Vermont Secretary of State
Office of Professional Regulation

Report on S.54:
Expanded Scope of Practice for Optometrists

December 31, 2003

During the 2003 legislative session S.54, a bill to expand the scope of practice of optometrists was introduced in the Vermont Senate. An identical proposal was introduced in the house as H.273.[1] The Vermont Optometric Association submitted the proposal for legislation. If enacted, the legislation would expand the scope of practice of the optometric profession. Most significantly, the legislation would permit those Vermont optometrists who are authorized to use therapeutic pharmaceutical agents (TPA's) to treat glaucoma and employ all therapeutic pharmaceuticals.

We conclude that with appropriate safety measures added to the legislation the public would not be harmed by expanding the scope of practice for optometrists. Specifically:

- **Optometrists, O.D.'s, possess a doctoral level degree.**

- **Optometrists are sufficiently trained to treat glaucoma and to use therapeutic pharmaceutical agents. Optometrists currently use the same tests that ophthalmologists use to detect or monitor glaucoma. Under current law only ophthalmologists are permitted to select and employ the medications used for each patient to treat glaucoma. Optometrists who are certified to employ therapeutic pharmaceutical agents are trained and receive continuing education to treat glaucoma.**

- **There is no documented evidence to show that an expansion of the scope of practice would harm the public health, safety or welfare.**

- **The experience of other states and the Veterans Administration indicates that the public health, safety and welfare will not be harmed by an expanded scope of practice.**

- **Passage of the proposal will result in financial savings from the elimination of redundant examinations.**

[1] S.54 has eight sponsors. H.273 has 15 sponsors.

•Passage of the proposal will decrease inconvenience to Vermonters for whom transportation to ophthalmology offices is difficult.

•Passage of the proposal will decrease the risk that patients will not follow up on glaucoma treatment.

• Modification of the proposed legislation is appropriate to address some of the credible concerns which were raised during this process. See, OPR Suggestions, post.

The complete report follows.

The Request for This Report

In May 2002 the Vermont Senate Committee on Health and Welfare wrote to the Office of Professional Regulation about S. 54. The letter said that the committee:

> "would benefit from a report on this issue conducted by the director of the Office of Professional Regulation, Jessica Porter, in consultation with the Board of Optometry, the Medical Practice Board, and any other relevant professional boards. In particular and as set forth in 26 V.S.A. §3105, we would like to understand whether the proposed expanded scope of practice would in any way endanger the health, safety, or welfare of the public."

The Office thanks The Vermont State Board of Optometry, Vermont Optometric Association, the Vermont Society of Ophthalmologists as well as the Department of Health and the Medical Practice Board who provided a wealth of information and answered our questions as the Office conducted its investigation for this Report. We have consulted with the Medical Practice Board during the investigative process and provided it a pre-publication draft of this report for review. They have expressed no opinion for this report as to whether S.54 would harm the health, safety, and welfare of the public. Donald R. Swartz, M.D., Director, Division of Health Improvement, Vermont Department of Health, wrote, "I agree with the conclusions of the OPR, though I believe that the reduction in health care costs will be minimal. *I also feel that the OPR's suggestions for additions to the legislation are important safeguards, and must be included in the final bill to provide the required protection of the public.*" (*emphasis added*)

Background

The optometrists, OD's, point out that 47 states, in one form or another, permit optometrists to treat glaucoma. Some statutes contain restrictions on types of glaucoma which may be treated. Some statutes have specific guidelines governing optometrists' obligations regarding referring patients to ophthalmologists. All 50 states, including Vermont since 1994, permit optometrists to employ some topical medications to treat ocular disease.[2] Forty-one states

[2] See, 26 V.S.A. § 1728, use of therapeutic pharmaceutical agents.

permit optometrists to prescribe oral medications. If this legislation becomes law, Vermont optometrists would join their colleagues in a fuller scope of practice.

The regulatory history of this profession shows a long standing tension between optometrists and medical doctors who practice ophthalmology. The latter group has opposed expansion of optometrists' scope of practice in the past. Ophthalmologists oppose this proposed expansion as well. Optometrists argue that the history of their profession vindicates their claims of competence. They submit that their experience in other states with a broader scope of practice disproves the predictions of harm ophthalmologists in Vermont and nationally raised in opposition to those expanded scopes of practice.

Vermont optometrists seek to obtain authority to practice what they call "primary eye care." This means treating the most common eye problems seen in the population at large. Optometrists see themselves as fully equal to medical doctors and capable of being in the "front line" of ocular medical care. Optometrists currently are expected and do make diagnoses of many conditions or diseases. The patients who require specialized or surgical care are referred to specialists, i.e. ophthalmologists. Many conditions or diseases of the eye require referral to an ophthalmologist for surgery (secondary eye care) or to another specialist for secondary and tertiary (hospital based) medical eye care. Tertiary care would most often occur when an ophthalmologist refers a patient to an ophthalmological specialist such as a "retinal specialist."

There are approximately 82 optometrists living and practicing in Vermont[3]. There are 109 licensees living outside of Vermont. There are 42 ophthalmologists practicing in Vermont. All have hospital privileges. All but one or two is board certified in ophthalmology. Every one treats glaucoma. All M.D.'s in Vermont are permitted under the scope of their licenses to treat glaucoma, although internists or family physicians apparently do not.

Methodology

To investigate the proposed legislation and its implications to the health, safety, or welfare of Vermonters, the Office has conducted interviews with optometrists and ophthalmologists. The Office conducted public hearings and received testimony of optometrists, ophthalmologists, nurses, optometric eye care patients and members of the general public. The Office has consulted with the Department of Health and the Medical Practice Board.

We reference 26 V.S.A. § 3105 which sets forth the criteria for sunrise review because the issues raised by an expanded scope of practice are somewhat analogous to those raised by initial licensure. We ask, "does the expanded scope of practice clearly harm or endanger the health, safety,

[3] The OPR website shows 238 persons who are or have been licensed. 47 are believed to be retired or deceased.

or welfare of the public?" We ask also if the potential for harm is recognizable and not remote or speculative. 26 V.S.A. §3105 (a) (1).

The ophthalmologists opposing S.54 maintain that this report should determine who is best able to treat patients, whether optometrists can perform the expanded functions "as safely as or with comparable quality to eye MDs (ophthalmologists)." The ophthalmologists ask if it is necessary to expand the scope of practice of optometrists. They argue against the sunrise standard stating it is,

> "not the only measurement by which this issue should be judged. Sunrise standards favor allowing everyone who may be 'adequately' qualified to practice in a given field to do so, while a public health standard looks more toward balancing the highest quality of care against issues such as public demand, access, need and cost."

David Weinberg, M.D., letter December 22, 2003. Referring to an earlier Commissioner of Health report and a draft of this report, Dr. Weinberg wrote, "No doubt these differences in approach led to the markedly different conclusions between your report and the one from the previous Commissioner of Health."[4] The review of S.54 which Dr. Weinberg advocates involves policy choices, not competency evaluations. As such, it is a matter beyond the sunrise analysis purview of the Office of Professional Regulation.

The ophthalmologists take the position that optometrists, "cannot perform these medical treatments 'as safely as' or with comparable quality to eye MDs (ophthalmologists)." Weinberg Dec. 22, 2003 letter.

We asked ophthalmologists to submit questions which they felt should be answered as part of this study. The Office found the questions drafted by David Weinberg, M.D., President of the Vermont Ophthalmological Society and a response drafted by Timothy Johnson, O.D., legislative Chairman of the Vermont Optometric Association to be extremely helpful to an understanding of the issues presented by this legislative proposal. They are reprinted in their entirety as Appendix A.

[4] In February 2002 the Commissioner of Health reported to the legislature on then pending H.116. She said she "took a public health perspective" and "cannot recommend this bill." She did write about other states' expansion of optometric practice. "After reviewing laws from all states, I could find no evidence for or against a scientific basis for law changes."

The Office took the opposing positions of the optometrists and ophthalmologists into consideration in analyzing weaknesses in each other's positions. At the first public hearing in August the Office issued an open invitation to the participants. The Office asked them to provide us documentation they could find of any known instances where optometrists treating glaucoma or using therapeutic pharmaceuticals have caused harm. The Office received no written documentation of harm until December. The ophthalmologists prepared and provided OPR a list with one paragraph recitations of 50 claimed instances of optometrists failing to diagnose or provide adequate treatment[5]. Optometrists, if asked, could produce a similar list of ophthalmological errors. A search of OPR records shows that the Office has received no complaint from any ophthalmologists. We have no way to assess the credibility of these claims. As recent highly publicized cases show, individual claims do not speak to the abilities of any profession as a whole. We believe that the overall record of optometrist treatment and safety is best reflected by their malpractice insurance rates. See Risk of Harm subsection on Malpractice Insurance as a measure of harm.

Our evaluation of the proposal ends with our conclusion:

The proposal for an expanded scope of practice does not, with appropriate safety measures, endanger the health, safety, or welfare of the public.

The Office does acknowledge that some modifications or additions to the proposal may be considered appropriate to address some credible concerns expressed during this process. See the section "OPR Suggestions" which follows this report's "Summary and Conclusion."

The Scope of S.54

- The most significant change to the optometry statutes is repealing the ban on "the treatment of glaucoma." 26 V.S.A. § 1728(b).

- The statute expands the scope of the practice of optometry by eliminating the restriction "performed without the use of drugs." 26 V.S.A. § 1703(2). Thus, the scope of practice for optometrists would be expanded to treating a disease or injury using "all pharmaceutical agents for the appropriate diagnosis, management, and treatment of the eye and adnexa.[6] " 26 V.S.A. § 1728. Note: Only those optometrists who are qualified to use therapeutic pharmaceutical agents are permitted the expanded scope of practice. The pharmaceuticals which optometrists currently use are no different from those used by ophthalmologists. Optometrists would be authorized to prescribe and administer injections including: epinephrine for anaphylaxis, injectable steroids, and all emergency medications.

[5]The list does not name the reporters or the optometrists. Dr. Weinberg wrote that ophthalmologists have been reluctant to come forward fearing reduced referrals and poorer professional relationships with optometrists.

[6] Adnexa means: The eyelids, with lashes and eyebrows, lacrimal apparatus, conjunctival sac, and extrinsic muscles of the eyeball.

- As introduced, the bill's provisions would permit optometrists to prescribe all controlled substances. This includes schedules I. through V. substances. The reality of optometric practice is that schedule I substances are not used. See, OPR Suggestions. Other controlled substances are rarely but predictably required as part of treatment. For example, optometrists do treat corneal abrasions which cause intense pain. They can anticipate prescribing oral antibiotics for lid infections. On the rare occasions where a patient has an unpredictable reaction to a medication, injections for anaphylaxis would be authorized.

- The statute leaves intact optometrists' authority to remove superficial foreign bodies from the eye, adding "and adnexa." The statute adds "by performing epilation of the eyelashes, punctal dilation, and lacrimal irrigation and insert punctal plugs." These are not surgical procedures. This additional language according to the proponents, recognizes these procedures which optometrists have been performing since 1994. The addition is intended to make clear that those procedures for removing foreign bodies are within the optometric scope of practice. The Board of Optometry has received no complaints about the performance of these procedures. Nothing in the testimony or comments received indicated any problem with optometrists in this part of their practice.

- The statute deletes the prohibition on the use of "therapeutic ultrasound" which is not performed by eye care providers. This was viewed as a "clean up" revision by the proponents. Optometrists agree that use of "therapeutic ultrasound" is not a part of their practice, current or proposed. Ophthalmologists told the Office that "therapeutic ultrasound" is "still used as a surgical treatment" for glaucoma and some eye tumors. This prohibition can be maintained.

- The proposed legislation retains the formulary contained in 26 V.S.A. § 1724 as a safeguard on optometric prescription discretion. The Office notes that in the past, all drugs sent to the ophthalmology department for approval have gone into effect with no comment, i.e, by default, and with no reported harm.[7] The ophthalmologists wrote to the Office stating that "several recent drugs were approved by the optometry board without notifying the chair of the U.V.M. Ophthalmology Department...." An Office, not Board, error resulted in a delay sending a list of drugs for approval. When the error was discovered in February 2002, the list of new drugs to be used was mailed. Once again they were approved with no comment. One June 2002 submission resulted in default approval as well.

- The new language says optometrists can "diagnose" rather than "ascertain" refractive and functional ability. Optometrists diagnose daily. Indeed, it is considered a failure to practice

[7] A suggested change to the new bill suggests that the Department of Pharmacology replace the Department of Ophthalmology as the consulting entity for drugs suggested for the formulary. See OPR Suggestions.

competently if one does not. The new language specifies "diagnose" rather than "detect the possible" presence of eye and adnexa disease or injury. The language recognizes that optometrists give a "diagnosis" rather than mere "detection...." These changes in language of the statute reflect the reality of current practice.

- The new language would permit optometrists who need to make referrals to make them to "the appropriate health care provider when warranted" rather than limiting those referrals to a "licensed physician when signs of possible disease or injury are found." This recognizes that optometrists would not have to refer 1) most glaucoma patients or 2) patients who need drugs the optometrist is permitted to prescribe. In some situations a licensed physician may not be the patient's primary medical provider. The provision recognizes that the patient may see the nurse practitioner most often. The nurse practitioner may be the medical professional with the most contact and information about the patient. In some cases the optometrist would refer a patient for reasons other than ophthalmological continuation of treatment.

- The proposed legislation would specifically add to prescribing and employment of ophthalmic lenses, prisms, "auto refractor or other automatic testing devices...as is consistent with the health of the eye." 26 V.S.A. § 1703(2)(b)(i). This is seen as a clarifying provision to make clear that such devices may be used as part of the optometry scope of practice. In fact, the devices are and have been used for many years. Specifying them in general terms in the statutes eliminates the need to specify which particular instruments may be used.

- Ambiguity: 26 V.S.A.§ 1728 specifies that an optometrist who possesses the endorsement permitting the use of therapeutic pharmaceutical agents may "remove superficial foreign bodies from the eye and adnexa." The statute adds that those same optometrists are permitted to perform "epilation of the eyelashes, punctal dilation, and lacrimal irrigation, and insert punctal plugs." The new 26 V.S.A. § 1729 speaks of certification to use therapeutic drugs and "perform other procedures." It appears that the language of 26 V.S.A. § 1728 and § 1729 together mean that "other procedures" are not additional procedures, but those specified in § 1728(2). See OPR Suggestions.

- As before, optometrists are not permitted to practice surgery.

Arguments in Support of the Proposed Legislation

Optometrists, the force behind S.54, argue that optometrists graduating from optometric schools are fully trained to treat glaucoma and use all appropriate pharmacological agents. They point to 47 other states' statutes which permit optometrists to treat glaucoma. Forty-one of those states permit prescription of glaucoma treating pharmaceuticals. Since 1994 Vermont has required a special endorsement to permit optometrists trained in pharmaceutical use to administer certain limited classes of pharmaceuticals for therapeutic purposes. The optometrists maintain that their training cannot be put to full use under the current statutes. They also argue that Vermont's limited scope of practice deters newly educated and licensed optometrists from locating in this state where the breadth of their training cannot be utilized.

Optometrists presented evidence of their educational background as primary care providers which includes ample training in the treatment of glaucoma and use of pharmaceuticals. See, Appendix A and Appendix B. They point to their mandatory continuing education requirements as a guarantee of continued competence. In response to training comparisons made by ophthalmologists, they point out that ophthalmologists are also trained as surgeons, something optometrists are not, and a factor considered when comparing their educational backgrounds. The most cogent summary of optometrists' position is contained in Dr. Timothy Johnson's answers to questions posed by David Weinberg, M.D. in Appendix A.

Continuing Education: No Vermont M.D. is required to take continuing education for license renewal. Only M.D.'s who wish to be Board Certified in a specialty or have hospital privileges have continuing educational requirements. Those are imposed through the certifying board or hospital, not state licensure. Ophthalmologists graduating since 1991 must be re-certified every 10 years. To maintain hospital privileges or board certification an ophthalmologist must generally take between 20 and 50 hours of continuing education per year. Weinberg letter Dec. 22, 2003. Optometrists point out that they too take required continuing education courses to ensure continued competence. See Appendix A. Optometrists who possess the certification needed to employ therapeutic pharmaceuticals are currently mandated to devote half of their continuing education (40 hours biennially) to their use. 26 V.S.A. 1716a. The training continues to include coverage of oral drugs used to treat eye conditions, even though optometrists are not permitted to employ them.

Optometrists cite the experience of other states and the Veterans Administration as proof that optometrists are competent to handle the requested scope of practice. At both public hearings, and in correspondence received by the Office, every optometry patient expressed complete confidence in the competence of their optometrist. Some patients related instances where their optometrist's monitoring of their glaucoma actually helped their ophthalmologist provide appropriate treatment.

Schools of optometry cover pharmaceuticals in their curricula. Optometry students are tested on it. All optometric graduates since 1994 automatically qualify for the endorsement to use therapeutic pharmaceuticals. Optometric doctors who graduated before that date would not be allowed to prescribe and employ therapeutic pharmaceuticals or treat glaucoma without earning a TPA endorsement.

The instruments which optometrists use now to detect glaucoma are the same ones used to monitor the effectiveness of its treatment, e.g., tonometer, peripheral vision measuring devices, optic nerve head viewer, ophthalmoscope/slit lamp photo units. Optometrists currently use lasers for diagnostic testing. The use of lasers is becoming more common for mapping the optical nerve head. Use of lasers for diagnostic purposes quantifies and monitors changes over time. The computer measures and reports changes much more precisely than previously possible through visual observation.

Indirect Benefits of the Proposed Legislation

Medical Expenses Reduced: The proponents argue that the bar to optometrists treating glaucoma increases the cost of medical care. Optometrists are trained to treat glaucoma. They are already required to diagnose it. Under current law when they detect glaucoma, they are then required to make a referral to an ophthalmologist who conducts the same examination. If optometrists are permitted to treat glaucoma, this redundancy would be eliminated. Ophthalmologists speculate that costs may not be decreased because optometrists "might" treat patients who do not require treatment.

Complete treatment: Optometrists cannot now prescribe oral analgesics or oral pain relievers as part of removing a foreign object. They cannot now prescribe oral antibiotic medication as part of the same procedure. An optometrist must find an M.D. or nurse practitioner to make the prescription. The prescription often is given based on the optometrist's telephone referral only. The proposed change in prescription authority would eliminate a wholly unnecessary extra step.

Patient Inconvenience Reduced: The bar to optometrists treating glaucoma results in patient inconvenience, primarily to the elderly, for whom transportation to an ophthalmologist's office can be problematic. This was made abundantly clear from letters from patients and by the testimony of patients at OPR's second public hearing. Getting to the ophthalmologist's office sometimes involves family members or others taking time from work to ensure that the glaucoma sufferer can visit an ophthalmologist to obtain the eye drops necessary for treatment. None of the patients heard from was deprived of needed emergency care, but community optometrists certainly present a more convenient option for many patients in Vermont's smaller towns. Optometrists prescribing the oral medications and drops used to treat glaucoma would make eye care more easily accessible. Optometry patients who testified and wrote to the Office all supported legislation which would permit their optometrists to treat glaucoma.

Access to eye care: There are two aspects to this issue: 1) finding a practitioner who can provide the treatment necessary, and 2) getting to that practitioner. Ophthalmologists point out, and the Office concurs, that there is a sufficient number of ophthalmologists in the state so that eye care patients are not deprived of appropriate eye care.

If the patient needs glaucoma treatment, the patient receives a referral to see an ophthalmologist for treatment of glaucoma or the patient's primary care physician for other medications. When this occurs, the patient must make another appointment enduring some delay. Sometimes the patient does not follow through on the referral and "falls through the cracks." One optometrist who took over a practice from an ophthalmologist reported that even when his office sent certified letters with return receipts to patients asking them to come in for follow up care, a large number of patients referred to the ophthalmologist did not follow up or even pick up their records for continued care. Other times when the patient does follow through, the referring optometrist will suggest to the primary care physician what specific medication is appropriate. This seems to vitiate the requirement of such a referral.

Family members or friends must sometimes take up to a half day to drive a patient to an ophthalmologist for what is often an appointment of less than one hour. A typical glaucoma check

and visual includes measurement of the eye pressure, examination of the optic nerve head and visual field test. Generally these measurements take about 45 minutes.[8] Traveling to an ophthalmologist is not an insurmountable obstacle to treatment, but a hurdle more difficult for some than others. If an optometrist were permitted to treat the condition locally, that hurdle would be removed. Optometrists routinely make referrals to ophthalmologists. Geographical proximity does not govern. Optometrists provide a choice of ophthalmologists whom they believe will provide the best outcome for the patient.

Once a patient has been treated by an ophthalmologist, the patient often is monitored by the optometrist who made the initial diagnosis. The optometrist consults with the ophthalmologist when necessary, the ophthalmologist sometimes making changes in medication on the optometrist's suggestion. Many maintain a close and satisfactory relationship.

The Office agrees with the ophthalmologists, that the "access" issue is one of inconvenience, delay, and transportation impediments, not a total lack of eye care treatment resources. For patients with serious transportation problems, there are available public transportation services. Many, especially the elderly, are apparently unaware of the transportation options available to them.

Arguments in Opposition to the Legislative Change

Ophthalmologists, the opponents of the bill, argue that optometrists are not as well trained and cannot treat glaucoma or use therapeutic pharmaceuticals "as safely" as ophthalmologists. Ophthalmologists point out that some of the drugs used to treat glaucoma, or used in the office can cause dangerous adverse reactions. As fully trained medical doctors, the ophthalmologists believe they are best qualified to understand the "whole patient" and make the most appropriate diagnosis and prescriptions. See discussion in harm section, Appendix A, and Appendix B, Educational Requirements. Dr. Weinberg wrote that "no internists or family physicians treat glaucoma. They do not have the additional training, experience or expertise to diagnose and manage patients with glaucoma."

Optometrists complete a comprehensive educational and training program. They receive a doctoral degree after four years of accredited graduate school and over 2,400 hours of clinical experience. See Appendices A and B. They are credibly tested for competence in areas of human biology including ocular/visual biology, theoretical, ophthalmic, and physiological optics, psychology, clinical science, and in treatment and management of ocular disease. See Optometry testing in Appendix 2. The ophthalmologists compare their training including larger numbers of patients seen during training to optometrists implying that optometrists' ability to provide primary eye care is somehow inferior.

[8] Note: Medicare pays for only one visual field examination per year. This test alone takes only 15 or 20 minutes depending on the level of testing and the type of testing device used.

The Office concludes that recent optometric graduates and optometrists possessing TPA authority do possess sufficient education and training to use therapeutic drugs and treat glaucoma.

Optometrists are at no disadvantage when prescribing the drugs used in their practice so long as they, like ophthalmologists have an adequate patient case history or communication with the patient's primary care provider. See, Appendix C, Pharmaceuticals, and OPR Suggestions.

The opponents speculate that "less experienced providers" might order a greater number of tests to provide comfort in treatment decisions. We have no information to evaluate this claim. The number of tests used would vary within either profession according to the experience of the practitioner.

Opponents suggest that the proposed legislation's permission to perform "appropriate procedures" could lead to the following: fluoresceine angiography, indocyanine green angiography, removal of benign skin lesions involving subcutaneous injections, sub tenon injections, retrobulbar injections, intraocular injections, ketamine (IM) for an infant's exam under anesthesia, management of skin and conjunctival neoplasms, and botox injections. With the exception of fluoresceine angiography which is performed by optometrists at V.A. facilities, and removal of **superficial** benign skin lesions, none of these procedures is seen by Vermont optometrists as necessary to primary eye care treatment. See, OPR suggestions.

One opponent to the bill implied in one public meeting that permitting optometrists to prescribe controlled substances could lead to more drug abuse. The Office knows of no evidence to support that contention.

Risk of Harm from an Expanded Scope of Practice

The Vermont Experience: Optometrists' scope of practice has been expanded twice before. In 1984 Vermont joined other states and permitted optometrists to employ topical drops for diagnostic purposes. In 1994 Vermont law permitted optometrists with proper training to use topical medications to treat eye diseases except glaucoma. 26 V.S.A. § 1728. Each proposed expansion of the scope of practice drew predictions of harm to Vermonters. Since 1989 there have been eight disciplinary actions taken against optometrists.[9] None arose from harm to patients reflecting less

[9] 1989 deceptive advertising
1989 conviction of a sexually related crime
1989 failure to provide copies of contact lense prescriptions
1993 failure to provide copies of contact lense prescription
1993 failure to provide copies of contact lense prescription
1993 use of a pharmaceutical beyond the scope of practice (use of a topical anesthetic)
1993 use of a pharmaceutical beyond the scope of practice (use of a topical anesthetic)

than competent treatment.

Other States and Federal Government: Past performance is often a reliable predictor of future behavior. The experience of the VA and the other 47 states which do permit optometrists to treat glaucoma and the 41 states which permit use of oral therapeutic pharmaceuticals provides support for the proposed legislation. All states which have made such expansions in the past have retained them.

The federal government, through the Veterans Administration permits optometrists the full scope of practice proposed by this legislation and more. According to Dr. Dorothy L. Hitchmoth, Chief of Optometry, Department of Veterans Affairs, White River Junction,

> "there are no restrictions on the type of medications that optometrists can use to treat glaucoma in the VA. All topical and oral medications currently approved by the FDA for the treatment of glaucoma are prescribed and used independently by optometrists in the VA system. There is no oversight, review, or consultation with an ophthalmologist or other M.D. required."

Dr. Hitchmoth continued, "Optometrists for [sic] have used glaucoma medications with expertise over 30 years in the federal system and over 20 years in many other states. Our track record is proven in peer reviews, quality assurance reviews, and state licensing boards across the country." The Office has seen no evidence to cast doubt about optometrists' performance.

The optometrists submitted statistics from the Association of Regulatory Boards of Optometry (ARBO). The Office has confirmed that in fact as of June 2003 there were no reported cases of optometric disciplinary actions or even complaints against optometrists reported to ARBO in the previous 12 months regarding prescribing pharmaceuticals or treatment of glaucoma.

1998 inappropriate sexual comments.

Malpractice Insurance, a Measure of the Risk of Harm: An indirect but conservatively reliable measure of how optometrists are practicing is mirrored in their malpractice insurance premiums. One would expect that problems with treating glaucoma and providing complete primary eye care would result in higher premiums. Information obtained from the American Optometric Association, Optometrist Professional Liability application, underwritten by the Chicago Insurance Company shows that in 2002 optometrists paid $415 per year for $2,000,000.00 per incident coverage for optometrists in this rating zone.[10] It is noteworthy that there is no difference in the malpractice premiums in states which allow the expanded scope of practice sought here and those for Vermont optometrists. This is perhaps the best indicator that concern of increased harm to the public, while well-intentioned, is unsupported by experience.

OPR Suggested Safety Modifications to S.54

- "Mandatory Referrals: The optometrist shall refer a patient diagnosed with glaucoma to an ophthalmologist for treatment if any one of the following is applicable:

  a) the patient is under 16 years of age.

  b) the patient has been diagnosed with malignant or uncontrolled glaucoma or neovascular glaucoma.

  c) the patient has congenital glaucoma.

  d.) the patient has been diagnosed with acute closed angle glaucoma. **The provisions of this subsection do not prohibit the optometrist from administering appropriate emergency stabilization treatment to the patient.**"

- "After 30 days notice to and consultation with ~~an ophthalmologist~~ a doctor of pharmacology designated by the head of ~~ophthalmology~~ pharmacology at the University of Vermont, the Board shall define the specific oral and injectable drugs or classes of drugs ~~and concentrations thereof~~ which optometrists shall be allowed to use pursuant to this subchapter and subchapter 6 of this title and shall notify the State Board of Pharmacy of the board's actions.

- "Optometrists are not authorized to prescribe Schedule I drugs."

- "Prescriptions for Schedule II drugs should be limited for use of no more than seven days at FDA recommended appropriate usage strength."

[10] This insurance zone includes: Alabama, Arizona, Delaware, Hawaii, Idaho, Indiana, Kansas, Kentucky, Maine, Maryland, Mississippi, Montana, Nebraska, New Hampshire, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

• "An optometrist licensed in this state and certified to use therapeutic pharmaceutical agents must show proof of current cardiopulmonary resuscitation certification as a condition of initial TPA certification and of license renewal. Acceptable courses shall include (1) courses in external cardiopulmonary resuscitation which are approved by the Vermont Heart Association or the American Red Cross; and (2) courses which include a review of diseases or conditions which might produce emergencies, such as anaphylactic shock, diabetes, heart condition or epilepsy. "

• "Indocyanine Green Angiography, removal of benign skin lesions involving subcutaneous injections, sub tenon injections, retrobulbar injections, intraocular injections, ketamine (IM) for an infant's examination under anesthesia, management of skin and conjunctival neoplasms, and botox injections are not part of the optometric scope of practice."

• "Optometrists certified to use therapeutic pharmaceutical agents shall, as part of required continuing education, receive not less than X per cent of their continuing education in the use of pharmaceuticals, including treating possible complications arising from their use, and the treatment of glaucoma." Note: TPA certified optometrists must now take 50% of their 40 hours biennially "related to therapeutic drugs and treatment of ocular disease." Board Rule 4.3.

C "Informed Consent: Before treating a patient for glaucoma each patient shall be provided an informed consent form which will notify the patient that the patient may be treated by the optometrist for glaucoma, or by an ophthalmologist. The form shall explain that ophthalmologists are surgically trained and may treat the types of glaucoma specified above which the optometrists do not treat. Each patient shall be notified of his or her right to a second opinion regarding diagnosis or treatment of glaucoma. The signed informed consent form must be filed in the client's record, and a copy must be provided to the client."

• "An optometrist employing beta-blockers or any other oral therapeutic pharmaceutical agent, as may be identified and designated in the future by the Board, which might prove to have significant systemic adverse reactions or systemic side effects shall, in a manner consistent with the other statutes, ascertain the risk of systemic side effects through either a case history or by communicating with the patient's primary care provider. The optometrist shall also communicate with the patient's primary care provider, or with a physician skilled in diseases of the eye when, in the professional judgment of the certified optometrist, it is medically appropriate to do so. The communication shall be noted in the patient's permanent record. The methodology of communication is left to the professional discretion of the optometrist."

• "Duration of treatment without referral: If the glaucoma patient does not respond to topically administered pharmaceutical agents and oral medications within a reasonable time, the patient shall be referred to an ophthalmologist."

• retain the words "the use of therapeutic ultrasound" to prohibitions section of § 1728(b).

• delete the word "by" preceding "performing epilation" in § 1728(2). Epilation and the other procedures listed are not related to the removal of superficial foreign bodies from the eye.

- "No optometrist may perform treatments or provide services which he or she is not qualified to perform or which are beyond the scope of his or her education, training, capabilities, experience, and scope of practice."

*** Summary and Conclusion ***

OPR's charge in this investigation is to report on whether passage of S.54 would "in any way endanger the health, safety, or welfare of the public." The Office issued an open invitation for opponents of this legislation to provide evidence of harm caused by an expanded scope of practice. The Office has received no documented case indicating that optometrists lack sufficient training to safely diagnose and treat glaucoma or use pharmaceuticals.

The Office of Professional Regulation concludes that passage of S.54 with appropriate safety measures added to the legislation would not endanger public health, safety or welfare.

Jessica G. Porter, Director
Office of Professional Regulation
Vermont Secretary of State
December 31, 2003

APPENDIX TO REPORT ON S.54

Appendix A
Ophthalmologist Questions and
Optometrist Answers

Dr. Weinberg's comments and questions are in bold. Dr. Johnson's responses are in italics.

Q: As you know, we are concerned that quality of eye care in Vermont may be reduced as credentialing standards regarding education, training, testing, continuing education and recertification are decreased.

A: *Education and Training*

The education and training of optometrists has increased exponentially for the profession of optometry since the first practice Act was enacted in 1901. Optometry has long been a doctoral-level independent health profession with similar education, training, and testing standards as medicine, dentistry, and podiatry. In fact, doctors of optometry are awarded their doctoral degree at the same point in the educational pathway as medical doctors, dentists, and podiatrists (after 4 years of graduate school). All optometry schools provide or require courses in human anatomy and physiology, biochemistry, microbiology, genetics, immunology, pharmacology, systemic pathology and clinical medicine, and neuroanatomy and physiology, Of course, the specific courses in ocular anatomy and physiology, ocular pathology, and ocular pharmacology are also provided. The curriculum of any optometry school is readily available and continuously subject to accreditation standards.

Testing

Most states, including Vermont, require passage of the National Board of Examiners in Optometry (NBEO). Other professions look to the NBEO as a model. The Executive Director of the NBEO, Norman Wallis, OD, is also on the board of the National Board of Medical Examiners. The current ruling in Vermont reads, "We require you to submit evidence that you have successfully passed all parts of the examinations of the National Board of Examiners in Optometry (Parts I, II, III, and Treatment and Management of Ocular Disease – TMOD)". Part I tests basic health science (1.5 days in length). Part II tests clinical science (1.5 days in length). Part III tests patient care and is a practical test of clinical procedures on actual patients in a one-to-one (examiner-to-candidate) format (1 day in length). The test on Treatment and Management of Ocular Disease (TMOD 1 day in length) is self-explanatory. More information can be obtained at http://www.optometry.org/exam_descriptions.htm.

Continuing Education and Recertification

By Vermont state law, therapeutically authorized optometrists must complete 40 hours of State Board approved continuing education every two years for license renewal. Medical doctors (including

ophthalmologists) are not required by state statute to take any continuing education for Vermont state license renewal. This can be verified at http://www.clearhq.org/fall_news_03_CErequirements_chart.htm. If an ophthalmologist chooses to voluntarily obtain and maintain "board certification" from a nongovernmental board, such as the American Board of Ophthalmology, then continuing education will be required to maintain that certification. However, there is no law in any state, including Vermont, requiring any medical physician (including ophthalmologists) to obtain "board certification" for state licensure or to maintain that certification to renew their state license. In other words, ophthalmologists require continuing education for "board certification" or hospital privileges, but not for state licensure.

Q: **The optometry lobby readily admits that they want to be able to practice at the identical level as ophthalmology (except for surgery), i.e. medical ophthalmology, and the pending legislation would provide for exactly that.**

A*: Vermont optometry seeks to obtain authority to practice optometry (i.e. primary eye care). No more, but no less. This is what we are educated and trained to do. Many conditions or diseases of the eye require and will continue to require referral to an ophthalmologist for surgery or to another specialist for secondary and tertiary medical eye care.*

Q: **We feel strongly that their background is <u>not</u> comparable to that of an ophthalmologist. As such, we feel they are attempting to achieve through legislation what they have <u>not</u> achieved through education and training, in other words, to practice medicine.** (*emphasis in original*)

A: Doctors of Optometry are educated and trained to be optometrists. Ophthalmology is a subspecialty of Surgery. Therefore, our education and training is not identical. Ophthalmologists receive extensive training for years in surgery and tertiary medical eye care that optometrists do not receive. Optometrists receive training in refractive and visual science that ophthalmologists do not receive. However, in the areas where our scopes of practice overlap (i.e. primary eye care), our basic health science background is comparable to medicine, dentistry, and podiatry (see the previously submitted comparison provided by Dr. Dorothy Hitchmoth) and we receive the necessary specialized ocular education and clinical training required to provide primary eye care (see the curriculum of any optometry school).

Q: **Here are some points/questions- some of which were raised at the hearing- which we feel are relevant to this issue of reduced credentials to treat diseases of the eye.**

What are the minimum national standards for all aspects of the clinical training for optometrists? (The ODs stated that they had uniform minimum standards.)

Are they uniform across all of the optometry schools in this country?

A: *All optometry schools are accredited by the Accreditation Council on Optometric Education (ACOE). All US medical schools are accredited by the Liaison Committee on Medical Education (LCME). Both accrediting bodies are recognized by the US Department of Education (USDE). The*

USDE has standards that the accreditation bodies must meet in order to be recognized. These accrediting bodies establish uniform standards that the individual schools must follow for accreditation. These standards do not require accrediting bodies to specify curriculums. This is left to the individual medical or optometry school. The individual schools must show that their curriculum meets the standards (and other criterion such as goals of the program, entry-level knowledge, etc.) in order for them to receive accreditation. Every medical and optometry school establishes minimum standards for clinical training. Uniformity is not a requirement from the accrediting body for neither medical nor optometric programs.

Q: **How are they enforced?**

A: *If a medical school or an optometry school does not maintain minimum standards, their accreditation recognition can be shortened in length prior to the next full program review, diminished (made provisional), or taken away entirely.*

Q: **Where are they listed?**

A: *ACOE Professional Optometric Degree Program Standards 2000 (reviewed 2001)*
http://www.aoa.org/students/pdf/pods.doc

LCME (Liaison Committee on Medical Education) Accreditation Standards
http://www.lcme.org/functionslist.htm

Q: **Are they in any way comparable to the minimum standards imposed on the education and training of ophthalmologists in terms of the number of patient visits; setting; supervision; number of diseased patients seen; number and types of eye diseases seen; and degree of complexity of those patients?**

A: *The standards imposed by the respective accrediting bodies concerning the clinical experiences of medical and optometry students are remarkably similar:*

"ED-2. Each course or clerkship that requires physical or simulated patient interactions should specify the numbers and kinds of patients that students must see in order to achieve the objectives of the learning experience." LCME

"6.8. The quantity, quality, and variety of experiences in the supervised care of patients must be sufficient to develop clinical competency for entry level practice." ACOE

Since the objectives of the clinical experience are not identical (optometrists are trained in primary eye care and ophthalmologists are trained in secondary and tertiary ophthalmic surgery), it stands to reason that the number and types of patients seen in clinic will not be identical. Optometry students probably see a higher proportion of primary care patients; and ophthalmology residents probably see a higher proportion of tertiary and surgical patients.

Q: **Do all optometrists do a residency after optometry school? What is the nature of these residencies? Are they in any way comparable to an ophthalmology residency? (We understand that 5th year residencies are increasing among optometrists. However, only 10- 15% of ODs presently do such additional optometry residency training.)**

A: *Because optometry is a primary care profession, residencies are not part of the normal education and training process. Just as with dentists, an optometrist graduates from the professional degree program ready to practice. As with dentistry, there is little specialization in optometry, making completion of a residency unnecessary for most practitioners. In addition, based on need/demand, there are only residency slots available for approximately 10% of each graduating class. Because medicine is so specialized, very few states, if any, will license a medical school graduate without some sort of residency. For most medical practitioners, a residency is necessary. Before podiatry was granted the authority to perform surgery of the foot and ankle, residencies were not common place either. With the addition of surgery to their scope of practice, podiatrists were required to complete residencies and the number of residency slots grew appropriately.*

Q: **Mary Hitchmouth [sic], OD testified that the language of the VT bill was more conservative than what is allowed in most of the rest of the country. We read the proposed VT bills and found them to be extremely open-ended, and would like to ask how the optometrists are reading it otherwise.**

A: *Mary Hitchmoth? Dorothy Hitchmoth, OD was recently named Young Optometrist of the Year by the American Optometric Association and we are very proud of her. The language of the Vermont law is more conservative than what is allowed in the rest of the country. The language of the introduced bill is admittedly broad and open-ended for very good reasons. All other doctoral-level independent health professions in Vermont have open-ended laws and aren't subjected to the periodic, tortuous up-dates that optometry has had to undertake. No other independent, doctoral-level practice act specifies individual medications and specific procedures. Vermont's optometry law was successfully up-dated in 1984 and 1994 despite the identical concerns and dire predictions made by organized ophthalmology now. Vermont optometrists, as well as optometrists across the nation, have demonstrated judicious use of our practice privileges. We believe state law should reflect our capabilities and accommodate the evolving nature of health care. The profession should not be micromanaged in state statute.*

Q**: She also testified that injectibles would only be used in cases of allergic reaction. First, how will that be enforced? Secondly, that's not how the legislative bills currently read. Thirdly, we have concerns regarding the ability of non MDs to discern what is truly an allergic reaction, given their limited, if any, general medical training.**

A: *Anaphylaxis (allergic reaction) is the most common reason that optometrists are allowed to administer injections of epinephrine (adrenalin) in other states. Dentists, nurses, physician assistants, policemen, EMS personnel, and lay persons with allergies are often equipped with autoinjectors for epinephrine to treat allergic reactions. If ophthalmology were indeed concerned about protecting the public, they would be insisting that optometrists should be prepared to deal with*

the anaphylactic reactions that could be precipitated by any of the medications we've been using since 1984.

Concerning other injectibles, optometrists would only perform limited primary care procedures such as treatment of chalazion and diagnostic fluorescein angiography. The remaining injectibles with applications in eye care are used in surgery or secondary and tertiary eye care which optometrists do not provide and therefore would not use.

A: **One optometrist testified that VT was becoming a "backwater" and that no new optometrists would come here under the existing scope of practice. Do they have any proof of this, other than the few anecdotes stated? At the hearings in 2002, evidence from the Secretary of State's records showed new young optometrists continue to seek licenses in VT.**

A: *Scope of practice is a consideration by new graduates as evidenced by the numerous requests we receive for copies of our state law, but it isn't the only consideration. Family ties and quality of life issues are also considered. In an average year, 10 new licenses are issued by the State Board of Optometry, but only 1 or 2 actually decide to live and practice in Vermont each year. The concern is that the best and brightest new graduates may give greater consideration to scope of practice limitations and will seek professional opportunities elsewhere. The limited scope of optometric practice in Vermont does lead to the "backwater" perception within the profession.*

Q: **Tom Terry testified that the continuing education requirements of medical doctors are nowhere nearly as stringent as that for ODs. Where is the evidence of this? Indeed it seems like the continuing medical education requirement for physicians (ophthalmologists), which is 50 hours of category 1 CME credit per year, is twice the number of hours required for ODs, based upon the testimony given at the last Secretary of State hearing.**

A: *As stated earlier, optometrists are required by law to complete continuing education requirements to renew their Vermont license. Ophthalmologists are not required by law to take any continuing education to renew their Vermont license. Ophthalmologists who chose to be board certified by the American Board of Ophthalmology are currently required to take 300 hours of continuing education every 10 years (240 hours must be in ophthalmology, the rest can be in general medicine). That is an average of 30 hours every year, not 50.*

Q: **You asked whether the re-certification requirements showing continued competency were comparable between the 2 professions. They are not, and the answer we believe given by optometry was that their 20 hours of continuing education should suffice.**

A*: Section 1716a of the Vermont Optometry Practice Act currently requires 40 hours of continuing education for renewal of a state license for therapeutically authorized optometrists (virtually every optometrist in the state).*

Q: **When asked whether any distinctions should be made between recent graduates and older graduates of optometry school, Tom Terry also testified that the same training for glaucoma**

had been in place for 38 years in optometry schools and for 20 years regarding the use of injections. Not only does this "fly in the face" of the argument that changes in education and training for ODs are what supports their request for an expanded scope, but it begs the question: Where would they have been allowed to get this training decades ago? Even if they had received appropriate training in treating glaucoma 38 years ago, wouldn't they have some concern that any skills gained would become somewhat stale after not treating a glaucoma patient for so many years.

A: *In the past, since the 16 optometry schools train optometrists to serve all 50 states, the colleges were granted exemptions to state scope of practice limitations to fully train graduates wherever they may practice. This was necessary in 1971 when Rhode Island first allowed diagnostic pharmaceuticals, in 1976 when West Virginia first allowed topical pharmaceuticals (including glaucoma treatment), and in 1977 when North Carolina first allowed oral pharmaceuticals. Optometry schools train students to a level that allows them to practice anywhere in the world and established satellite clinics at military bases, veteran's hospitals, and Indian reservations (which were all exempt from state scope of practice limitations) for this very purpose. In the early years, these clinics were under the supervision of ophthalmologists. We fully admit that we first learned how to treat glaucoma from ophthalmology and we continue to learn from ophthalmology research.*

Optometrists are learned doctoral-level healthcare professionals. There is an implied assumption made at this level of education and training that, like medical physicians, practitioners will seek necessary education throughout their careers to stay current. Indeed, that is what our continuing education requirement is all about. Doctoral-level healthcare providers are expected to know when to refer, when to learn more, etc. If not, then every time a new surgical procedure or instrument for ophthalmologic care was approved, the legislature would have to enact a new law stating what education and training an ophthalmologist must complete prior to using this new procedure or instrument.

Although Vermont optometrists aren't currently allowed to treat glaucoma, we see glaucoma patients every day. We are required to diagnose the condition (to the same standard of care as an ophthalmologist) and that is often more difficult than treating the disease. We continue to see these patients, either in co-management or for other eye care needs, so we must be aware of their medications and possible side-effects. The diagnosis and treatment of glaucoma have made great strides in the past decade. We (ODs and MDs) are now able to diagnose glaucoma earlier in the course of the disease and new medications are more effective with fewer side effects. This is why the VOA sponsors several courses in glaucoma advances every year (including lectures by ophthalmologists). We have already submitted a list of glaucoma-specific continuing education offered in Vermont since 1994. This does not include the many other overlapping courses and oral medication up-dates Vermont optometrists attend at regional and national conferences.

Q: **You asked for specifics regarding the number and types of glaucoma patients seen by ODs in optometry school. We believe that obtaining this information and comparing it to the same data for Ophthalmology students is critical. We also think you should ask the comparable nature of the treatment allowed and supervision given to these students in their training.**

A: *While the types of patients being examined vary from student to student—due to variability between one training site and another (as well as from one day's schedule to the next)—a review of Pacific University's student Patient Billing & Coding Logs (electronic) reveals that the average student in the 2002 graduating class had an average of 2500 patient encounters and spent over 1900 hours in supervised clinical care. No fewer than 1500 of a graduate's "intern of record" patient encounters have involved pathology of an ocular, systemic, or mental health nature. Of this number, no fewer than 75-85 of the cases have included glaucoma.*

Pacific University is affiliated with 111 clinical sites. There is at least one licensed optometric educator teaching at each site, and the grand total is 264, with each of these optometrists possessing drug-prescribing privileges. Each doctor has adjunct faculty rank. In addition, across this clinical network, there are 165 licensed MDs working directly with the students and the patients they are seeing. They, too, have adjunct faculty appointments. Pacific's clinical curriculum is very representative of the curriculum supported at all accredited optometry programs in the US. Further information can be obtained from any optometry school.

Of course, Vermont optometrists see many more patients with pathology, including glaucoma, during routine, day-to-day practice than any optometry student.

Q**: We anxiously await the responses to your question of the comparability of their clinical rotations in general medicine such as internal medicine, cardiology, pulmonary medicine, dermatology, etc. We believe that a general medical background/education regarding a wide variety of systemic illnesses of the body- for example, the multiple chronic conditions which many elderly glaucoma patients frequently have- is critical in providing the highest level of medical care for treatment of glaucoma, in prescribing all drugs, and treating eye diseases in general. The medications used in treatment of glaucoma and other eye diseases will enter the bloodstream and have a wide range of potentially serious effects on other organ systems, e.g. the heart, lungs, brain, etc., as well as potentially dangerous interactions with other drugs with which optometrists may be unfamiliar, given their limited general medical training.**

A*: This is the same argument used against optometry in 1972 when an ophthalmologist from Rhode Island claimed to the VT Senate Health and Welfare Committee that optometrists would precipitate heart attacks and death by using medications to dilate the pupil (Free and Independent by Sen. Frank Smallwood). It's now a different group of ophthalmologists, but it's the same scare tactics we heard in 1984, in 1994, and today. Certainly we have established the basic health science background optometrists receive, proven the training we receive to provide this level of care, and demonstrated the professional judgment this scope of practice requires.*

Q: **Finally you had asked both groups for a generalized description of glaucoma. We just learned that we have not gotten that to you and will do that shortly.**

A*: As far as a generalized description of glaucoma is concerned, we don't even need to answer this question. We are in complete agreement with ophthalmology on the diagnosis, treatment, and*

management of glaucoma as long as it is not described as "a disease that can only be treated and managed by an ophthalmologist."

Q**: We also do intend to provide you with an answer to your question of " Where we would suggest drawing the line" on this issue regarding what medications would be less risky for optometrists to prescribe. You may recall that I said I'd prefer to not answer that question 'off the cuff'". Indeed, I hope you will be able to come to the Vermont Ophthalmological Society meeting at the Inn at Essex on 10/18/03, where that question can be answered more fully, with the input of many other practicing ophthalmologists in Vermont.**

A*: In our experiences meeting with the ophthalmologists, the reasonable ophthalmologists (and there are a few) either won't attend the meeting or won't speak out because the hardliners will pressure them. It may be helpful to talk to ophthalmologists (without Vermont peer pressure) in states where this issue was resolved years ago.*

End questions and answers D. Weinberg, M.D., and T. Johnson, O.D.

Appendix B Educational Requirements
Optometry Degree v. Medical Degree

Source: Dorothy Hitchmoth letter

Optometry degree curriculum vs. medical degree curriculum
The New England College of Optometry (NEWENCO)
Dartmouth Medical School (DHMC)

The New England College of Optometry Curriculum

This information is taken directly from the NEWENCO website, www.ne-optometry.edu

The curriculum of the four-year program is organized and delivered through four departments: Vision Sciences, Biomedical Sciences, Community Care and Public Health, and Specialty and Advanced Care. Each course is developed as one step in a sequence designed to facilitate each student's mastery of the knowledge and skills required of an optometric professional capable of managing conditions of the human eye and visual system.

The ***Department of Vision Sciences*** provides course material leading to an understanding of the theory and application of optics as well as the structure and function of the normal and abnormal visual system. To that end, the content of the vision science curriculum is presented within four general areas: optics, vision testing, binocular vision and visual neuroscience. The ***Department of Biomedical Sciences*** courses provide the student with an understanding of the normal and abnormal structure and function of the human organism. A background is provided in the fundamental anatomical, biochemical, and biophysical mechanisms; the physiological, immunological, and pathological processes; and the diagnosis, treatment, and management of ocular disease.The ***Department of Community Care and Public Health*** provides classroom education, technical workshops, and clinical training to help students develop their patient care skills and to understand the role of optometric care within the greater health care delivery system. Emphasis is placed on balancing scientific knowledge, technical expertise, problem-solving ability and personal interactions to stimulate doctors-in-training to become competent, compassionate, eye care professionals. Clinical assignments are selected based upon their offering diverse patient populations, exposure to state of the art instrumentation, and supervisory faculty who are committed to both patient care and education.The ***Department of Specialty and Advanced Care*** offers courses and clinical programs that encompass the specific background, skills, clinical insights, and patient-management capabilities required of optometrists within the specialized clinical realm of contact lenses, low vision, and pediatric optometry and binocular vision. The curriculum provides a foundation that integrates basic science with clinical science and is directly related to the provision of clinical care of patients within these specialized subject areas.Clinical experiences enable students to become competent optometric professionals who can integrate scientific knowledge with clinical insights to diagnose, treat, and manage visual and ocular problems and co-manage related systemic conditions. The preceptorship method is used throughout the program. It calls for close initial supervision by licensed faculty, with the students assuming more responsibility over time. The role of the preceptor slowly changes from supervisor to consultant. The students' final year is entirely clinical with assignments to an array of diverse practice settings.

Displaying results for OD1 for ALL term(s). FIRST YEAR

Coursename	*Coursenumber*	*Instructor*	*Lecturehours*	*Labhours*	*Otherhours*	*Credit(s)*	*Department*	
THEORY & METHODS OF VISION TESTING	VS11201	J. Comerford	52 hours (4 hrs/wk.)	6 hours (3, 2 hr. labs)	none	5.5	VS	Fall
OPTICS I	VS11001	N. Coletta	52 hrs (4 hrs/week)	12 hrs (6, 2 hr labs)	none	6.0	VS	Fall
PRINCIPLES & PRACTICE OF OPTOMETRY IA	CPH12005	N. Carlson	39 hrs (3 hrs/week)	26 hrs (13, 2 hr labs)	(patient care) 8 hrs	5.5	CCPH	Fall
BIOCHEM, MOL BIOL, & CELL PHYSIOLOGY (OF DIABETES & GLAUCOMA)	BSD10203	M. Zorn	65 hrs (3.8 hrs/week)	6 hrs (3, 2 hr labs)	(seminars) 4 hrs (2, 2hr sessions)	7.0	BSD	Fall
CELL BIOLOGY & HISTOLOGY	BSD10200	D. Troilo	55 hrs (4.25 hrs/wk)	6 hrs (3, 2 hr. labs)	none	6.0	BSD	Fall
HUMAN ANATOMY	BSD10008	T. Freddo	52 hrs (4.0 hrs/wk)	26 hrs(13, 2hr labs)	none	6.5	BSD	Fall
OPTICS II	VS11002	E. Loewenstein / B. Wong	56 hrs (3.5 hrs/wk)	32 hrs (16, 2 hr.labs)	none	7.0	VS	Spring
INTEGRATIVE SEMINAR I	IDS14004	M. Zorn / A. Denial	none	none	(pbl) 16 hrs (2 hrs/alt. weeks)	1.5	IDS	Spring
PRINCIPLES & PRACTICE OF OPTOMETRY IB	CPH12006 / CPH 12106	N. Carlson	51 hrs (3 hrs/week)	34 hrs (17, 2 hr labs)	(patient care) 24 hrs	7.0 / 1.0	CCPH	Spring
SYSTEMS PHYSIOLOGY & HISTOLOGY	BSD10201	D. Troilo	60 hrs (3.5 hrs/week)	10 hrs (5, 2hr labs)	3 hrs	6.5	BSD	Spring
NEUROANATOMY	BSD10009	S. Koevary	34 hrs (2.0 hrs/wk)	4 hrs (2, 2 hr.	none	3.5	BSD	Spring

				Labs)				

Displaying results for OD2 for ALL term(s). SECOND YEAR

Coursename	*Coursenumber*	*Instructor*	*Lecturehours*	*Labhours*	*Otherhours*	*Credit(s)*	*Department*	
BINOCULAR VISION AND OCULAR MOTILITY	VS21203	G. McCormack	65 hrs. (5 hrs/wk.)	8 hrs (4, 2 hr. lab)	none	7.0	VS	Fall
OPTICS III	VS21003	E. Loewenstein/N. Coletta	39 hours (3 hrs/wk)	10 hours (5, 2 hr.labs)	none	4.5	VS	Fall
INTEGRATIVE SEMINAR IIA	IDS24005	M. Zorn / A. Denial	none	none	(pbl) 12 hrs (2 hrs/alt. weeks)	1.0	IDS	Fall
PRINCIPLES & PRACTICE OF OPTOMETRY IIA	CPH 22007 / CPH22107	D. Kurtz	52 hrs. (4 hrs/wk.)	32.5 hrs (13, 2.5 hr. lab)	(patient care) 78 hrs. (6/wk)	7.0 / 3.5	CCPH	Fall
INFECTIOUS DISEASE AND PATHOLOGY I	BSD20601	R. Frankel	26 hrs (2 hrs/week)	none	none	2.5	BSD	Fall
IMMUNOLOGY	BSD20401	S. Koevary	25 hrs (1.9 hrs/week)	none	none	2.5	BSD	Fall
CONTACT LENSES	SAC23001	R. Watanabe	54 hrs (3.2 hrs/wk)	60 hours (17, 3.5 hr labs)	none	8.5	SAC	Spring
NEUROSCIENCE AND VISUAL ASSESSMENT	VS21205	F. Thorn	60 hrs (3.5 hrs/wk)	6 hrs (3, 2 hr.labs)	none	6.0	VS	Spring
ENVIRONMENTAL OPTOMETRY	VS21401	J. Comerford	26 hrs (1.5 hrs/wk)	4 hrs (2, 2 hr.labs)	none	3.0	VS	Spring
INTEGRATIVE SEMINAR IIB	IDS24006	M. Zorn / A. Denial	none	none	(pbl) 16 hrs (2 hrs/alt. weeks)	1.5	IDS	Spring
PRINCIPLES & PRACTICE OF OPTOMETRY IIB	CPH22008 / CPH 22108	D. Kurtz	68 hrs (4 hrs/week)	42.5 hrs (2.5 hr labs/week)	(patient care) 102 hrs (6 / week)	9.0 / 5.0	CCPH	Spring

INFECTIOUS DISEASE AND PATHOLOGY II	BSD20602	R. Frankel	51 hrs (3 hrs/week)	6 hr (3, 2hr labs)	none	5.5	BSD	Spring
GENERAL AND OCULAR PHARMACOLOGY	BSD20801	J. Mertz / J. DeJesus	60 hrs (3.5 hrs/week)	none	none	6.0	BSD	Spring

Displaying results for OD3 for ALL term(s). THIRD YEAR

Coursename	*Coursenumber*	*Instructor*	*Lecturehours*	*Labhours*	*Otherhours*	*Credit(s)*	*Department*	
PRINCIPLES & PRACTICE OF OPTOMETRY IIIB	CPH32111	J. Hazelwood	3 hrs	8 hrs (4, 2 hr labs)	(patient care) 104 hrs (8 / week)	6.0	CCPH	Fall
SPECIAL POPULATIONS	SAC33601	B. Moore	60 hrs (4.6 hrs/wk.)	none	(seminar) 8 hrs	6.5	SAC	Fall
DEVELOPMENT, STRABISMUS AND AMBLYOPIA	SAC33402	E. Weissberg / F. Thorn	60 hrs (4.6 hrs/wk.)	10 hours (5, 2 hr. labs)	none	6.5	SAC	Fall
PUBLIC HEALTH	CPH32401	B. Barresi	13 hrs (1 hr/week)	none	none	1.0	CCPH	Fall
INTEGRATIVE SEMINAR IIIA	IDS34007 (A.Y. 2005)	none	none	none	(pbl) 12 hrs (2 hrs/alt. weeks)	1.0	IDS	Fall
ADVANCED OCULAR DISEASE I	BSD30701	B. Sleight / B. Fisch	39 hrs (3 hrs/week)	none	none	4.0	BSD	Fall
CLINICAL MEDICINE	BSD30901	J. List	60 hrs (3.5 hrs/week)	none	none	6.0	BSD	Spring
ADVANCED OCULAR DISEASE II	BSD30702	B. Sleight / B. Fisch	60 hrs (3.5 hrs/week)	none	none	6.0	BSD	Spring

PRINCIPLES & PRACTICE OF OPTOMETRY IIIC	CPH32112	J. Hazelwood	4 hrs	14 hrs (7, 2 hr labs)	(patientcare) 136 hrs (8 / week)	8.0	CCPH	Spring
VISION REHABILITATION	SAC33201	L. Frank / R. Jamara	20 hrs (1.2 hrs/wk.)	10 hours (5, 2 hr. Labs)	none	2.5	SAC	Spring
INTEGRATIVE SEMINAR IIIB	IDS34008 (A.Y. 2005)	none	none	none	(pbl) 12 hrs (2 hrs/alt. weeks)	1.0	IDS	Spring
ELECTIVES	none	none	none	none	none	6.0	IDS	Spring
PRACTICE MANAGEMENT AND HEALTH CARE ECONOMICS	CPH32601	B. Barresi	25 hrs (1.5 hr/week)	none	none	2.5	CCPH	Spring
PRINCIPLES & PRACTICE OF OPTOMETRY IIC	CPH22009	D. Kurtz	40 hrs (5 hrs/week)	20 hrs (8, 2.5 hr labs)	none	5.0	CCPH	Summer
PRINCIPLES & PRACTICE OF OPTOMETRY IIIA	CPH32110	J. Hazelwood	none	8 hrs (1, 8hr workshop)	(patient care) 64 hrs (8 / week)	3.5	CCPH	Summer
BINOCULAR AND ACCOMMODATIVE ANOMALIES	SAC33401	B. Kran / G. McCormack	36 hrs. (4.5 hrs/wk.)	10 hours (5, 2 hr. labs)	none	4.0	SAC	Summer

Fourth Year

See clinical instruction above. All optometry students spend 100% of their time in direct clinical care for the period of 12 months. The clerkships take place in community health centers, medical centers, hospitals, and practices in the Boston area, across the country and around the world. Fourth year optometry students also complete additional training in office emergencies and cardiac life support certification in this year.

All curriculum for all years of study can be viewed directly on the website:

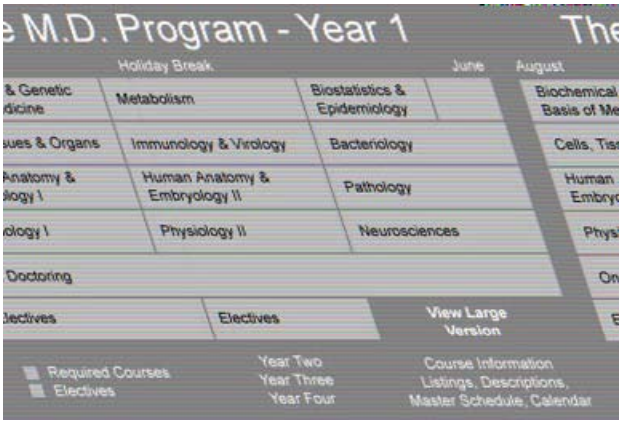
****

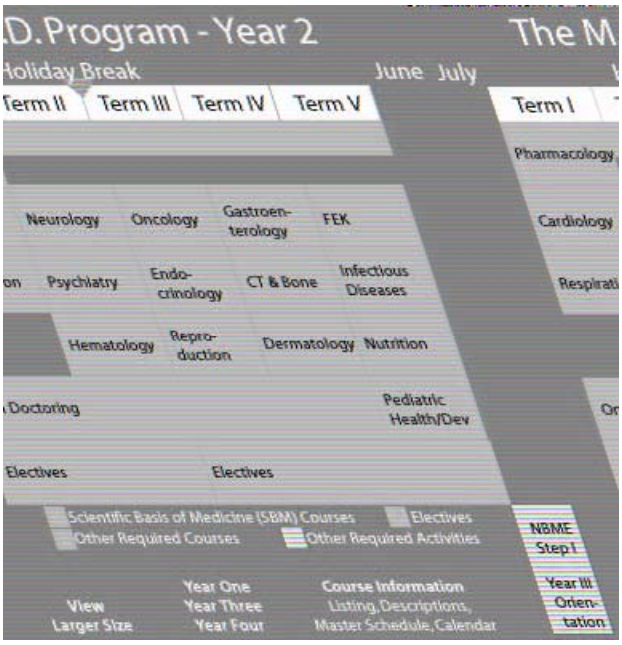
Dartmouth Medical School Curriculum

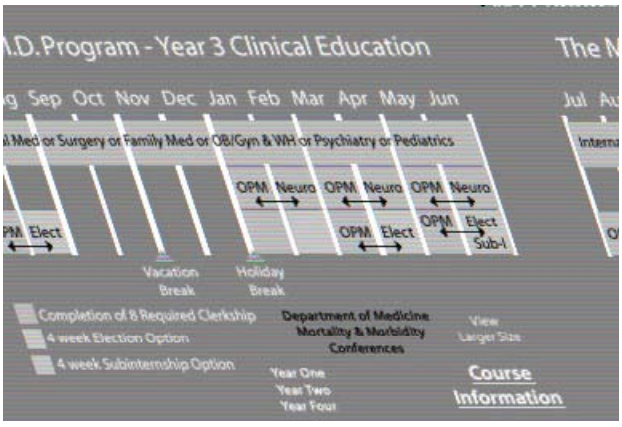
The M.D. Program Courses Curriculum Overview
This information is taken directly from the DHMC website, www.dartmouth.edu.

Year One - During the 39 weeks of Year 1, the curriculum focuses on the theme of the normal structure and function of the human body. Faculty introduces the important biomedical basic sciences from various basic science departments in the classical medical disciplines of human anatomy and embryology, histology, physiology, biochemistry, cell biology, microbiology, immunology, and pathology. A recently developed multi disciplinary course in neuroscience (combining elements of neuroanatomy and neurophysiology) has proven to be very successful, and a redesigned course covering the fundamental disciplines of biostatistics and epidemiology has been very popular. In conjunction with these fundamental or basic biomedical sciences, students begin their clinical studies with the course "On Doctoring", which extends over the first and second years, and introduces them to the science and art of caring for patients. A variety of elective courses are also offered. Year Two - During the 38 weeks of Year 2, the major theme shifts to a study of pathophysiology--what goes wrong during disease. During this year, faculty from virtually every basic science and clinical department participate in the Scientific Basis of Medicine Program (SBM for short), which coordinates 14 separate courses. Each course in SBM focuses on a separate organ system or process, whereas courses in Year One focused on separate scientific disciplines. The required courses in Year Two include studying the cardiovascular system, the respiratory system, the nervous system, psychiatry, hematology, the endocrine system, the reproductive system, oncology, the gastrointestinal system, dermatology, connective tissue and bone, the renal system, and nutrition. Each of these SBM courses combines elements of physiology, pathophysiology, genetics, medicine, surgery, and pediatrics. Much of the material is taught in seminars, conferences, or problem-based learning tutorial groups. Course directors coordinate closely with yearlong courses in pharmacology and On Doctoring. For example, during the SBM course in Neurology, On Doctoring is likely to cover the examination of the nervous system, while the Pharmacology course covers the antiseizure medications. Near the end of the year, an additional course in childhood health and development is also offered. At the end of the year, students take Step I of the USMLE series of examinations leading to licensure, and attend a 3-day orientation session leading up to Year 3. Year Three - Year 3 builds on the skills and knowledge acquired during courses taken in Year 1 and Year 2. The required clerkships of Year 3 offer students the chance to experience the major broad specialty areas of clinical medicine (e.g. internal medicine, psychiatry, surgery, obstetrics and gynecology, pediatrics, and family medicine) in a variety of settings and communities, well in advance of the Year 4 process of making career and residency decisions. These 48 weeks of required clerkships are carried out both at the major medical facilities of the Dartmouth-Hitchcock Medical Center (Mary Hitchcock Memorial Hospital, VA Hospital, and Dartmouth-Hitchcock Clinic) and at a variety of affiliated hospitals and ambulatory sites, where patient populations and styles of practice differ widely. About one-third of the total time is spent training in ambulatory clinic facilties, while about two-thirds of the rotations take place in hospital settings. Year Four - This final year of medical school offers each student the chance to complete several required clerkships, to begin to differentiate his or her clinical interests through a series of electives, to complete several outstanding courses designed to prepare our seniors for residency and for a career as a lifelong learner, and to work closely with a personal advisor to find the most appropriate postgraduate plan or residency slot. Along with required clerkships in Neurology and Women's Health and a subinternship of the student's choice, Year 4 students choose from a wealth of clinical and other electives offered on campus, across the U.S., and around the world. The DMS Medical Education Committee strongly encourages students to pursue at least one clinical experience in an off-campus setting. All seniors take excellent required courses titled "Health, Society, and the Physician," "Clinical Pharmacology and Therapeutics," "Advanced Medical Sciences," and "Advanced Cardiac LIfe Support."

Curriculum


M.D. Program - Year 1
Holiday Break
June
August
Metabolism
Biostatistics & Epidemiology
Immunology & Virology
Bacteriology
Human Anatomy & Embryology II
Pathology
Physiology II
Neurosciences
Doctoring
Electives
Electives
View Large Version
Required Courses
Electives
Year Two
Year Three
Year Four
Course Information
Listings, Descriptions,
Master Schedule, Calendar


D. Program - Year 2
Holiday Break
June
July
Term II
Term III
Term IV
Term V
Term I
Pharmacology
Neurology
Oncology
Gastroen-terology
FEK
Cardiology
Psychiatry
Endo-crinology
CT & Bone
Infectious Diseases
Hematology
Repro-duction
Dermatology
Nutrition
Doctoring
Pediatric Health/Dev
Electives
Electives
Scientific Basis of Medicine (SBM) Courses
Other Required Courses
Electives
Other Required Activities
NBME Step I
View Larger Size
Year One
Year Three
Year Four
Course Information
Listing, Descriptions,
Master Schedule, Calendar
Year III Orien-tation


D. Program - Year 3 Clinical Education
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Med or Surgery or Family Med or OB/Gyn & WH or Psychiatry or Pediatrics
OPM
Neuro
OPM
Neuro
OPM
Neuro
OPM
Elect
OPM
Elect
OPM
Elect
Sub-I
Vacation Break
Holiday Break
Completion of 8 Required Clerkship
4 week Elective Option
4 week Subinternship Option
Department of Medicine Mortality & Morbidity Conferences
View Larger Size
Year One
Year Two
Year Four
Course Information

Optometry Testing: Optometrist Training:

Optometrists are educated by a rigorous academic and clinical curriculum requiring four years of undergraduate study followed by four years in graduate professional study that includes over 2,400 hours of clinical experience. The training of optometrists directly parallels that of dentists and general practice physicians in that their terminal degrees and qualification for licensure occur upon graduation from professional school. Like dentists, many graduate optometrists go on to residency training in specialized areas; however, unlike physicians, only graduates pursuing subspecialty fields pursue residency training in dentistry and optometry. Like dentists, optometrists are qualified to enter primary care practice upon graduation and licensure in all 50 states. **All optometrists are required to complete all three sections of the National Board for licensure in any state.**

Optometrists must take almost all of courses that medical doctors do to complete their degree. Optometry students take more pharmaceutical courses than medical students. Also, optometry students must take additional, extensive, course work in the specialty of eye care during their four years, therefore, optometry students graduate with a higher number of credit hours than medical students. In addition, the information below shows that graduating optometrists are tested on this knowledge by a *uniform national standard.*

The following is taken directly from the National Board of Examiners website, www.nbeo.org, and clearly demonstrates the breadth and scope of topics tested at the national level. All optometrists must undergo this rigorous three part national board testing.

Part I consists of 435 multiple-choice items administered across three 3.75-hour sessions. Basic Science assesses a candidate's fundamental knowledge and understanding of the scientific principles upon which optometric practice is based so that subsequent mastery of clinical content, both systemic and ocular, can occur.

The Basic Science examination is targeted for students who have *completed* their second professional year in a school or college of optometry accredited by the Accreditation Council on Optometric Education (ACOE) of the American Optometric Association.

In addition, this test assesses those basic science areas that relate to the safe and effective treatment of ocular diseases as well as providing a basis for lifelong learning in optometry. Basic Science is composed of four major subject areas, which parallel four of the Clinical Science subject areas. The subject areas and their relative emphases are shown below.

	Number of Items*
A. Human Biology - 195 Items (45%)	
1. Gross Anatomy	8-12
2. Histology	14-22
3. Neuroscience	19-27

4. General Biochemistry	21-31
5. General Physiology	20-28
6. General Microbiology	11-17**
7. General Immunology	10-16**
8. General Pharmacology	30-46**
9. General Pathology	23-35

B. Ocular/Visual Biology - 90 Items (21%)	**Number of Items***
1. Anatomy of the Eye, Ocular Adnexa and Visual Pathway	29-37
2. Ocular and Visual Pathway Development	4-10
3. Ocular Physiology/Neurophysiology	29-37
4. Ocular Pharmacology	13-21**

C. Theoretical, Ophthalmic, and Physiological Optics 125 Items (29%)	**Number of Items***
1. Geometrical Optics	15-19
2. Physical Optics	5-7
3. Ophthalmic Optics	16-20
4. Visual Optics	21-27
5. Visual Perception	37-45
6. Ocular Motility	16-22

D. Psychology - 25 Items (6%)	**Number of Items***
1. Psychophysical Methodology	3-7
2. Human Development	18-22

TOTAL	**435**

Part II - Clinical Science

Part II consists of 435 multiple-choice items administered across three 3.75-hour sessions. Clinical Science assesses a candidate's application of the knowledge of Basic Science to the prevention, diagnosis, treatment and management of clinical conditions that relate to optometric practice. In comparison with the Basic Science examination, Clinical Science places much greater emphasis on the candidates' ability to ***apply*** knowledge.

The Clinical Science examination includes a scoring component on the Treatment and Management of Ocular Disease (TMOD®) exam.

The Clinical Science examination is targeted for students near the middle of their final professional year in an ACOE accredited school or college of optometry. Clinical Science is composed of six major subject areas, four of which parallel the four Basic Science subject areas. The subject areas and their relative emphases are shown below.

A. Systemic Conditions - 70 Items (16%)

Number of Items**

1. General Health
5-9

2. Neurological System
3-5

3. Musculoskeletal System
1-3

4. Skin and Hair
1-3

5. Head and Neck
2-6

6. Hematopoietic System
2-4

7. Immunologic System
3-7

8. Cardiovascular System
4-10

9. Renal and Urogenital System
3-7

10. Gastrointestinal System
2-4

11. Liver and Biliary Tract
1-3

12. Endocrine/Metabolic System
5-9

13. Reproductive System
1-3

14. Respiratory System
4-10

15. Nutrition
1-3

16. Mental Illness and Behavioral Disorders
1-3

17. Infectious Diseases
3-5

18. Congenital/Hereditary Conditions
1-3

B. Ocular Disease/Trauma - 180 Items (41%)***
Number of Items**

1. Orbit, Adnexa, Lacrimal System
22-34

2. Cornea/External Disease
42-60

3. Glaucoma
20-30

4. Lens/Cataract
5-11

5. Uveitis, Sclera/Episclera
18-28

6. Retina/Vitreous
19-29

7. Neuro-Ophthalmic Disorders
16-26

C. Refractive/Oculomotor/Sensory Integrative Conditions 125 Items (29%)
Number of Items**

1. Anomalies of Refraction: Ametropia
21-27

2. Anomalies of Refraction: Presbyopia
8-10

3. Anomalies of Refraction: Aphakia, Pseudophakia, and Aniseikonia
5-9

4. Low Vision
10-14

5. Sensory Anomalies of Binocular Vision/Strabismus
16-20

6. Anomalies of Eye Movement
10-14

7. Anomalies of Accommodation and Accommodative Vergence 10-14

8. Refractive Correction Applications
28-34

D. Perceptual Conditions - 33 Items (8%)
Number of Items**

1. Anomalies of Child Development
10-14

2. Anomalies of the Aging Adult
10-14

3. Anomalies Secondary to Acquired Neurological Impairment
4-8

4. Anomalies of Color Vision (Inherited, Acquired)
2-4

E. Public Health - 15 Items (3%)
Number of Items **

1. Epidemiology
4-7

2. Biostatistics and Measurement
2-3

3. Environmental Vision
1-3

4. Health Care Policy and Administration
4-6

F. Legal and Ethical Issues - 12 Items (3%)
Number of Items **

1. Licensure and Governmental Regulation of Optometry
2-4

2. Standards of Professional Ethics
1-2
3. Doctor-Patient Relationship
3-6

4. Professional Liability
2-4

* On Clinical Science items, it is assumed that normative values for the following should be known by the candidate:

- Serum glucose: fasting and random
- **Total cholesterol and HDL cholesterol**
- **Westergren sedimentation rate**
- **Vital signs (i.e., blood pressure, pulse rate, respiratory rate, body temperature)**

Part III assesses a candidate's ability to examine actual patients, evaluate actual clinical data, and render patient care decisions, unlike the Basic Science and Clinical Science examinations, which assess cognitive skill (i.e., knowledge). This multifaceted examination consists of two administratively distinct sections and formats: a 5-station Clinical Skills performance (i.e., practical) test, and a written test in Patient Assessment and Management (PAM).

In the Clinical Skills section, the candidate examines a patient at each of 5 stations in the performance of 18 clinical skills. Although this section measures primarily psychomotor skills, it contains an assessment of affective (i.e., clinical habits and attitudes) and communication skills, as well as some interpretation of clinical findings. This test section is administered in one 3.50 hour session; however, because of the limited number of candidates who may be examined per session, multiple sessions are scheduled. !

A. Clinical Skills - Practical Exam with 5 Stations and 18 skills (65%)

Station 1:

1. Case History/Patient Communication2. Near Cover Test & Extraocular Motility Evaluation3. Pupil Testing4. Blood Pressure Measurement

Station 2:

5. Biomicroscopy6. Goldmann Applanation Tonometry7. Gonioscopy8. Collagen Implant Insertion and Removal Station

Station 3:

9. Retinoscopy10. Distance Subjective Refraction11. Accommodation Testing12. Heterophoria

and Vergence Testing at Near

Station 4:

13. Patient Communication/Education and Prescription Writing in Ocular Disease Management14. Ophthalmic Materials Evaluation

Station 5:

15. Binocular Indirect Ophthalmoscopy16. Non-Contact Fundus Lens Evaluation17. Soft Contact Lens Insertion, Evaluation, and Removal18. Rigid Gas Permeable Contact Lens Insertion, Evaluation, and Removal

B. Patient Assessment and Management Exam (PAM) - 40 Patient Scenarios (35%)

1. Ocular Disease/Trauma - Diagnosis, Data Interpretation, Clinical Correlation2. Ocular Disease/Trauma - Treatment, Pathophysiology/Etiology, Follow-up, Prognosis 3. Refractive/Functional Conditions - Diagnosis, Data Interpretation, Clinical Correlation 4. Refractive/Functional Conditions - Treatment, Pathophysiology/Etiology, Follow-up, Prognosis

Appendix C
Pharmaceuticals

According to Dr. Dorothy L. Hitchmoth:

"The following list is a sample of some of the different pharmaceutical classes currently in use. This list is not complete and only exemplifies some medications that can be utilized and some of their possible side effects. The following list represents some of the more potent and potentially dangerous drug classes. There are potential serious side effects to other classes of glaucoma medications but the following represent some of the most serious. The following adverse reactions may be experienced in any individual but occur most often in those individuals who have contraindicating systemic diseases. A thorough medical history is required and taken by our staff optometrists before administering the medications. In addition, these adverse reactions do have the potential to lead to cardiac arrest, death, and chronic disease."

Medication: Some potential adverse reactions

Topical Beta blockers: Syncope (fainting), heart block, stroke, congestive heart failure, heart palpitations, unexpected dangerously low blood sugar in diabetics, respiratory failure, depression, impotence.

Oral carbonic anhydrase inhibitors: convulsions, fatigue and malaise, drowsiness, depression, confusion, paresthesia of the extremities, nausea, vomiting, constipation, blood in the urine, kidney stones, severe anemia, impotence, liver failure.

Oral Hyperosmotic agents: i.e. mannitol, blood clots, low blood pressure, high blood pressure, angina-like chest pain, tachycardia, congestive heart failure, convulsions, nausea, diarrhea, dehydration, pulmonary congestion.

Alpha agonists: bradycardia, palpitations, arrhythmia, headache, insomnia, decreased libido, dizziness, abdominal pain, taste and smell abnormalities.