



Ophthalmic Photographers' Society  
BOARD OF CERTIFICATION

**CRA™**

# Certified Retinal Angiographer Program Guide

Accredited by NCCA  
(National Commission for Certifying Agencies)  
*The Accreditation Body of the Institute for Credentialing Excellence*



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If the date on this Program Guide is more than three months old, please check the OPS website to make sure you have the most current version.

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**NOTES:**



## Ophthalmic Photographers' Society BOARD OF CERTIFICATION

### **Introduction**

Welcome and thank you for your interest in the Certified Retinal Angiographer (CRA) Program. This Program Guide details the process and procedures involved in becoming a CRA. It contains the program application, details the eligibility and portfolio requirements and includes the multiple-choice examination content outline. The Ophthalmic Photographers' Society Board of Certification (OPS BOC) administers the CRA Program.

The Ophthalmic Photographers' Society is a non-profit organization dedicated to a highly specialized form of medical photography. The main objectives of the Society are to provide primary and continuing education in the field of ophthalmic imaging, to set and maintain standards for the profession through certification programs, and to promote scientific advancement in the technology.

The Society serves as a professional organization for its members, sponsoring educational meetings and promoting the exchange of information and the field of ophthalmic imaging nationwide.

The OPS holds its Annual Educational Meeting in conjunction with the annual meeting of the American Academy of Ophthalmology. The OPS meeting program includes presentations of papers on advances in scientific photography and instrumentation, as well as an extensive educational program.

OPS' membership includes ophthalmologists, optometrists, veterinarians, pathologists, medical and ophthalmic photographers, nurses, ophthalmic assistants, technicians, technologists, researchers, and engineers. Active members promote the objectives of the Society. Sustaining members are organizations and individuals actively involved with ophthalmology or ophthalmic photography for commercial or charitable purposes. Anyone involved in ophthalmic photography is encouraged to apply to the OPS Membership Office ([ops@opsweb.org](mailto:ops@opsweb.org)).

The Society created the Board of Certification (BOC) in 1979. The OPS BOC serves as the formal body responsible for the certification of retinal angiographers and ophthalmic photographers. The National Commission for Certifying Agencies (NCCA) accredited the OPS BOC certification program in 1999, and reaccredited most recently in 2015. CRA Certification requires submission of work examples that meet established standards and successful completion of multiple-choice examination. To date, more than 800 ophthalmic photographers have attained the CRA credential. Membership in the OPS, while encouraged, is not a requirement for certification.

## Communications

Please direct all communications to:

<b>Mailing Address:</b>	<b>Ophthalmic Photographers' Society</b> 1887 W Ranch Rd Nixa, MO 65714
<b>Office Phone:</b>	<b>(417) 725-0181 (800) 403-1677</b>
<b>Office Fax:</b>	<b>(417) 724-8450</b>
<b>Web Address:</b>	<a href="http://www.opsweb.org">www.opsweb.org</a>
<b>Email Address:</b>	<a href="mailto:cra@opsweb.org">cra@opsweb.org</a>

## Certification Policies

The OPS BOC is responsible for certification of retinal angiographers and ophthalmic photographers. Certification designates an individual who has met the OPS BOC's standards of competence. The OPS BOC is responsible for the administration of the CRA examination. The OPS BOC contracts with ISO Quality Testing to administer the CRA examination.

### **CRA™**

Certified Retinal Angiographer (CRA) designates an individual who has met the OPS BOC standards of competence in fundus photography and retinal angiography. The OPS BOC standards are meant to assure delivery of competent, professional fundus photography and retinal angiography services.

CRA's demonstrate competence by understanding and being able to:

- Identify the ocular anatomy.
- Recognize common ocular pathology.
- Perform single frame fundus photography.
- Perform sequential stereo fundus photography.
- Perform rapid sequence fluorescein angiography.

The CRA examination is offered at IQT testing centers.

The OPS BOC is the only agency authorized to designate an individual as a Certified Retinal Angiographer. The OPS BOC developed its program to facilitate voluntary certification of ophthalmic photographers. Its sole purpose is recognition of attainment of a standard level of knowledge and skill in fundus photography and retinal angiography. Certification does not guarantee recognition by any other individual, group, agency or institution. The liability of the OPS BOC or its representatives is limited strictly to this recognition by the OPS BOC.

### **Provisional Certified Retinal Angiographer (Provisional CRA)**

The designation Provisional Certified Retinal Angiographer (Provisional CRA), describes an individual who has met the criteria of the CRA except the work experience eligibility requirement. The OPS BOC established the Provisional CRA Program for those who wish to become CRA-certified, but do not yet meet the work experience requirements for the CRA Program. Individuals using formal education or professional certification as a substitute for up to one year of the work experience requirement are eligible to participate in the Provisional CRA Program. The work experience waiver procedures are described in the eligibility requirements section on page 10.

The Board offers the Provisional CRA to support those who choose ophthalmic photography as their vocation. The Provisional CRA serves a population who greatly benefits from the OPS's services, educational support and programming as they work towards meeting the requirements for full certification.

To become a Provisional CRA, an applicant must submit a portfolio that satisfies the board's eligibility requirements and pass the CRA multiple-choice examination. Once the CRA Section Chair receives and approves documentation of the required work experience, the CRA Section Chair will upgrade the candidate's Provisional CRA status to CRA. An applicant awarded Provisional CRA status may use the designation Provisional CRA. The Provisional CRA must not use the designation CRA.

### **Statement of Nondiscrimination**

The OPS BOC shall admit applicants of any age, sex or sexual orientation, race, religion, color, national origin, disability or marital status to all rights, privileges, programs, and examinations generally made available through its association. It shall not discriminate on the basis of age, sex or sexual orientation, race, religion, color, national origin, disability or marital status in the administration of its certification policies.

### **Application Process**

The CRA candidate must complete the following in order to qualify to sit for the CRA.

- Submit a completed CRA Program Application.
- Submit a CRA Portfolio per the guidelines listed below.
- Upon acceptance of the Portfolio, the candidate is provided an Examination Application.
- Upon receipt of Exam Application, employment verification and exam fee, the candidate will receive information on how to schedule the CRA examination.

CRA applicants complete a Program Application on the OPS Website at [http://www.opsweb.org/?page=portfolio\\_submission](http://www.opsweb.org/?page=portfolio_submission) or request an application from the OPS Membership Office (1-800-403-1677 or OPS@opsweb.org). The completed application and portfolio should be submitted to the CRA section Chair. To ensure evaluators have adequate time to review your portfolio, the program application and portfolio should be submitted a minimum of eight weeks in advance of a desired examination date.

Submission of the Program Application establishes a relationship between the OPS BOC and the individual applicant. All correspondence, scores and certificates are mailed directly to the applicant's home address. Each applicant is responsible for notifying the BOC directly of any change of name, email address or home address. This will enable all confidential correspondence concerning certification and recertification to reach the applicant. By applying for the CRA examination the applicant agrees to the terms set forth in this program guide regarding certification requirements and examination. Applicants attest that all information they submit is true and complete to the best of their knowledge. Any misrepresentation or misconduct in the application or examination process may result in disqualification or revocation of certification. (See Disciplinary Policy on page 29)

Applicants with accepted portfolios are eligible to examine and will receive an Examination Application and a schedule of the upcoming examinations from the CRA section Chair. The application must be completed and returned along with the examination fee (Paid by credit card online through the OPS store or by check made payable to OPS BOC), copy of current CPR certificate and a letter of employment verification and/or evidence of formal education or professional certification. Examination applications must be received at least four weeks before any test date. Eligibility requirements for the CRA and requirements for Provisional CRA are explained in greater detail on page 10. The BOC reserves the right to limit the number of applicants accepted for a scheduled examination or to cancel a scheduled examination.

## Special Testing Arrangements

The OPS BOC grants reasonable accommodations for candidates with documented disabilities, in compliance with the Americans with Disabilities Act. If special assistance or arrangements are required, the following protocol must be followed:

The candidate must request accommodations in writing and submit the request with the CRA application. This request must include a complete description of the requested accommodation.

Documentation of the disability, as diagnosed by a qualified health care professional, must accompany the request.

Applicants whose religious practices prevent them from taking the examination on Saturdays or Sundays should contact the CRA Section Chair to apply for special accommodations at least six weeks prior to a scheduled test date.

The OPS BOC may contact candidates requesting accommodations to discuss the disability and/or requested accommodation. In conference with a psychometrician, with consideration of examination security and examination administration guidelines, a reasonable accommodation will be made. Candidates will be notified of the accommodations to be offered and any charges that occur will be passed through to the candidate without markup.

## Program Fees

The CRA examination fee for current OPS members is \$465 and \$555 for non-OPS members (non-OPS member fee includes optional one-year OPS membership). There is no time limit for completion of the examination once an individual has submitted payment.

The examination fee includes a \$50 non-refundable application fee and covers one administration each of the CRA multiple-choice examination. The non-refundable fee for retesting for either or both components is \$285.

### Examination Fees:

OPS Member	\$465.00
Non - Member	\$555.00 (includes optional 1 year OPS Membership)

### Retesting Fees:

\$285.00

**Note: All fees must be remitted in US dollars.** Payment by credit card can be made on the OPS Online Store (<https://opsweb.site-ym.com/store/default.aspx>) or with the **OPS Membership Office (1-800-403-1677)**.

**\*\*\*All bank fees related to insufficient funds will be invoiced to the applicant.**

**\*\*\*All fees related to failure to appear without sufficient notice (2 weeks or notice of illness or family emergency) is invoiced to the applicant. The current fee for failure to appear is \$160.**

## Refunds

Examination fees (minus a \$50 application fee) are fully refundable, with certain exceptions. For example, the BOC will subtract fees it incurs on behalf of the candidate who fails to appear at an examination site. The BOC will not refund any portion of the fee if a candidate fails the examination or begins and chooses not to complete the exam. There are no refunds for retests.

Refund requests must be submitted to the CRA Section Chair. Refunds are made payable and mailed to the party that originated the payment of the examination fee.

## **Report of Examination Results**

Applicants will be notified by mail of their results within eight weeks of the test date. The CRA examination is designed to be a minimum competency examination, and is not intended to distinguish scores achieved above the passing point. Therefore, no numeric scores will be reported for applicants who pass the examination. The OPS BOC established this policy as a safeguard against misuse of examination scores.

- Candidates passing the examination receive notice of successful performance. The CRA examination is a minimum competency examination and is not intended to distinguish scores above the passing point. Numeric scores are not reported above the passing point.
- Candidates who do not pass the examination receive a numeric scaled score and a report indicating content areas of weakness. The report is designed to provide a tool for study and preparation for retaking the examination. The raw passing score is translated onto a scaled reporting score. Passing the examination requires a scaled score of 70.
- At the testing site for the multiple-choice component, candidates receive a preliminary printed score report upon completion of the examination; at certain times within the test development process, scores may be withheld pending test/question statistical review. In either case official scores are sent via USPS from the OPS BOC representatives from OPS headquarters.
- Examination report will be provided only to the candidate, and will NOT be provided over the phone, email, or fax.

The OPS BOC will not release any results early; all examination results are mailed at the same time. No examination results will be reported by telephone. Results of the examination are confidential and are released only to the applicant. The OPS BOC reserves the right to release to the general public a certificant's name and status.

## **Receipt Of Certification**

Once the Board of Certification notifies applicants that they have completed all requirements for certification, they may use the title Certified Retinal Angiographer or CRA as long as the certificant maintains his or her certification (see recertification guidelines on page 22). This designation may be used as part of a signature, and on letterheads and business cards etc. The OPS BOC mails certificates to successful applicants with their notification.

## **Re-Testing**

Applicants should review their detailed examination results to determine those subject areas in which further study may be needed. Failing candidates are allowed to reapply to retake the examination upon payment of a \$285 re-examination fee. The first retake may take place as soon as the re-examination fee is received and processed. Candidates may retest four times. An additional \$285 re-examination fee must be paid for any subsequent retest. Candidates are afforded 12 months in which to take and pass the examination. After the fourth failure there is a six-month waiting period, after which candidates may schedule another retest.

## **Appeals And Grievances**

Should certification be denied, applicants have 30 days to appeal the decision in writing to the CRA Section Chair. Should the CRA Section Chair deny this appeal, the applicant has another 30 days to appeal to the BOC. Any charge or complaint will be investigated, reviewed and reported to all parties concerned. The Chair of the OPS BOC may appoint a special committee to conduct an impartial review. The members of the committee shall be outside the sphere of OPS BOC influence. The committee will make recommendations to the OPS BOC. The OPS BOC, which will deliberate and vote as a whole, shall render the final decision regarding the recommendation of the committee. The OPS BOC's decision is final and binding.

## **Revocation**

Fraud or misrepresentation on the application, portfolio, or in the examination can result in denial or revocation of Certification. The OPS BOC reserves the right to void examination results, bar participation in the certification program, revoke certification or other sanctions in accordance with the Disciplinary Policy (Page 24). The OPS BOC will consider such actions if members have reason to question the validity of an applicant's examination results, suspects misconduct at a test center, or suspects an applicant has reported fraudulent information. Denial or revocation of certification may be appealed in writing to the Chair of the OPS BOC.

## **Recertification**

The OPS BOC requires each Certified Retinal Angiographer (CRA) to re-certify at three-year intervals by accumulating Continuing Education Credits in the field of Ophthalmic Photography and related curriculum. The purpose of CRA recertification is to enhance continued competence of certificants through continuing education. Approved courses encourage exposure to new approaches and technology in addition to the renewal of basic skills. The BOC deems a three-year interval appropriate given the pace of changing advances in Ophthalmology and Ophthalmic Photography, the time commitment required to achieve the required CECs, and the availability of programming. CRA recertification is required at three-year intervals following initial certification. The requirements for recertification are listed on page 22.

## **Statement Of Proprietary Interest**

The Board of Certification has no commercial or proprietary interest in any products used or mentioned in the certification program. The use of brand names in this program guide or on any examination is only for illustration and does not imply OPS BOC endorsement.

## **Records And Data Retention Policy**

All applications, correspondence, supporting documentation and materials generated in the testing process are for one year following attainment of the CRA credential. Computer records of applicant demographics and test scores are kept indefinitely.

## **Privacy/Confidentiality Policy**

The OPS BOC abides by its strict privacy/confidentiality policy demonstrating its firm commitment to CRA candidates and certificant privacy available at: [http://c.ymcdn.com/sites/www.opsweb.org/resource/resmgr/BOC\\_PDFs/Current\\_BOC\\_Privacy\\_Policy.pdf](http://c.ymcdn.com/sites/www.opsweb.org/resource/resmgr/BOC_PDFs/Current_BOC_Privacy_Policy.pdf) The policy applies to all aspects of the CRA credential including the secure handling and storage of application materials, examinations, scores, and candidate and certificant records. OPS BOC staff and volunteers are

required to complete a non-disclosure document agreeing to protect the privacy of CRA certificants and candidates. It is the policy of the OPS BOC that non-disclosure protected information may NOT be released to or shared with:

- Any member of the public without an applicable statutory exception or written release from the CRA candidate/ certificant.
- Any member of the OPS BOC unless the recipient has a legitimate interest for the use of that protected information to perform a service or carry out a responsibility within that person's scope of employment or engagement as an OPS BOC agent.

The OPS BOC procedure is that protected information may only be released or shared in accordance with this policy. OPS staff and OPS BOC agents with access to protected information are expected to safeguard that information from unauthorized disclosure. This includes, as appropriate:

- Computer Systems and Applications Security: Central processing units, peripherals, portable storage devices, operating system, applications software and data;
- Physical Security: The premises occupied by OPS and/or the OPS personnel, agents or contractors using computer
- Operational Security: Environmental control, power equipment, operational activities related to operations;
- Procedural Security: Established and documented security processes for information technology staff, vendors, management and individual users of protected information;
- Network Security: Communications equipment, transmission paths, switches, terminals and adjacent areas.

The OPS and the OPS BOC reserve the right to change this policy at any time by notifying users of the adoption of a new privacy statement.

### **Statement On Administration Of Intravenous Injections**

The administration of intravenous injections is not a requirement for certification. Therefore, the Board of Certification has no legal authority to test or certify the competency of applicants in the administration of intravenous injections.

The Board of Certification recommends that applicants check with the appropriate agency or agencies within the state that they practice to determine that state's requirements. States regulate the credentials required to administer intravenous injections. The laws and required credentials of each state vary.

# Requirements for Certification

## Examination Eligibility Requirements

Eligibility for the multiple-choice is contingent upon fulfilling these requirements:

1. Submission and acceptance of a satisfactory portfolio (See Portfolio Requirements page 28).
2. A letter from the employing physician(s) or institution(s) verifying the applicant's employment history as a Retinal Angiographer for a minimum of two years.

This two-year work experience requirement is meant to allow time for an applicant to acquire, through hands-on experience, the knowledge and skills necessary to perform fundus photography and fluorescein angiography. It should include enough patient interaction to allow an applicant to develop the clinical judgment and patient management skills necessary for competent performance as a retinal angiographer. A competent retinal angiographer must be able to elicit cooperation from a non-cooperative or challenging patient for acceptable performance of rapid sequence fluorescein angiography. A competent retinal angiographer should be able to recognize and react to medical and photographic complications during fluorescein angiography. Internships or practicum are considered part of a formal education program. These clinical experiences do not qualify as work experience.

Formal education or professional certification in photography, ophthalmic photography or ophthalmology, may be used as a substitute for up to one year of the work experience requirement. An official transcript mailed directly from the academic institution to the CRA Section Chair or a photocopy of a current JCAHPO certificate must be submitted for documentation and verification. Work experience substitution waivers will be granted in the following increments:

Associate Degree in Photography or Certified Ophthalmic Assistant (COA) = 3 months work experience

Bachelor's Degree in Photography, Certified Ophthalmic Technician (COT), Optical Coherence Tomographer-Certified (OCT-C) = 6 months work experience

Bachelor's Degree in Medical/Scientific Photography/Imaging or Certified Ophthalmic Medical Technologist (COMT) = 9 months work experience

Bachelor's Degree in Medical/Scientific Photography/Imaging (With advanced electives in Ophthalmic Photography) or Bachelor's Degree in Ophthalmic Photography = 12 months work experience

Individuals using formal education or professional certification as a substitute for up to one year of the work experience requirement are eligible to participate in the Provisional CRA Program. In order to take the multiple-choice examination, a candidate must fulfill the eligibility requirements with the exception of the work experience requirement and must have a work experience waiver approved by the CRA Section Chair.

3. Submission of a copy of a current certificate in cardiopulmonary resuscitation (CPR) that included both multiple-choice and hands-on examinations. (American Red Cross or American Heart Association preferred).

## Verification of Eligibility Information

The Board of Certification reserves the right to verify the experience and/or education attested to by the applicant by calling the employer(s) listed on the application form or requesting written documentation of the submitted information either prior to or after the examination.

Applicants will be declared ineligible for examinations if any of their eligibility requirements are found to be unsatisfactory.

## **Portfolio Requirements Outline**

The portfolio must be produced entirely by the applicant. **See Appendix A, page 31 for detailed portfolio requirements and standards.** The program application form must be completed and submitted before the portfolio submission. All portfolios must be submitted digitally using the Portfolio Submission online portal (<http://www.opsweb.org/?page=portfoliosubmission>). By submitting the portfolio and form, the applicant attests to the authenticity of the work submitted. Submission of work completed by anyone other than the applicant constitutes fraud. Fraud or misrepresentation of the portfolio may result in disqualification of the applicant.

### **Successful Completion**

The following requirements are necessary to achieve the designation of Certified Retinal Angiographer by the OPS BOC:

- Satisfactory completion of all eligibility requirements
- A passing score on the multiple-choice examination.

# **The CRA Examination**

## **Examination Philosophy**

The designation of CRA is meant to assure stakeholders (patients, employers, regulators, the public) that the certificant has demonstrated an established level of competency in performing fundus photography and retinal angiography. Certification requires a thorough knowledge of the subject matter. The examination is designed to recognize applicants who display a level of knowledge and ability that demonstrates competence as a certified retinal angiographer.

The content validity (relevance), fairness, and accuracy of the CRA examination are assured. The OPS BOC, working with experts in the field of certification programming, mandates that the examination development, administration, scoring and reporting adhere to international professional standards and guidelines establishing assessment and certification best practices. The most important of these standards are promulgated by such key organizations as the National Commission for Certifying Agencies (NCCA), ISO/American National Standards Institute (ANSI) 17024 Standards, the American Psychological Association (APA), and the Council on Licensure, Enforcement and Regulation (CLEAR). This body of standards provides a means for ensuring that the assessment and credentialing process is a fair measure of competence and is legally defensible.

The examination content outline is based upon the 2014 Job Analysis Study (also called a Role Delineation) that will be revalidated periodically. The most recent study findings were implemented in the summer of 2014, and utilized a full-scale survey methodology inviting all known CRA professionals to participate. This research was performed under the direction of a panel of Subject Matter Experts (SMEs) representing the full complement of diversity in the field, providing a documented link between the content of the examination and practice on the job as a CRA.

The passing standard (cut score) for the CRA examination was determined using methodologies involving a representative panel of CRA SMEs and empirical judgments (Angoff, Design V). New forms and versions of the examination are systematically implemented to protect the integrity and security of the examination program and to conform to testing industry standards. Each new examination form contains a significant percentage of new questions that are unique to the new form. Psychometric procedures are used to score the examinations in compliance with relevant technical guidelines. The CRA examination reports scores using a scaled score model, where raw scores are placed on a 0-100 scale with 70 reported as the passing score on all examinations. Score scaling is a common psychometric practice, used on many examinations including the SAT, ACT and OPS OCT-C examinations.

Ongoing question writing, question review, and examination and question analyses are conducted to ensure that the validity, reliability and other psychometric characteristics of the examinations conform to standards. New questions written by CRA SMEs are reviewed multiple times, verified to an approved reference, and linked to the examination content outline. All questions undergo statistical review to ensure that they operate properly. Professional test development and psychometric staff, contracted by the OPS BOC, oversee all of these activities. The Board is highly confident that the validity of the exam content, the reliability of the test instruments and the measurement processes employed to analyze, score and establish reporting scores are of the highest caliber.

## **Examination Design, Scoring and Reporting**

The OPS BOC works with its testing consultant and contractors in the development, administration, scoring and reporting of the CRA examination, and facilitates research studies with a committee of CRAs to establish passing scores for each examination. Using Modified Angoff V standard-setting procedures, the CRAs are asked to review every question on the examination and provide empirical judgments of the likelihood of competent CRAs answering the question correctly. Through this process, a raw score representing competency is established. The raw passing score is translated onto a scaled reporting score. Passing the examination requires a scaled score of 70.

## Examination Procedures

The CRA examination is available at OPS-approved Test Centers through ISO Quality Testing to be taken at a location and time of the candidate's choosing. Details and access to a sample online test to familiarize yourself with the process are made available when applying for the multiple-choice exam. Information about ISO Quality Testing locations are available online at:

<https://opsweb.site-ym.com/?page=takeatest>

## Preparing For the Examination

The CRA examination tests the applicant's knowledge of general digital photography, fundus photography and fluorescein angiography. The Examination Content Outline and Weightings (**page 16**) identify the areas in which to concentrate for the examination. The OPS BOC provides a suggested reference list as a resource that may be useful to supplement the training and experience related to competent performance as a CRA.

A list of suggested references can be found in Appendix B. The OPS BOC does not endorse any particular text or author. This list is not intended to be inclusive, but reflects references used to support the test development process. Use of the references during study for the CRA exam does not guarantee successful performance on the examination.

## Additional Opportunities for Study

The OPS offers retinal angiography and related courses, workshops and publications independent of the OPS BOC. The OPS BOC provides no training nor educational materials, and it is important to note that CRA candidates are not required to purchase training or education materials from the OPS in order to pass the examination. Attendance at OPS courses and workshops is not a prerequisite to sitting for the CRA examination; the courses are not designed to serve as examination preparation classes, nor do they serve any ancillary examination-related purposes. The course curriculums are designed specifically to review broad concepts and offer high-level overviews of OPS-relevant topics and sub-topics. More information about educational opportunities may be found at the OPS Web Site at [www.opsweb.org](http://www.opsweb.org).

## CRA Advisor Program

The BOC developed the CRA advisor program to provide guidance to prospective CRA applicants. Advisors are CRAs. Each CRA advisor is provided the latest **CRA Program Guide** for reference and must work within parameters established by the BOC. The advisor can offer the applicant advice and direction. Interested applicants are encouraged to contact a member of the CRA Advisor Program Committee.

<https://opsweb.site-ym.com/?page=examprehelp>

E-mail: [advisor@opsweb.org](mailto:advisor@opsweb.org)

## OPS LENDING LIBRARY

The OPS Board of Education developed the lending library to provide access to standard texts in Ophthalmology and Ophthalmic Imaging that may be of assistance in preparation for the CRA examination. The Advisor Committee member can assist you in selecting books that address exam content areas you feel you would like to study further. Books are lent from the OPS **Membership Office (1-800-403-1677)**

[ops@opsweb.org](mailto:ops@opsweb.org)

## Examination Administration Rules and Regulations

The Examination Administrator or proctor is the OPS BOC's designated agent for maintaining secure and valid examination administration. Any individual found by the Board or its agent to have engaged in conduct that compromises or attempts to compromise the integrity of the examination process will be subject to disciplinary action as sanctioned by the OPS BOC, The Code of Ethics and the OPS BOC policies and procedures.

Examinations are administered according to a strict protocol to ensure the examination security and to protect the right of each candidate to a standardized testing experience. In addition to the attestation on the CRA Application, as a prerequisite to distribution of examination materials, candidates are required to sign a Security Affidavit agreeing to abide by all rules and regulations, including the following:

- During the registration procedures at the test site, candidates must sign the test roster and provide one form of valid government-issued photo identification, such as a driver's license or passport.
- No books, papers, texts, references, or personal calculators are allowed into the examination room. Scratch paper and a pencil will be provided, and then collected by the test proctor after testing. No electronic devices of any kind are permitted in the testing room (e.g. cell phones, smart phones). If any are found, the candidate will be disqualified.
- If at all possible, personal belongings should not be brought to the testing site. If they are, they will be placed in a secure location and will be unavailable to the candidate during the examination.
- No food or drink is allowed in the examination site. Candidates with a specific medical condition (e.g., hypoglycemia, pregnancy, diabetes) requiring the consumption of water or food during the examination period must submit a written request to the OPS BOC for a special accommodation prior to the examination.
- Visitors are not permitted in the examination room.
- At no time during the examination may candidates give or receive help to one another, or communicate in any way. Examination proctors have the authority to remove a candidate suspected of cheating from the examination room, at which time scores will be cancelled and disciplinary action will be taken.
- Candidates are expected to follow all instructions from examination proctors, printed in test booklets, and answer sheets, and/or displayed in the computer-testing program. Candidates will be provided with the opportunity to ask questions prior to beginning the examination.

The computer-delivered examinations include a detailed five-minute tutorial program designed to give candidates confidence in the use of the program, as well as familiarity with the system prior to beginning the examination. The tutorial questions are for demonstration purposes only and do not impact examination scores. Candidates are encouraged to take the time to complete the tutorial as it explains features of the computerized testing system. The candidate name and the name of the examination will be shown at the upper left corner of the screen. If either of these is incorrect, candidates are asked to inform the proctor. A navigation grid is posted on the upper right of the screen, depicting the number of questions on the examination, and the status of those questions (answered, bookmarked for review, or skipped). A digital clock is also posted indicating a countdown of available time. Registered candidates may take a sample test (content is not CRA exam related) before going to the test site by accessing the testing contractor's website using the following URL link:

[www.iqttesting.com/Default.aspx?Function=SampleExam&Exam=8](http://www.iqttesting.com/Default.aspx?Function=SampleExam&Exam=8)

Candidates may leave the testing room only after receipt of express permission from the proctor. Candidates must sign out and sign in from the room and must surrender all testing materials when they exit. Exit from the testing room is permitted for washroom and drinking fountain visits only. Candidates may not access cell phones or leave the building during breaks. Test timing is not paused for these breaks.

Disqualifying behaviors include but not limited to:

- Creating a disturbance
- Aiding or asking for aid from another candidate
- Any attempt to remove copy, buy, sell, or reproduce testing materials
- Unauthorized possession of test materials
- Impersonation of another candidate
- Use of contraband materials or equipment in the testing site
- Any falsification or misrepresentation of information provided during the CRA application process

## **Candidate Comments**

During the multiple-choice examination candidates have the opportunity to post comments simply by clicking on the icon entitled Comment on this Question. Once the multiple-choice examination is completed, candidates may provide feedback and comments on the examination exit survey. Examination proctors may not discuss or comment on the examination contents. All comments and questions are reviewed and considered by the OPS BOC; however, security procedures preclude discussion with candidates concerning individual test questions or comments. Candidates should not expect a response to a comment unless it relates to a problem with the examination administration. Candidate comments or lack thereof may be taken into consideration as evidence during the appeals process (details of examination appeal procedures follow).

## **Multiple-Choice Examination**

The CRA multiple-choice examination consists of a total of 175 four-option, multiple-choice questions, administered using computer-based examinations. Candidates are allotted two hours in which to complete the exam. Each multiple-choice question has four answer choices; only one answer choice is correct. It is a closed-book examination. Candidates will be provided with scratch paper and a pencil; both will be collected after the test administration. Candidates are encouraged to read the questions carefully, choosing the single best response, first answering the questions that they are sure of, returning to the more difficult questions as time allows. Credit is given only for questions that have responses: questions left blank will be scored as incorrect; therefore, there is no penalty for guessing.

# MULTIPLE-CHOICE EXAMINATION CONTENT OUTLINE and PERCENTAGES

## CRA Multiple Choice Examination Final Content Outline with Weighting

- I. Applies the Principles of the Anatomy, Physiology, and Pathology of the Eye** (16% 28 items on exam)
- A. Demonstrates an understanding of external ocular structure
  - B. Demonstrates an understanding of anterior segment structures (cornea, anterior chamber, iris, lens)
  - C. Demonstrates an understanding of posterior structures (vitreous, retinal layers, pigment epithelium, choroid, optic nerve)
  - D. Demonstrates an understanding of anatomical landmarks and terminology
  - E. Understands the circulation properties (iris, retina, optic nerve, choroid)
  - F. Understands metabolic processes of the retina
  - G. Recognize and identify the ocular manifestations and associated findings of ophthalmic diseases and disorders:
    - 1. Systemic
    - 2. Vascular
    - 3. Retinal
    - 4. Choroidal
    - 5. Optic disc/nerve
    - 6. Scleral
    - 7. Inflammatory
    - 8. Trauma
    - 9. Lesions/tumors
    - 10. Hereditary/congenital
    - 11. Anterior segment diseases affecting patient safety or image quality
  - H. Recognize and identify the clinical findings relating to:
    - 1. Diabetic retinopathy
    - 2. Hypertensive retinopathy
    - 3. Macular degeneration
    - 4. Vascular occlusions
    - 5. Ocular histoplasmosis
    - 6. Central serous retinopathy
    - 7. Toxoplasmosis
    - 8. Cystoid macular edema
    - 9. Macular hole
    - 10. Angoid streaks
    - 11. Macroaneurysm
    - 12. Hereditary macular dystrophies
    - 13. Malignant melanoma
    - 14. Hemangioma
    - 15. Retinoblastoma
    - 16. Choroidal nevus
    - 17. Optic atrophy
    - 18. Optic neuritis
    - 19. Glaucoma
    - 20. Papilledema
    - 21. Drusen
    - 22. Uveitis
    - 23. Retinal detachment/tear

24. Retinopathy of prematurity
25. Autoimmune retinopathy
26. Sickle cell retinopathy
27. Cytomegalovirus retinitis
28. Anterior ischemic optic neuropathy
29. Coloboma
30. Coats' disease
31. Epiretinal membrane
32. Retinal toxicity
33. Stargardt disease
34. Retinal plaque
35. Retinitis pigmentosa
36. Lattice degeneration
37. Medial opacities

## II. Patient Management and Patient/Operator Safety

(6% 10 items on exam)

- A. Perform a patient flashlight examination to determine:
  1. Contraindications to dilation
    - a. narrow angles
    - b. contact lenses
    - c. iris fixated/anterior chamber intraocular lens
  3. Media opacities (e.g., scarring/cornea and lens)
  4. The presence of inflammation (e.g., infection)
- B. Informs patient of procedures to be performed, pharmacologic agents to be administered, expected outcomes, and potential side effects
- C. Answers patient questions concerning the procedure
- D. Elicits cooperation from uncooperative or physically disabled patients
- E. Provides for written informed consent for angiography
- F. Establishes/reviews patient records including:
  1. Medical/surgical history
  2. Allergies
  3. Pregnancy
  4. Ocular history
  5. Photographic history
- G. Administers prescribed drops including:
  1. Verifies physician's orders
  2. Maintains aseptic/sterile technique
  3. Performs punctal occlusion
  4. Monitors and assesses the effects of the drops
  5. Recognizes and responds to adverse reactions to drops
- H. Demonstrates proficiency in CPR
- I. Adheres to Universal Precautions as defined by the Centers for Disease Control and Prevention (CDC)
- J. Observes Occupational Safety and Health Administration (OSHA) and The National Institute for Occupational Safety and Health (NIOSH) regulations relating to ophthalmic photography
- K. Understands HIPAA confidentiality and privacy regulations relating to ophthalmic photography

## III. General Photography

(10% 18 items on exam)

- A. Understands the functions and properties of digital imaging including:
  1. Demonstrates basic computer skills

2. Stocks and inventories digital supplies

B. Understands the function and components of the digital camera including:

1. Still digital camera – color
2. Still digital camera – monochrome
3. Digital video
4. Central processing unit (CPU)
5. Archiving devices and media
6. Backup power and voltage protection
7. Electronic components

C. Performs routine maintenance and digital equipment troubleshooting including:

1. Electronic components
2. Cleaning equipment including relay lenses
3. Software maintenance
4. Hardware maintenance
5. Storage utilization

D. Understands digital imaging properties including:

1. Resolution
2. ISO rating/gain/noise
3. Dynamic range
4. Contrast
5. Exposure control
6. Color balance
7. Gamma
8. Bit depth

E. Understands the use of digital image overlays

F. Understands the use of digital measurement utilities

G. Understands digital color management

1. Monitor calibration
2. Printer calibration

H. Demonstrates digital image processing skills related to output including:

1. Proofsheets production
2. File format/compression
3. Output resolution
4. Contrast enhancement
5. Sharpening
6. Brightness
7. Color balance
8. Resampling
9. Scaling
10. Printing
11. Composite/montage

I. Recognizes sources and corrects conditions causing digital artifacts including:

1. Blooming
2. Noise
3. Over/under exposure
4. Over/under saturation
5. Over sharpening
6. Interpolation
7. Sensor dust
8. Pixel dropout

- J. Follows established clinical imaging protocols (practice-based or clinical trials)
- K. Follows clinical trial certification procedures

#### **IV. Data and Image Management**

(4% 7 items on exam)

- A. Has a working knowledge of image editing software
- B. Organizes archival systems in accordance with state and federal regulations
- C. Coordinates network file transfers for archiving/patient database systems
- D. Observes networking security (e.g., firewalls, patient privacy, security, access, wireless transmissions)
- E. Uses technology for image review (e.g., video, projection, stereo-viewers, electronic transmissions, digital overlays)
- F. Demonstrates knowledge of Picture Archiving and Communication Systems (PACS) and Electronic Medical Records (EMR)
- G. Understands Digital Imaging and Communications in Medicine (DICOM) Standards

#### **V. Fundus Photography – Fundus Camera and Scanning Laser Ophthalmoscope**

(23% 40 items on exam)

- A. Performs routine fundus camera maintenance and equipment troubleshooting including:
  1. Replaces viewing bulbs and flash tubes
  2. Replaces fuses
  3. Clean equipment including lenses
- B. Demonstrates the techniques of image production using a fundus camera including:
  1. Set reticule for accommodative correction
  2. Verify filter positions
  3. Establish photographic plan
  4. Adjust photographic plan during photography in response to unusual situations or findings
  5. Set viewing angle
  6. Set flash power
  7. Set shutter/flash synchronization
  8. Set viewing light intensity
  9. Position patient for photography
  10. Establish fixation
  11. Establish alignment and focus
  12. Recognize the need for diopter/axial eye length compensation
  13. Perform fundus photography - non-stereoscopic
  14. Perform fundus photography - stereoscopic
  15. Perform fundus photography - using astigmatic correction device
  16. Perform anterior segment photography with a fundus camera to document:
    - a. media opacities
    - b. gross anterior pathologies
- C. Demonstrates the technique of image production using a Scanning Laser Ophthalmoscope (SLO) including:
  1. Verify filter positions
  2. Establish photographic plan
  3. Adjust photographic plan during photography in response to unusual situations or findings
  4. Set/establish magnification/angle of view
  5. Select appropriate light source
  6. Set light source intensity

7. Position patient
8. Establish fixation
9. Establish alignment/working distance/focus
10. Adjust gain/sensitivity
11. Recognize the need for diopter/axial eye length compensation
12. Perform SLO fundus photography - non-stereoscopic
13. Perform SLO fundus photography - manual/auto stereoscopic
14. Perform SLO anterior segment photography to document:
  - a. media opacities
  - b. gross anterior pathology

**VI. Monochromatic Imaging and Fundus Autofluorescence** (5% 9 items on exam)

- A. Uses monochromatic light sources/filters to perform monochromatic imaging including:
  1. Blue (~480nm)
  2. Green (~540nm)
  3. Red (~640nm)
  4. Near Infrared (~800nm)
  5. Autofluorescence- visible
  6. Autofluorescence- infrared
- B. Uses Scanning Laser Ophthalmoscope or Modified Fundus Camera to use fundus autofluorescence for imaging including:
  1. Uses excitation and barrier filters/wavelengths
  2. Understands image acquisition mean calculations/image averaging
  3. Understands exposure, noise effect, and gain
  4. Understands the cause of artifacts (e.g., retinal bleaching, ghosting)
  5. Understands disease specific applications (e.g., RPE changes/lipofuscin)

**VII. Fluorescein Angiography with Fundus Camera or Scanning Laser Ophthalmoscope** (25% 43 items on exam)

- A. Performs fluorescein angiography including:
  1. Makes preparations for IV fluorescein injection or oral fluorescein administration
  2. Identifies and confirms patient demographics
  3. Perform green filter (red-free) photography:
    - a. non-stereoscopic images
    - b. stereoscopic images
  4. Coordinates photographic sequence with the administration of dye
  5. Takes a control photograph
  6. Starts timer
  7. Acquires angiographic sequence on non-stereoscopic images
  8. Acquires angiographic sequence of stereoscopic images
  9. Monitors and assesses patient response to the procedure
  10. Responds to any adverse reactions
- B. Understands the theory of luminescence including:
  1. Fluorescence
  2. Pseudo and autofluorescence
  3. Excitation filters/wavelengths
  4. Barrier filters/wavelengths
- C. Performs descriptive angiographic interpretation including recognizing:
  1. The phases of circulation including:
    - a. early phase (filling phase): choroidal
    - b. early phase (filling phase): arterial
    - c. early phase (filling phase): arteriovenous
    - d. early phase (filling phase): venous

- e. mid phase
- f. late phase
- 2. The mechanisms of hyperfluorescence including:
  - a. transmission defect
  - b. leakage
  - c. staining
  - d. pooling
- 3. The mechanisms of hypofluorescence including:
  - a. blockage
  - b. filling defects
- 4. The anatomical location of lesions

**VIII. Indocyanine Green (ICG) Angiography**

(3% 5 items on exam)

- A. Performs ICG Angiography
- B. Understands principles and properties of ICG dye
- C. Understands applications of ICG Angiography
- D. Performs descriptive angiographic interpretation by recognizing:
  - 1. The phases of circulation
  - 2. The mechanisms of hyperfluorescence
  - 3. The mechanisms of hypofluorescence
  - 4. The anatomical location of lesions

**IX. Pharmacology**

(5% 9 items on exam)

- A. Understands and recognizes the properties and effects of pharmacologic agents related to or effecting ophthalmic photography including administration of:
  - 1. Topical miotics
  - 2. Topical mydriatics
  - 3. Topical cycloplegics
  - 4. Topical anesthetics
  - 5. Topical lubricants
  - 6. Topical stains and dyes
  - 7. Intravenous sodium fluorescein
  - 8. Intravenous indocyanine green (ICG)
  - 9. Oral sodium fluorescein
  - 10. Oral antihistamines
  - 11. Oral anti-nausea agents
- B. Understands the significance of patient's age and weight
- C. Understands and recognizes contraindications and adverse reactions to topical agents
- D. Understands and recognizes contraindications and adverse reactions to intravenous agents  
(e.g., fluorescein, indocyanine green (ICG))
- E. Monitors agents for potential contaminations
- F. Monitors agents for expirations

**X. Other Imaging Technology**

(3% 6 items on exam)

- A. Optical Coherence Tomography (OCT)
- B. Optical Coherence Tomography - Anterior Segment (OCT)
- C. Slit Lamp Imaging
- D. Non-mydriatic fundus/angiography cameras
- E. Ultra-Wide Field Fundus Imaging

## Requirements for CRA Recertification

The OPS/BOC requires each Certified Retinal Angiographer (CRA) to re-certify at three-year intervals by accumulating Continuing Education Credits in the field of Ophthalmic Photography and related curriculum. The purpose of CRA recertification is to enhance continued competence of certificants through continuing education. Approved courses encourage exposure to new approaches and technology in addition to the renewal of basic skills. The Board deems a three year interval appropriate given the pace of changing advances in Ophthalmology and Ophthalmic Photography, the time commitment required to achieve the required CECs, and the availability of programming. It is the responsibility of the Certified Retinal Angiographer to provide proof of compliance with the recertification requirements prior to the end of the third year of each interval of certification. Failure to do so will result in the revocation of OPS certification. Once revoked, certification can only be regained by applying for and fulfilling the current requirements for CRA certification.

### The requirements for recertification are as follows:

1. Recertification requires the accrual of **15 hours** of continuing education credit (**15 CECs**) during each three-year interval following initial certification.

### CECs may be earned in the following manner:

- A. Of the fifteen required hours, **a minimum of five (5 CECs) MUST be earned by attending official OPS courses or OPS BOC pre-approved courses and workshops.** Each 1:1 OPS approved hour of lecture or workshop equals one credit hour (1 OPS CEC).
- B. Of the fifteen required hours, a maximum of ten (10 CECs) MAY be earned by teaching official OPS or OPS approved courses or workshops. Each hour of lecture or workshop equals one credit hour (1 CEC).
- C. Of the fifteen required hours, **a maximum of ten (10 CECs) MAY be earned by attending NON-OPS APPROVED courses or workshops.** These include courses or workshops approved by the Joint Commission of Allied Health Personnel in Ophthalmology (JCAHPO) or courses approved by the American Medical Association (AMA) for Category I Continuing Ophthalmic Medical Education. Each hour of these courses or workshops equals one half-credit hour (1/2 CEC).
- D. Of the fifteen required hours, **a maximum of ten (10 CECs) MAY be earned by first authorship or co-authorship in the OPS Journal, ophthalmic or photographic journals or text books and other scientific publications.** All submissions must be of merit and well recognized. The total value for any submission shall not exceed three (3 CECs). Submission of publications for CEC review must be made by separate application. (See CECs for Publication on OPS website for details)

### Responsibility and Verifications

It is the responsibility of Certified Retinal Angiographer's to keep track of their CECs and submit their application with supporting documentation verifying course teaching, course or workshop attendance or publication credits. Credits for teaching must be supported by a copy of the printed program reflecting the type and degree of involvement. A certificate of attendance or statement of attendance on official letterhead from the director of the course or workshop is required. A paid receipt is not acceptable as evidence of attendance. Credits for publications must be supported by a validation letter from the Recertification Section Chair.

2. Recertification requires the submission of a copy of a current certificate in cardiopulmonary resuscitation (CPR) from a recognized organization. The American Red Cross or the American Heart Association are preferred. CPR recertification may be satisfied by taking the American Heart Association online course: Heartsaver® CPR AED Online Part 1. Only Part 1 is required for CRA - Recertification.
3. Payment of the prevailing **recertification fee**, payable in US dollars to the OPS/BOC.

4. Payment by credit card can be made online at: <https://opsweb.site-ym.com/> or through the **OPS Membership Office (1-800-403-1677)**.

### **Recertification Fees**

Non-member Fee: \$200.00

OPS Member Fee: \$100.00

**Please call the OPS Membership Office (1-800-403-1677) to verify your membership status.** Fees should be payable to the OPS BOC in US dollars.

### **Recertification Extensions and Appeals**

Recertification extensions may be issued on an individual basis due to extreme hardship. The Recertification Section Chair (Recert@opsweb.org) is authorized to give a one-time 6 week extension. Letters of revocation are sent after the 6 week period. Should recertification be denied, the applicant may appeal within thirty (30) days to the Chair of the Board of Certification (BOC@opsweb.org). Appeal instructions are provided with the letter of revocation. The Board of Certification decision regarding all appeals will be final and binding. (Refer to Appeals and Grievances policy on **page 8** for details.)

### **Recertification Applications and Information**

The Chair of the Recertification Section annually notifies, in February, all CRA's with an expiration date of December 31st of that concurrent year. CRA's that have not received notification by March 1st, of their third year of certification, should contact the Recertification Section Chair ([Recert@opsweb.org](mailto:Recert@opsweb.org)). Applications may be downloaded from: <http://www.opsweb.org/?page=Recertification>

CRAs having difficulty completing their requirements or expect to be unable to meet the December 31st deadline should contact the Recertification Section Chair (Recert@opsweb.org) as soon as possible. The Recertification Section Chair may be able to provide assistance or a course of action for completing the requirements.

CRAs should contact the Section Chair by email or phone for current answers to any questions or concerns about recertification requirements or accrual of continuing education credits.

### **Requirements for Provisional CRA Recertification**

Provisional CRAs are required to recertify at three year intervals following the same guidelines as CRAs. It is the responsibility of the Provisional CRA to provide proof of compliance with the recertification requirements prior to the end of the third year of each interval of certification. Failure to do so will result in the revocation of OPS certification. Once revoked, certification can only be regained by applying for and fulfilling the current requirements for CRA certification.

The three year interval will start following certification as a Provisional CRA regardless of when the certificant's status converts to CRA. If the Provisional CRA has not completed the work experience criteria by the time recertification is due, the Provisional CRA must comply with the CRA recertification requirements to maintain the Provisional CRA.

## Disciplinary Policy

The OPS BOC may impose sanctions against applicants or individuals already awarded certification for failure to meet OPS BOC rules and standards of initial certification or recertification. The CRA program is a voluntary process, not required by law for employment in the field. Monitoring and evaluating actual job performance is beyond the scope of the OPS BOC.

Grounds for Action: the Board of Certification reserves the right to deny certification, void examination results, bar participation in the certification program or to revoke certification. The following are grounds for action:

- Obtaining or attempting to obtain certification or recertification for oneself or another through fraud or misrepresentation on any certification application, document, portfolio, or examination.
- Improper conduct during the examination, including, but not limited to giving or receiving answers from another applicant, attempting to remove test materials or information from any examination room, or impersonating another applicant.
- Unauthorized possession, distribution or disclosure of examination materials or content.
- Misrepresentation of certification or certification status.
- Gross or repeated negligence in providing ophthalmic photography services.
- Substance abuse to a degree, which impairs professional performance.
- Physical or mental condition which impairs competent professional performance.
- Physical or sexual abuse of a patient.
- The conviction of, plea of guilty, or plea of nolo contendere to a crime which is directly related to public health, safety, or professional performance providing ophthalmic photography services.
- Failure to cooperate reasonably with any OPS BOC investigation of a disciplinary matter.

Sanctions for violation of standards of conduct or examination procedures may include:

- Denial or suspension of eligibility
- Re-examination
- Revocation
- Censure
- Reprimand
- Suspension
- Probation
- Other corrective action as the OPS BOC deems appropriate

Sanctions may be appealed. All appeals must be submitted in writing to the Chair of the Board of Certification.

## **CONTACTS:**

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## **Appendix A**

<b>Portfolio Requirements</b>	<b>27</b>
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## Portfolio Requirements

The portfolio must be produced entirely by the applicant. All submissions must be uploaded to the BOC web portal:

[www.opsweb.org/default.asp?page=portfoliosubmission](http://www.opsweb.org/default.asp?page=portfoliosubmission)

Detailed image and folder labeling instructions are found within this section.

The online portfolio submission form (found at the end of this program guide) must be completed and submitted with **the portfolio**. By signing the portfolio submission form, the applicant attests to the authenticity of the work submitted. Submission of work completed by anyone other than the applicant constitutes fraud. Fraud or misrepresentation of the portfolio may result in disqualification of the applicant.

The CRA portfolio should reflect the pride, skill and professionalism of the applicant. It is more important to demonstrate the quality of photography rather than unique pathology. The portfolio may include normal eyes where applicable. The Portfolio Committee reviews all images using the same rating standards.

## Photography Requirements

### Color Imaging Section

This section demonstrates the applicant's ability to produce clinical color images. **The images are taken at the assigned field-of-view (20,35,45,60 degrees). If not defined, you may take the images at whatever field-of-view you deem appropriate for the pathology and assignment.**

#### General criteria

All original images must be produced using a fundus camera. All images submitted must be of diagnostic quality (digital color images saved with minimal or lossless compression are acceptable) and uploaded to the BOC web portal:

[www.opsweb.org/default.asp?page=portfoliosubmission](http://www.opsweb.org/default.asp?page=portfoliosubmission)

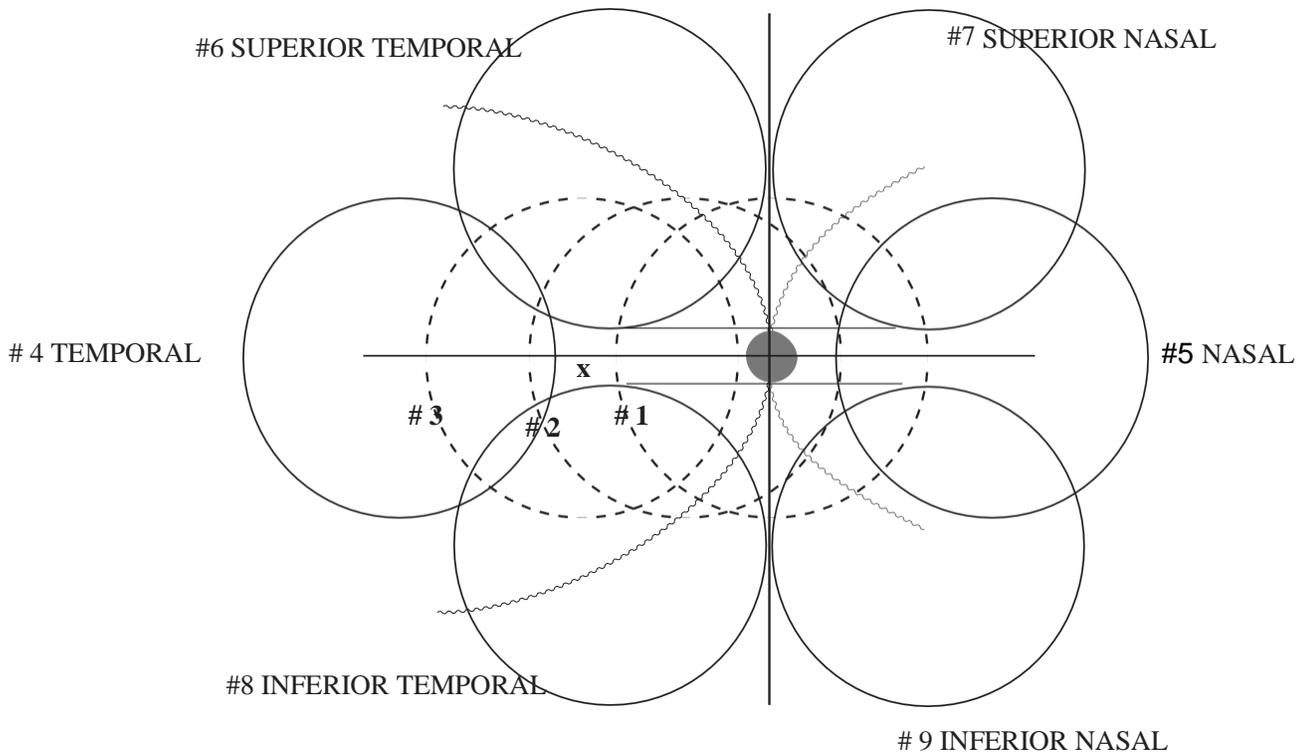
Refer to the *Field Definition Guide* on page 29 for field definition of these images.

#### Required color photographs:

- 1 & 2, 3 & 4 Sequential stereo pair of the posterior pole of both eyes same patient
- 5 Macula, centered on the fovea
- 6 & 7 Sequential stereo pair centered on the optic disc
- 8 Temporal to the macula
- 9 High magnification of optic disc (2X magnification or 20 degree field)
- 10 Nasal to optic disc (centered at least 2 disc diameters away from the optic nerve)
- 11 Superior temporal arcade
- 12 Inferior temporal arcade
- 13 Lesion in mid-periphery (most posterior margin of the frame is at least 3 disc diameters from the disc margin)
- 14 Posterior pole of a high myopic or aphakic eye
- 15 Posterior pole photo **THROUGH** media opacity (hazy view)
- 16 Posterior pole photo **AROUND** media opacity (same eye as #15) (clear view)
- 17 Posterior pole through small pupil (< 3 mm)
- 18 Fundus camera (external) photo **FOCUSED ON THE IRIS** (same eye as in #17)
- 19 Posterior pole photo **THROUGH AN IOL**
- 20 Fundus camera (external) photo **FOCUSED ON THE IRIS** (same eye as in #19)
- 21 Fundus camera (external) photo focused on a contact lens on an eye
- 22 & 23 Sequential stereo pair of the inferior nasal field
- 24 Fundus photo of an image with an alignment artifact (crescent) present
- 25 Fundus photo of an image with the crescent corrected (same eye as in #24)

# Field Definition Guide

## Circles Approximate a 30 Degree Field-of-View



### **RIGHT EYE**

- #1 CENTERED ON DISC**
- #2 POSTERIOR POLE**
- #3 MACULA, CENTERED ON FOVEA**
- #4 TEMPORAL**
- #5 NASAL**
- #6 SUPERIOR TEMPORAL ARCADE**
- #7 SUPERIOR NASAL**
- #8 INFERIOR TEMPORAL ARCADE**
- #9 INFERIOR NASAL**

**\*\*\*Use the assigned field-of-view (20,35,45,60 degrees). If field of view (20,35,45,60 degrees) is not defined, you may take the images at whatever field-of-view you deem appropriate for the**

**pathology and assignment. Please note the field numbers referenced above are not ETDRS nomenclature.**

## **ANGIOGRAPHY SECTION**

This section demonstrates the applicant's ability to capture the flow dynamics of fluorescein dye passing through the circulatory systems of the eye in a clinical setting.

### **General criteria**

All images must be produced using a fundus camera or SLO.

All images must be submitted as digital files.

All images must be saved in sequential order on proof sheets.

**Four angiograms are required**; each must be of a different patient. Three of the four angiograms must have pathology but the fourth can be without pathology. The angiograms may be, but are not required to be bilateral.

The four **angiograms** may be produced using 35mm film, digital equipment or any combination of the two, however all submissions must be digital.

Each angiogram must be submitted according to the following list of requirements.

### **Requirements:**

#### **1. Proof Sheets**

**Digital angiograms** - A proof sheet (with a minimum of 16 images), saved as a high quality digital file. **The timer must be recorded on the proof sheet.**

#### **2. FA Images**

Digital FA images are submitted as minimal or lossless compressed images. **The timer must be recorded on the images. There should be four FA images in each folder**

Refer to the Phases of Circulation Guide in this section.

#### **3. Color Images**

A color image of the posterior pole of the primary eye of each of the corresponding FOUR angiograms. If the area of pathology covered by the angiogram is not in the posterior pole, then a second image centered on the area of pathology of the involved eye must also be submitted.

Label the color images as described in the Portfolio Assembly Section (**page 31**) and place in the appropriate FA folder; use FA3C for the posterior pole image and FA3C2 for an additional image if the pathology is not in the posterior pole.

#### **4. Stereo Monochromatic Green (Red Free) Posterior Pole**

A stereo pair of the posterior pole of the primary eye of each of the corresponding FOUR angiograms.

## **PHASES OF CIRCULATION GUIDE**

**Use this guide to determine which frames to select from each angiogram to document the early, mid and late circulation phases for each of the four angiograms required for the portfolio.**

### **EARLY CIRCULATION PHASE** (Filling Phases) (Arterial Phase, Venous Phase)

Fluorescein dye is present only in the choroid and retinal arteries or in the choroid, retinal arteries and veins.

### **MID CIRCULATION PHASE** (Early Recirculation Phase)

Fluorescein dye of high intensity is equally present in the retinal arteries and veins.

### **LATE CIRCULATION PHASE STEREO PAIR** (Late Recirculation Phase) (Elimination Phase)

5 minutes or later post injection, fluorescein dye of reduced intensity is present in the choroid, retinal arteries and veins or

the choroidal and retinal vessels are dark. Must be a stereo pair of the posterior pole

## **Portfolio Rating Standards**

The Portfolio Committee uses standards established and approved by the Board to perform ratings of CRA portfolios.

CRA portfolios are rated by applying the following standards:

- Intent: Is the required image present?
- Field of view: Does the image show the specified field of view?
- Focus: Is the image within an acceptable range of focus?
- Exposure: Is the image exposure within an acceptable range?
- Contrast: Is the image contrast within an acceptable range?
- Artifacts: Is the image/ free of undesirable artifacts?

All criteria for each required image must be met for the portfolio to be found satisfactory.

## **Portfolio Assembly**

The required image files must be labeled as described below.

**Submit Digital Image files as described below** to the BOC web portal in five folders labeled: **CF, FA1, FA2, FA3, and FA4.**

Please zip each folder using WinZip (PC) or "Create Archive" (Mac) and upload each zipped folder.

•**CF Folder:**

- CF1 through CF25,
- Use L and R to identify stereo orientation (CF1L, CF2R).

•**FA1 Folder:**

- FA1proof
- FA1E (for early), FA1M (for mid), FA1LLS and FA1LRS (for late left and late right stereo pair), FA1C (for color image[s]), FA1ML and FA1MR (for monochromatic stereo pair).

•**FA2 Folder:**

- FA2proof
- FA2E (for early), FA2M (for mid), FA2LLS and FA2LRS (for late left and right stereo pair), FA2C (for color image[s]), FA2ML and FA2MR (for monochromatic stereo pair).

•**FA3 Folder:**

- FA3proof
- FA3E (for early), FA3M (for mid), FA3LLS and F3LRS (for late left and right stereo pair),, FA3C (for color image[s]), FA3ML and FA3MR (for monochromatic stereo pair).

•**FA4 Folder:**

- FA4proof
- FA4E (for early), FA4M (for mid), FA4LLS and F4LRS (for late left and right stereo pair),, FA4C (for color image[s]), FA4ML and FA4MR (for monochromatic stereo pair).

**The portfolio will be deemed unsatisfactory if it contains extra examples of the requested images.**

## **Portfolio Submission**

The portfolio must be uploaded to the BOC web portal. Take the same care packaging your portfolio as you did producing it.

Complete the program application online:

[https://opsweb.site-ym.com/?page=portfolio\\_submission](https://opsweb.site-ym.com/?page=portfolio_submission)

**Do not include your employment verification letter or CPR certificate with this submission. These documents are submitted with the Examination Application.**

The CRA Portfolio Committee will review the portfolio within 30 days. Portfolios meeting the requirements will receive a notification of acceptance.

Portfolios not meeting the requirements will receive a critique of the unacceptable segments. The applicant can correct any deficiencies and resubmit the required component(s); if the portfolio committee returns the entire portfolio, correct the required components and resubmit the entire portfolio.

The Ophthalmic Photographers' Society Board of Certification assumes no liability for any materials lost through the web submission process. The Board of Certification recommends that applicants maintain a copy of the portfolio for their personal records.

The Portfolio Committee will notify the CRA Section Chair of the applicant's examination eligibility. The Section Chair will send the applicant an Examination Application and information regarding upcoming examination dates.

## Appendix B

### Suggested References

Below is an extensive list of study resources compiled from the suggestions of CRA examiners and candidates who have taken the examination. Many of the texts and references cover some of the same material, so it is not necessary to review them all. A candidate can pick and choose from these or other appropriate references, based on availability and individual need. Some of these references may no longer be in print, but can still be found in a medical library.

#### Ophthalmology

**Atlas of Clinical Ophthalmology** Spalton DJ. [2004] Elsevier - Health Sciences Division; ISBN: 0723432406

**Atlas of Fundus Autofluorescence Imaging**, Holtz, Schmitz-Valckenbuerg, et. al., Springer, 2007

**Atlas of Indocyanine Green Angiography: Fluorescein Angiography, ICG Angiography and OCT Correlations.**

Coscas, G. Elsevier, 2006.

**Atlas of Laser Scanning Ophthalmoscopy** Scheuerle, AF, Schmidt, E, Springer Publishing 2004

**Clinical Eye Atlas** Gold DH, Lewis RA. [2002] AMA Press; ISBN: 1579471927

**Clinical Retina** Quillen D, Blodi B. [2002] American Medical Association; ISBN: 1579472842

**Fluorescein and ICG Angiography: Textbook and Atlas** Richard I, Soubrane G, Yannuzzi L. [2nd edition 1998] Thieme Medical Pub; ISBN: 0865777128

**Fluorescein and Indocyanine Green Angiography: Technique and Interpretation** (Ophthalmology Monographs, 5) Berkow JW. [2nd edition 1997] American Academy of Ophthalmology; ISBN: 1560550449

**Fundus Autofluorescence** Lois, N. Forrester, J. Lippincot Williams and Wilkins 2009

**Fundus Fluorescein Angiography** Chopdar A. [1996] Butterworth-Heinemann Medical; ISBN: 075061885X

**General Ophthalmology** Vaughan D, Asbury T, Riordan-Eva P. [15th Edition] McGraw-Hill Professional Publishing; ISBN: 0838531377

**Ocular Therapeutics Handbook: A Clinical Manual** Bruce E. Onofrey; Nicky R. Holdeman;; Leonid Skorin, [2nd Edition 2005] Lippincott Williams & Wilkins Publishers; ISBN: 0397513925

**The Ophthalmic Assistant** Stein HA, Slatt BJ, Stein RM. [7th Edition 1999] Harcourt Brace; ISBN: 0323009131

**Ophthalmic Terminology** Speller and Vocabulary Builder Stein HA, Slatt BJ, Stein RM. [3rd Edition 2000] Mosby-Year Book; ISBN: 0801664381

**Quick Reference Dictionary of Eye Terminology** Janice K. Ledford;; Joseph Hoffman;; Al Lens. [5th Edition 2008] Slack, Inc.; ISBN: 1556424728

**The Retina Atlas** Yannuzzi L, Green W, Battista KM. [1995] Mosby-Year Book, Inc.; ISBN: 0815134320

**Retina** Ryan S, Ogden T, Hinton D, Schachat AP. [3rd edition 2000] Mosby-Year Book; ISBN: 0323008046

**Stereo Atlas of Fluorescein and Indocyanine Green Angiography** Stevens RA, Saine PJ, Tyler ME. [1999] Butterworth-Heinemann Medical; ISBN: 0750670010

**Stereoscopic Atlas of Macular Diseases Diagnosis and Treatment** Gass DM. [4th edition 1996] Mosby-Year Book; ISBN: 0815134169

**Wolff's Anatomy of the Eye and Orbit** Bron AJ, Tripathi I, Tripathi B. [8th edition 1998] Lippincott Williams & Wilkins Publishers; ISBN: 0412410109

### **Ophthalmology (Out of Print)**

**Interpretation of Fundus Fluorescein Angiography** Schatz H, Burton T, Yannuzzi L, Rabb M. [1978] C.V. Mosby Company, St. Louis, MO

### **Ophthalmic Photography**

**Clinical Ocular Photography (Basic Bookshelf for Eyecare Professionals)** Cunningham D. [1998] Slack, Inc. ISBN: 1556423772

**Ophthalmic Photography: A Textbook of Fundus Photography, Angiography & Electronic Imaging** Saine PJ, Tyler ME. [2nd Edition 2001] Elsevier - Health Sciences Division; ISBN: 0750673729

**Practical Retinal Photography and Digital Imaging Techniques** Tyler ME, Saine PJ, Bennett T. [2003] Butterworth-Heinemann Medical; ISBN: 0750673710

**Ophthalmic Imaging: Posterior Segment, Anterior Eye Photography, and Slit Lamp Biomicroscopy** Sisson CP. 2018, Routledge, Taylor and Francis Group; ISBN 9781138886001

### **Ophthalmic Photography (Difficult to Find/Out of Print)**

**Fluorescein Angiography of the Retina** Wessing A, Mosby, [1969]

**Ophthalmic Photography** Justice JJ. Little, Brown, [1982]

**Ophthalmic Photography** Coppinger JM, Maio M, Miller K. Slack, [1987]

**Textbook of Ophthalmic Photography** Wong D, Inter-Optics Publications, Inc. [1982]

### **Photography**

**Langford's Advanced Photography** Langford MJ. [7th edition 2008] Focal Press; ISBN:0240514866

**Langford's Basic Photography** Langford MJ. [8th edition 2008] Focal Press; ISBN: 0240514858

**Color Confidence: The Digital Photographer's Guide to Color Management** Grey T. (2006) John Wiley & Sons, Incorporated ISBN 0470113138

**Dictionary of Photography & Digital Imaging: The Essential Reference for the Modern Photographer**  
Ang T, [2002] Watson-Guptill Publications; ISBN: 0817437894

**Digital Image Processing** Gonzalez RC, Richard E, Woods RE. [3rd Edition 2007] Prentice Hall PTR.; ISBN: 021180758

**Real World Photoshop CS3:** Blatner D., [3rd Edition] ISBN: 0321334116, Pearson Education; [2007]

### **Optical Coherence Tomography**

**Everyday OCT:A Handbook for Clinicians and Technicians.** Schuman, J., Puliafito, and C Fujimoto, J..  
Slack, Inc.; [Second Edition 2017]

**The Stratus OCT Primer: Essential OCT.** Bressler, N. and Ahmed, I. Carl Zeiss Meditech, 1 800 342 9821.

### **Journal Articles**

Allen L. **Ocular fundus photography. Suggestions for achieving consistently good pictures and instructions for stereoscopic photography** American Journal of Ophthalmology. 33:13-28. 1964

Ball K. **Wise GM. A modified technique of fluorescein angiography**  
Journal of Ophthalmic Photography 1980; 3(2):32

Bartlett D, Hoops S. **"Is it hypoglycemia?" recognition and management of low blood sugar levels before, during and after Fluorescein angiography in individuals with diabetes**  
Journal of Ophthalmic Photography, 1989;11(2):58

Bartlett D. **The use of fluorescein angiography in pregnancy** Journal of Ophthalmic Photography, 1989;11(2):76

Bird A. **Retinal Fundus Autofluorescence** Journal of Ophthalmic Photography Summer/2007 Vol 29:Supplement p.58

Cain DR, McPhee TJ, George TW. **Non-painful vascular staining following the injection of sodium fluorescein** Journal of Ophthalmic Photography, 1987-88;10(1-2):39

Croswell M. **Fluorescein angiography survey brief** Journal of Ophthalmic Photography, 1992;14(2):61

Delori FC. Gragoudas ES. Francisco R. Pruett RC. **Monochromatic ophthalmoscopy and fundus photography** The normal fundus. Archives of Ophthalmology. 95(5):861-8, 1977 May.

Dewhirst RR, Stanford MR. **Severe adverse reactions to sodium fluorescein dye: results of the BOPA 1998 pilot study** British Journal of Ophthalmic Photography, 1999;2:20

Ducrey NM. Delori FC. **Gragoudas ES. Monochromatic ophthalmoscopy and fundus photography II. The pathological fundus** Archives of Ophthalmology. 97(2):288-93, 1979 Feb

Hamm DA. **Patient management and the ophthalmic photographer** Journal of Ophthalmic Photography, 1993;15(2):68

Jacobs J. **Fluorescein sodium-what is it?** Journal of Ophthalmic Photography, 1992;14(2):62

Justice J Jr. **Ocular fundus photography** International Ophthalmology Clinics. 16(2):23-32, 1976.

Justice J Jr. **Fluorescein angiography** International Ophthalmology Clinics. 16(2):33-9, 1976.

Justice J Jr. **Basic interpretations of fluorescein angiography** International Ophthalmology Clinics. 16(2):41 - 52, 1976.

Kelly MP. **A superior method of achieving high myopic retinal focus.** Journal of Ophthalmic Photography, 1995;17(2):6

Kwiterovitch & Maguire M, Murphy R, et al. **Frequency of adverse reactions after fluorescein angiography** Ophthalmology 1991;98:1142.

Lucot J. **The thirty minute angiogram** Journal of Ophthalmic Photography 1981; 4(2):37

Merin LM. **Aesthetics in angiographic imagery** Journal of Ophthalmic Photography 1981;4:22.

Merin LM, Lam BL. **Fluorescein angiogram during vasovagal syncope** Journal of Ophthalmic Photography, 1994;16(2):94

Novotny HR, Alvis DL. **A method of photographing fluorescence in circulating blood in the human retina** Circulation 1961;24:82.

Palestine AG. **Does fluorescein angiography interfere with clinical laboratory testing?** Journal of Ophthalmic Photography, 1991;13(1):27

Picchiottino R. **Disease-specific fluorescein angiography** Journal of Ophthalmic Photography, 1989;11(1):15

Priel E. **Photographing the challenging patient** Journal of Ophthalmic Photography 1997;19(3):98

Priel, FOPS. **Fundus Autofluorescence with a Confocal Scanning Laser Ophthalmoscope** Journal of Ophthalmic Photography Summer/2007 Vol 29:Supplement p.62

Saine PJ, Bocino JA, Marcus DF, Nelson PT. **Timing of color fundus photographs and intravenous fluorescein angiography** Journal of Ophthalmic Photography, 1984;7(2):112

Saine PJ. **Errors in fundus photography** Journal of Ophthalmic Photography, 1984;7(2):120

Saine PJ. **Focusing the fundus camera: a clinical approach** Journal of Ophthalmic Photography, 1992;14(1):7

Schmitz-Valckenberg S, Holz F. , **Fundus Autofluorescence Imaging in Geographic Atrophy** Summer/2007 Vol 29:Supplement p.74

Sobel JA. **Oral fluorescein** Journal of Ophthalmic Photography, 1996;18(2):38

Tyler ME. **Total tonal information in fluorescein angiography** Journal of Ophthalmic Photography 1979;2(1):62

Tyler ME. **Stereo fundus photography: principles and technique**  
Journal of Ophthalmic Photography 1996;18(2):68

Wolfe DR. **Fluorescein angiography basic science and engineering**  
Ophthalmology. 93(12):1617-20, 1986 Dec

Wong D. **Fundus photography and fluorescein angiography**  
Journal of Ophthalmic Photography 1971;2(1):10

Wong D. **Peripheral fundus photography**  
Journal of Ophthalmic Photography, 1983;6(2):51

Yannuzzi LA. Fisher YL. Levy JH. **A classification of abnormal fundus fluorescence** Annals of Ophthalmology. 3(7):711-8,1971 Jul

Yannuzzi LA. Rohrer KT. Tindel LJ. Sobel RS. Costanza MA. Shields W. Zang E. **Fluorescein angiography complication survey** [Review]

### **Internet Resources**

**Journal of Ophthalmic Photography.** Search every issue from January 1978 through the present.

<https://www.opsweb.org/?JOPDownload>

**Fundus Photography** Saine PJ. OPS web site:

<https://www.opsweb.org/?page=fundusphotography>

**Scanning Laser Ophthalmoscopy** Bennett TJ. OPS web site:

<http://www.opsweb.org/?page=SLO>

**Fundus Autofluorescence** Bennett TJ. OPS web site:

<http://www.opsweb.org/?page=Autofluorescence>

**Monochromatic Fundus Photography** Bennett TJ. OPS web site:

<https://www.opsweb.org/?page=Monochromatic>

**Fundamentals of Fluorescein Angiography** Bennett TJ.

<https://www.opsweb.org/?page=FA>

**Digital Imaging** Montague PR. OPS web site: <https://www.opsweb.org/?page=digitalimaging>

**Eyetec.net** Gallimore, G. <http://www.eyetec.net>. TZV Publishing, 2007.

The Board of Certification has collected this list of resources to assist applicants in preparation for the Examination. The accuracy of the information within the sources is the responsibility of the authors.

## CRA Application Check List

- \_\_\_\_\_1. Compile CRA Portfolio.
- \_\_\_\_\_2. Submit a completed online Program Application
- \_\_\_\_\_3. Upload your portfolio and employment/portfolio verification latter.
- \_\_\_\_\_4. After your portfolio is accepted, complete the Examination Application (sent to you by CRA portfolio chair). Submit this form and exam fees as directed (payable in US dollars to the OPS/BOC or by credit card via the OPS website store or the OPS Central Office at 1-(800)-403-1677.
- \_\_\_\_\_5. Once all paperwork and fees are received, the CRA Section Chair will contact you with instructions on selecting the place and time of your multiple choice exam.



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