagnosis and treatment of complex retinal detachments (e.g., giant tear).
7. Evaluation and treatment of more complex cases of retinopathy of prematurity (e.g., tractional retinal detachment).
8. Evaluation and treatment of complex forms of retinal vascular diseases (e.g., combined arterial and venous obstructions, advanced diabetic and hypertensive retinopathy, peripheral retinal vascular occlusive diseases, and acquired retinal vascular diseases).
9. Evaluation and treatment of the uncommon manifestations or presentations of the following macular diseases:
  - a. Age-related macular degeneration.
  - b. Recurrent subfoveal neovascularization.
  - c. Uncommon macular dystrophies.
  - d. Refractory cystoid macular edema.
  - e. Recurrent central serous choroidopathy.
  - f. Acute posterior multifocal placoid pigment epitheliopathy.
  - g. White dot syndromes.
  - h. Serpiginous choroiditis.
  - i. Acute zonal outer retinopathy.
  - j. Triangular syndrome.
  - k. Polypoidal choroidopathy.
10. Advanced retinal electrophysiology techniques (e.g., multifocal electroretinography).
11. Principles of surgical management of complex diabetic retinopathy.
12. Advanced vitreoretinal surgical techniques:
  - a. Macular hole repair.
  - b. Epiretinal membrane peeling.
  - c. Application of intravitreal triamcinolone and dyes to facilitate total vitrectomy, membrane, and ILM peeling.
  - d. Complex vitrectomy for proliferative vitreoretinopathy.
  - e. Vitrectomy with 23g and 25g instruments.
  - f. Use of heavy liquids.
  - g. Foreign body removal.
  - h. Endophthalmitis treatment.

13. Evaluation and treatments of more complex or uncommon cases of posterior uveitis (e.g., sympathetic ophthalmia) and endophthalmitis (e.g., endogenous).

#### B. Technical/Surgical Skills

1. Interpretation and application of the results of fluorescein and ICG angiography and optical coherence tomography (OCT) in complex retinal or choroidal pathology (e.g., occult subretinal neovascular membrane) in clinical practice.
2. Interpretation and application in clinical practice electrophysiology (e.g., ERG, PERG, mfERG, EOG, VEP, and dark adaptation) in more complicated retinal pathology.
3. Interpretation and application of advanced ocular imaging techniques in clinical practice.
4. Scleral buckling procedures in complex retinal detachment.
5. Intravitreal injections of triamcinolone and anti-VEGF factors (Macugen, Lucentis, and Avastin).
6. Application of advanced pars plana vitrectomy techniques (as in theoretical knowledge section).

#### References for Standard and Advanced Level (in addition to Basic Level)

1. Ryan SJ, Puliafito CA, Davis JL, Parel JM, Milne P. Retina. 4th ed. Philadelphia: Elsevier Mosby, 2006; 3 v. (xxiv, 2654, 2664)
2. Kaufman PL, Alm A, Adler FH. Adler's physiology of the eye: clinical application. 10th ed. St. Louis: Mosby, 2003; xvii: 876
3. Newmark E. Ophthalmic medical assisting: an independent study course. 4th ed. San Francisco: American Academy of Ophthalmology, 2006; xvii: 350
4. Bradford CA. Basic ophthalmology for medical students and primary care residents. 8th ed. San Francisco, CA: American Academy of Ophthalmology, 2004; xv: 175
5. Kanski JJ, Nischal KK, Milewski SA. Ophthalmology: clinical signs and differential diagnosis. London; Philadelphia: Mosby, 1999
6. Holz FG, Spaide RF (eds). Medical retina (Essentials in Ophthalmology series). Berlin; Heidelberg; New York: Springer, 2005

## VIII. Uveitis



### I. Basic Level (Para-ophthalmic Personnel)

#### A. Theoretical Knowledge

1. Basic knowledge of the anatomy, physiology, pathology, immunology, microbiology and pharmacology of the uvea, necessary to understand and achieve basic diagnostic and therapeutic goals.
2. Basic information on classification, etiology, and epidemiology of uveitis.
3. Basic principles of history taking and evaluation of the patient with uveitis.
4. Signs and symptoms of anterior, intermediate, and posterior uveitis.
5. Differential diagnosis of uveitis (including infectious, posttraumatic, associated with a systemic disease, and masquerade syndromes).

6. Describe indications for ancillary testing (e.g., fluorescein angiography, ultrasound, radiological testing, and laboratory investigations).

#### B. Technical/Surgical Skills

1. Perform an examination of anterior segment for acute or chronic uveitis (slit lamp, magnifying lens) – identification of ciliary injection, keratic precipitates, inflammatory cells, flare, fibrin, hypopyon, iris nodules, and anterior or posterior synechiae.
2. Perform tonometry (e.g. Schiotz, Tonopen, and pneumotonometry).

#### References for Basic Level

1. Newmark E. Ophthalmic medical assisting: an independent study course. 4th ed. San Francisco: American Academy of Ophthalmology, 2006; xvii: 350
2. Bradford CA. Basic ophthalmology for medical students and primary care residents. 8th ed. San Francisco, CA: American Academy of Ophthalmology, 2004; xv: 175
3. Kanski JJ, Nischal KK, Milewski SA. Ophthalmology: clinical signs and differential diagnosis. London; Philadelphia: Mosby, 1999

#### Learning Activities

Passive learning: study available references, recommended by a local supervisor.

### II. Standard Level (Residents and Ophthalmologists)

#### A. Theoretical Knowledge

1. Anatomy, embryology, physiology, pathology, microbiology, immunology, genetics and pharmacology of the uvea.
2. Advanced principles of history taking in patients with uveitis (review of systems).
3. Classification, etiology, and epidemiology of uveitis.
4. General principles of diagnosis (clinical approach and ancillary tests).
5. Differential diagnosis and management of various types of uveitis, including:
  - a. Anterior, intermediate, posterior, and panuveitis.
  - b. Infectious uveitis – viral (e.g., herpes simplex virus, varicella-zoster virus, Epstein-Barr virus, cytomegalovirus), bacterial (e.g., syphilis, borreliosis, cat scratch disease, tuberculosis, brucellosis, leprosy, Whipple's disease), fungal (e.g., candidiasis, coccidioidomycosis, cryptococcosis, and histoplasmosis), parasitic (e.g., toxoplasmosis, toxocariasis, onchocerciasis, loiasis, trypanosomiasis, and ophthalmomyiasis).
  - c. Immune-mediated (e.g., HLA-B27 associated uveitis, chronic iridocyclitis in patients with juvenile idiopathic arthritis, lens-associated uveitis, sarcoidosis, Behçet's syndrome, Vogt-Koyanagi-Harada syndrome, white dot syndromes, Wegener's granulomatosis, birdshot retinochoroidopathy, and sympathetic ophthalmia).
  - d. Traumatic uveitis.
  - e. Immunodeficiencies – AIDS, opportunistic infections.
  - f. Masquerade syndromes – nonneoplastic and neoplastic (including large cell lymphoma).

- g. Endophthalmitis – postoperative, posttraumatic, endogenous.
  - 6. Evaluation and treatment of complications of uveitis (e.g., glaucoma, cataract, band keratopathy, cystoid macular edema, retinal detachment, and retinal and choroidal neovascularization).
  - 7. Indications, contraindications and complications of corticosteroid and immunosuppressive therapy in uveitis.
- B. Technical/Surgical Skills**
- 1. Basic and advanced techniques of examining and imaging the uvea.
    - a. Slit-lamp biomicroscopy, tonometry, magnified posterior segment examination, scleral depression, and tyndalometry.
    - b. Fluorescein and indocyanine green angiography, ultrasound, OCT.
    - c. Evaluation of laboratory and radiologic testing.
  - 2. Administer local and systemic corticosteroids, including subconjunctival and sub-Tenon's injections.

### III. Advanced Level (Experienced Ophthalmologists and Uveitis Specialists)

- A. Theoretical Knowledge**
- 1. Complex ocular immunology and microbiology.
  - 2. Diagnosis, evaluation, and treatment of less common, chronic, recurrent, or severe uveitis syndromes.
  - 3. Evaluation and treatment of uveitis associated with immunodeficiencies.
  - 4. Indications, contraindications, and complications of medical and surgical therapy of uveitis.
- B. Technical/Surgical Skills**
- 1. Administer corticosteroids by various routes (including sub-Tenon's, intravitreal and intravenous injections, and implantation of a sustained-release delivery system).
  - 2. Administer and monitor immunosuppressive therapy.
  - 3. Perform diagnostic procedures (anterior chamber aspiration, vitreous and chorioretinal biopsy).
  - 4. Treat complications of uveitis (e.g., cataract extraction, glaucoma surgery, vitrectomy, scleral buckle, and EDTA chelation of calcium depositions in band keratopathy).

### References for Standard and Advanced Level (in addition to Basic Level)

1. Opremac EM. Basic and Clinical Science Course Section 9. 2005 – 2006, Intraocular Inflammation and Uveitis. San Francisco: American Academy of Ophthalmology, 2005
2. BenEzra D. Ocular inflammation: basic and clinical concepts. London Malden, MA: Martin Dunitz; Distributed in the United States by Blackwell Science, 1999; xiv: 512
3. Duane's clinical ophthalmology on CD-ROM. In. Philadelphia: Lippincott Williams & Wilkins: computer optical disc, 2002
4. Forrester JV, International Ocular Inflammation Society. Posterior segment intraocular inflammation: guidelines. Hague; New York: Kugler Publications, 1998; xii: 184
5. Foster CS, Vitale AT. Diagnosis and treatment of uveitis. Philadelphia: W.B. Saunders, 2002; xvi: 900
6. Pepose JS, Holland GN, Wilhelmus KR. Ocular infection and immunity. St. Louis: Mosby-Year Book, 1996; xxx: 1552
7. Yanoff M, Duker JS, MD Consult LLC. Ophthalmology. 2nd ed. St. Louis: Mosby, 2004

## IX. Glaucoma



### I. Basic Level Goals (Para-ophthalmic Personnel)

Mastery of the Basic Level Goals are essential for building a foundation in order to understand the goals of the levels that follow.

#### A. Cognitive Skills

1. Describe the epidemiology and genetics of primary open angle, congenital, and juvenile glaucoma.
2. Perform a detailed patient history with special attention to the risk factors associated with glaucoma (e.g., African heritage) and pertinent past history (e.g., trauma, use of topical steroids, etc.).
3. Describe the gross anatomy of the anterior chamber, posterior chamber, and the ciliary body including the blood supply of the optic nerve and disc.
4. Describe the microscopic anatomy of the trabecular meshwork and ciliary body.
5. Describe the three normal aqueous humor pathways through the trabecular meshwork (including the significance of episcleral venous pressure), the uveal scleral system, and vitreous.
6. Describe the basic principles of tonometry and tonography as they relate to the outflow facility of the trabecular meshwork.
7. Describe the origin of the general population pressure curve, its mean and standard deviations, and its significance for individual patient intraocular pressure (IOP) levels.
8. Describe the pathway of the ganglion cell fibers from the retinal ganglion cell layer to the lateral geniculate body.
9. Describe the microscopic anatomy of the retina with special attention to the ganglion cell layer as it relates to embryonic development and the nerve fiber bundle defect.
10. Describe the biochemical aspects of apoptosis and the possible role of neuro-protection.
11. Describe fundamentals of perimetry, including kinetic and automated static perimetry, including the concept of the Island of Traquair.
12. Describe the principles, indications, and basic methods of gonioscopy, static and dynamic, including the identification and importance of the "optical wedge".
13. Describe the pharmacologic principles of medical management of glaucoma including duration of action and the ocular and systemic side effects.
14. Describe in detail the proper administration of eye drops, including the benefits of gentle eyelid closure and/or punctal occlusion.
15. Describe the problem of poor patient compliance and the various methods to improve same.
16. Describe the features that distinguish primary and secondary angle closure glaucoma, including aqueous misdirection, and to understand the importance of chronic angle glaucoma as the most common type of glaucoma worldwide.
17. Know the main results of the major clinical trials in glaucoma (see Major Glaucoma Clinical Trials).

#### B. Technical Skills

1. Perform tonometry (Goldmann applanation, Schiötz, Tonopen, and airpuff) including recognition and correction of testing artifacts.

2. Perform visual field testing including tangent screen, Goldmann, standard automated perimetry, frequency doubling perimetry, and confrontation fields.
3. Perform corneal pachymetry and relate the findings to interpretation of intraocular pressure.
4. Perform a Seidel test for a leaking filtering bleb.
5. Test for a relative afferent pupil defect.
6. Perform the oblique flashlight (torch) test for detection of iris bombe and a shallow anterior.

### References for Basic Level

1. Wilson FM, Gurland JE. Practical ophthalmology: a manual for beginning residents. 5th ed. San Francisco, Calif.: American Academy of Ophthalmology, 2005
2. Bradford CA. Basic ophthalmology for medical students and primary care residents. 8th ed. San Francisco, CA: American Academy of Ophthalmology, 2004; xv: 175
3. Asia Pacific Glaucoma Guidelines, South East Asia Glaucoma Interest Group (SEAGIG): [http://www.ngc.gov/summary/pdf.aspx?doc\\_id=8502&stat=1&string=](http://www.ngc.gov/summary/pdf.aspx?doc_id=8502&stat=1&string=)
4. Simmons S. Basic and clinical science course section 10. 2005 – 2006, glaucoma. San Francisco: American Academy of Ophthalmology, 2005: 242
5. Comprehensive Adult Medical Eye Evaluation Preferred Practice Pattern, San Francisco, American Academy of Ophthalmology, 2005. [http://www.aao.org/education/library/ppp/upload/Comprehensive\\_Adult\\_Medical\\_Eye\\_Exam.pdf](http://www.aao.org/education/library/ppp/upload/Comprehensive_Adult_Medical_Eye_Exam.pdf)
6. Primary Open-Angle Glaucoma Preferred Practice Pattern, San Francisco, American Academy of Ophthalmology, 2005. [http://www.aao.org/education/library/ppp/upload/Primary\\_Open-Angle\\_Glaucoma.pdf](http://www.aao.org/education/library/ppp/upload/Primary_Open-Angle_Glaucoma.pdf)
7. Primary Open-Angle Glaucoma Suspect Preferred Practice Pattern, San Francisco, American Academy of Ophthalmology, 2005. [http://www.aao.org/education/library/ppp/upload/Primary\\_Open-Angle\\_Glaucoma\\_Suspect.pdf](http://www.aao.org/education/library/ppp/upload/Primary_Open-Angle_Glaucoma_Suspect.pdf)
8. Primary Angle Closure Preferred Practice Pattern, San Francisco, American Academy of Ophthalmology, 2005. [http://www.aao.org/education/library/ppp/upload/Primary\\_Angle\\_Closure-2.pdf](http://www.aao.org/education/library/ppp/upload/Primary_Angle_Closure-2.pdf)

### II. Standard Level Goals (Residents and Ophthalmologists)

Mastery of the Basic Level Goals are essential for building a foundation in order to understand the goals of the standard and advanced levels.

#### A. Cognitive Skills

1. Describe the evaluation and treatment of the glaucomas with more complex etiologies (e.g., angle recession, inflammatory, steroid-induced, pigmentary, pseudoexfoliative, phacolytic, neovascular, postoperative, malignant, lens particle glaucomas, plateau iris, glaucomatocyclitic crisis, iridocorneal endothelial syndromes, aqueous misdirection).
2. Describe the complexities of more advanced tonometric data (e.g., diurnal curve, pneumotonometry, the effect of corneal thickness on IOP).
3. Describe the more advanced optic nerve and nerve fiber layer changes in primary and secondary glaucoma with emphasis on the typical and atypical features associated with glaucomatous cupping (e.g., rim pallor, rapid progression, central acuity loss, intracranial lesions) and include other non-glaucomatous anomalies appearing discs with visual field loss (i.e., drusen, optic neuritis, etc.).

lous appearing discs with visual field loss (i.e., drusen, optic neuritis, etc.).

4. Describe more advanced forms of perimetry (e.g., short wave automated perimetry, frequency doubling technology, and other perimetric strategies such as threshold testing, supra-threshold testing, special algorithms, etc.).
  5. Describe in detail the anatomy of the angle of the anterior chamber as seen with gonioscopy, including normal variations.
  6. Describe in detail the complex gonioscopic findings seen in the less common conditions including plateau iris, appositional vs. synechial closure, reverse pupillary block, etc.
  7. Describe the principles and use of medical management for more advanced glaucoma.
  8. Describe mechanism, recognition, and treatment of angle closure secondary to aqueous misdirection (ciliary block).
  9. Describe the clinical features and treatment of the several etiologies of ocular hypotony following filtering procedures.
  10. Describe the features and treatment options for primary infantile and juvenile glaucomas.
  11. Describe the clinical findings and treatment of the secondary glaucomas.
  12. Describe the various uses of laser surgical treatments to the eye for open and narrow angle glaucoma: include indications, technique, the relationship of spot size and duration, and the properties of lasers used (e.g., argon, diode, YAG). Include success rates and complications for each type.
  13. Describe the incisional surgical treatment of glaucoma (e.g., trabeculectomy, combined cataract and trabeculectomy, setons, and cyclodestructive procedures, including indications, techniques, and complications).
  14. Describe the evidenced-based conclusions of the major clinical trials and their application to clinical practice (see Major Glaucoma Clinical Trials).
- B. Technical/Surgical Skills
1. Perform YAG laser posterior capsulotomy for uncomplicated posterior capsule opacity.
  2. Perform argon, diode, or YAG laser peripheral iridotomy for angle closure glaucoma.
  3. Perform argon/diode laser trabeculoplasty and/or argon/diode iridoplasty.
  4. Perform diode cyclophotocoagulation (ab externo and ab interno).
  5. Perform standard first trabeculectomy with or without antimetabolites and with removable/releasable sutures.
  6. Perform small incision cataract/IOL surgery combined with a trabeculectomy, at the same or at different sites.
  7. Describe and manage a postoperative flat anterior chamber.
  8. Perform revision of the more common types of filtering bleb problems.

### References for Standard Level (in addition to Basic Level)

1. Alward WLM. Glaucoma: the requisites in ophthalmology. St. Louis: Mosby, 2000; xii: 260

2. Becker B, Shaffer RN, Stamper RL, Lieberman MF, Drake MV. Becker-Shaffer's diagnosis and therapy of the glaucomas. 7th ed. St. Louis: Mosby, 1999; xv: 716

### III. Advanced Level Goals (Experienced Ophthalmologists and Glaucoma Specialists)

#### A. Cognitive skills

1. Describe the features of the most complex and most advanced forms of primary and secondary open angle glaucoma.
2. Describe the mechanics of aqueous humor dynamics in the advanced and complex glaucomas (e.g., angle recession, combined or multi-factorial glaucoma, traumatic or inflammatory glaucoma, pigment dispersion glaucoma).
3. Apply in clinical practice, tonometric and tonographic methods (e.g., diurnal curve) in complicated or atypical cases of glaucoma.
4. Apply the most advanced knowledge of optic nerve and nerve fiber layer anatomy. Describe techniques, methods, and tools for analyzing the nerve fiber layer.
5. Recognize and evaluate atypical or multifactorial cupping (e.g., rim pallor).
6. Describe, interpret, and apply the results of the most complex and advanced forms of perimetry, including special kinetic and automated static perimetry strategies (e.g., special algorithms).
7. Describe the principles and indications, and apply to clinical practice, the findings of gonioscopy in the most complex primary and secondary glaucomas.
8. Describe the principles of medical management of the most advanced and complex glaucoma (e.g., advanced primary open angle glaucoma previously treated with medicine, laser or surgery; secondary glaucomas).
9. Recognize, describe, and treat the most advanced cases of primary open angle glaucoma (e.g., monocular patients, repeat surgical cases, normal tension glaucoma, secondary and inflammatory glaucomas, angle recession).
10. Recognize, describe the features of, and treat the most advanced and complex cases of primary angle closure glaucoma (e.g., postoperative cases, secondary angle closure, aqueous misdirection).
11. Recognize, describe the clinical features of, and treat common and uncommon etiologies of ocular hypotony (e.g., choroidal detachment, leaking trabeculectomy bleb).
12. Describe the features of, and treat or refer, the primary infantile and juvenile glaucomas.
13. Describe the principles, indications, and complications of laser treatment of more advanced or complex glaucoma (repeat procedures).
14. Describe the more advanced surgical treatment of glaucoma (e.g., trabeculectomy, combined cataract and trabeculectomy, setons, and cyclodestructive procedures, including indications, techniques, and complications).
15. Critically analyze the major clinical trials in glaucoma (see Major Glaucoma Clinical Trials).

#### B. Technical/Surgical Skills

1. Perform YAG or argon laser procedures in complex and/or high risk glaucoma patients (e.g., monocular patient,

repeat laser, vitreous lysis, suture lysis, acute and chronic angle closure).

2. Perform cyclophotocoagulation for more advanced cases (e.g., prior surgery, monocular).
3. Perform routine and repeat trabeculectomy with or without antimetabolites.
4. Describe, manage, and treat surgically, if necessary, a flat anterior chamber.
5. Perform more advanced techniques for the revision of filtering blebs (e.g., failing bleb, leaking bleb).
6. Perform surgical bypass surgery (valves).
7. Recognize and treat complications of glaucoma surgery blebs.

### References for Advanced Level (in addition to Basic and Standard Levels)

1. Ritch R, Shields MB, Krupin T. The glaucomas. 2nd ed. St. Louis, Mo.: Mosby-Year Book, 1996; 3 v. (xxvi, 1807, 1827, [1810] of plates)

### Major Glaucoma Clinical Trials

**Basic Level Goals:** Describe the evidence-based conclusions of the major glaucoma clinical trials and their application to clinical practice.

**Standard Level Goals:** Obtain a general understanding of the major glaucoma clinical trials and their application to clinical practice.

**Advanced Level Goals:** Obtain a thorough knowledge (i.e., critical analysis of the study's purpose, data collection, and clinical significance) of the major glaucoma clinical trials and their application to clinical practice.

### Fluorouracil Filtering Surgery Study (FFSS)

1. Van Buskirk EM. Five-year follow-up of the Fluorouracil Filtering Surgery Study. *Am J Ophthalmol* 1996; 122: 751–752
2. (No authors listed). Five-year follow-up of the Fluorouracil Filtering Surgery Study. The Fluorouracil Filtering Surgery Study Group. *Am J Ophthalmol* 1996; 121: 349–366
3. (No authors listed). Three-year follow-up of the Fluorouracil Filtering Surgery Study. *Am J Ophthalmol* 1993; 115: 82–92
4. (No authors listed). Risk factors for suprachoroidal hemorrhage after filtering surgery. The Fluorouracil Filtering Surgery Study Group. *Am J Ophthalmol* 1992; 113: 501–507
5. (No authors listed). Fluorouracil Filtering Surgery Study one-year follow-up. The Fluorouracil Filtering Surgery Study Group. *Am J Ophthalmol* 1989; 108: 625–635

### Normal Tension Glaucoma Study

1. Drance S, Anderson DR, Schulzer M. Risk factors for progression of visual field abnormalities in normal-tension glaucoma. *Am J Ophthalmol* 2001; 131: 699–708
2. Drance SM. The Collaborative Normal-Tension Glaucoma Study and some of its lessons. *Can J Ophthalmol* 1999; 34: 1–6

### Additional background reading:

3. Bayer AU, Erb C. Short wavelength automated perimetry, frequency doubling technology perimetry, and pattern electroretinography for prediction of progressive glaucomatous standard visual field defects. *Ophthalmology* 2002; 109: 1009–1017

4. Schulzer M. Errors in the diagnosis of visual field progression in normal-tension glaucoma. *Ophthalmology* 1994; 101: 1589–1594; discussion 1595

#### Ocular Hypertension Treatment Study (OHTS)

1. Kass MA, Heuer DK, Higginbotham EJ et al. The Ocular Hypertension Treatment Study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. *Arch Ophthalmol* 2002; 120: 701–713; discussion 829–830
2. Gordon MO, Beiser JA, Brandt JD et al. The Ocular Hypertension Treatment Study: baseline factors that predict the onset of primary open-angle glaucoma. *Arch Ophthalmol* 2002; 120: 714–720; discussion 829–830
3. Palmberg P. Answers from the ocular hypertension treatment study. *Arch Ophthalmol* 2002; 120: 829–830
4. Keltner JL, Johnson CA, Quigg JM, Cello KE et al. Confirmation of visual field abnormalities in the ocular hypertension treatment study. Ocular Hypertension Treatment Study Group. *Arch Ophthalmol* 2000; 118: 1187–1194
5. Kass MA. The ocular hypertension treatment study. *J Glaucoma* 1994; 3: 97–100

#### Glaucoma Laser Trial (GLT) and Glaucoma Laser Trial Follow-up Study (GLTFS)

1. (No authors listed). The Glaucoma Laser Trial (GLT) and glaucoma laser trial follow-up study: 7. Results. Glaucoma Laser Trial Research Group. *Am J Ophthalmol* 1995; 120: 718–731
2. (No authors listed). The Glaucoma Laser Trial (GLT): 6. Treatment group differences in visual field changes. Glaucoma Laser Trial Research Group. *Am J Ophthalmol* 1995; 120: 10–22
3. (No authors listed). The Glaucoma Laser Trial (GLT): 5. Subgroup differences at enrollment. Glaucoma Laser Trial Research Group. *Ophthalmic Surg* 1993; 24: 232–240
4. (No authors listed). The Glaucoma Laser Trial: 4. Contralateral effects of timolol on the intraocular pressure of eyes treated with ALT. GLT Research Group. *Ophthalmic Surg* 1991; 22: 324–329
5. (No authors listed). The Glaucoma Laser Trial (GLT): 3. Design and methods. Glaucoma Laser Trial Research Group. *Control Clin Trials* 1991; 12: 504–524
6. (No authors listed). The Glaucoma Laser Trial (GLT). 2. Results of argon laser trabeculoplasty versus topical medicines. The Glaucoma Laser Trial Research Group. *Ophthalmology* 1990; 97: 1403–1413
7. (No authors listed). The Glaucoma Laser Trial. I. Acute effects of argon laser trabeculoplasty on intraocular pressure. Glaucoma Laser Trial Research Group. *Arch Ophthalmol* 1989; 107: 1135–1142
8. Richardson LE. Argon laser trabeculoplasty: a review. *J Am Optom Assoc* 1992; 63: 252–256
9. Lichter PR. Practice implications of the Glaucoma Laser Trial. *Ophthalmology* 1990; 97: 1401–1402

#### X. Useful Websites

1. The “Atlas of Ophthalmology” (<http://www.atlasophthalmology.com>) is an online multimedia database edited by Georg Michelson, MD, from the University Augenklinik in Erlangen, Germany and Robert Machemer, MD, from Duke University in Durham, North Carolina, USA. It is endorsed by the ICO.
2. EyeAtlas – Online Atlas of Ophthalmology: <http://www.eyeatlas.com>
3. Images of eye diseases: <http://www.redatlas.org>
4. International Council of Ophthalmology: <http://www.icoph.org> (has links for Basic and Clinical Assessments, i.e., testing and examinations; email address: [assess@icoph.org](mailto:assess@icoph.org))
5. New York Eye & Ear Infirmary: Digital Atlas of Ophthalmology [http://www.nyee.edu/page\\_deliv.html?page\\_no=50](http://www.nyee.edu/page_deliv.html?page_no=50)
6. International Agency for the Prevention of Blindness (IAPB): <http://www.iapb.org>
7. Vision 2020: Right to Sight: [http://www.v2020.org/detection\\_mac.htm](http://www.v2020.org/detection_mac.htm)

#### Selected Ophthalmology Journal Websites

Didactic review articles are an excellent source of information and perspective. Regular literature searches to stay aware of new reviews and original clinical studies are highly encouraged. Some examples of useful websites are listed below, but the list is by no means comprehensive.

1. Acta Ophthalmologica Scandinavica: <http://www.blackwellpublishing.com/journals/aos>
2. American Journal of Ophthalmology: <http://www.ajo.com>
3. Archives of Ophthalmology: <http://www.archophthalmol.com>
4. British Journal of Ophthalmology: [www.bjophthalmol.com](http://www.bjophthalmol.com)
5. Canadian Journal of Ophthalmology: <http://www.eyesite.ca>
6. Clinical and Experimental Ophthalmology: <http://www.blackwellpublishing.com/journals/aos>
7. Community Eye Health Journal: [http://www.jceh.co.uk/journal/31\\_11.asp](http://www.jceh.co.uk/journal/31_11.asp)
8. Cornea: <http://www.corneajrnl.com>
9. Current Opinion in Ophthalmology: <http://www.cooptophthalmology.com>
10. Digital Journal of Ophthalmology: <http://www.djo.harvard.edu>
11. European Journal of Ophthalmology: <http://www.eur-jophthalmol.com/ejo/>
12. Eye: <http://www.nature.com/eye/>
13. Glaucoma: <http://www.glaucomajournal.com>
14. Graefe's Archive for Clinical and Experimental Ophthalmology: <http://www.springerlink.com>
15. International Ophthalmology Clinics: <http://www.internationalophthalmology.com>
16. Investigative Ophthalmology and Visual Science: <http://www.iovs.org>
17. Lippincott Williams and Wilkins: <http://www.lwwonline.com>
18. Ophthalmologica: <http://www.karger.com>
19. Ophthalmology: <http://www.aao.org>
20. Several sub-specialty journals are available through: <http://www.ophsource.org>
21. Transactions of the American Ophthalmological Society: <http://www.aosonline.org>