OPTOMETRIC EDUCATION

The Journal of the Association of Schools and Colleges of Optometry

Volume 50, Number 1
Winter-Spring 2025

To Be Here or Not To Be Here, That is the Question.
Use of recorded lectures in healthcare education: A Review

ALSO INSIDE

ASCO ASSOCIATION *of* SCHOOLS *and* COLLEGES *of* OPTOMETRY

Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Table of Contents

Articles

PEER REVIEWED

Development of a Pilot Objective Structured Clinical Examination in Optometric Education

Patricia Hrynchak, OD, MScCH (HPTE), FAAO, Dipl AAO, Jenna Bright, BSc, MSc, OD, Sarah MacIver, BSc, OD, FAAO, Natalie Hutchings, BSc, PhD, MCOptom, Stanley Woo, OD, MS, MBA, FAAO, Dipl AAO | *Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)*

Abstract

Introduction: An Objective Structured Clinical Examination (OSCE) is a performance-based examination in a simulated environment intended to assess multiple clinical abilities or competencies. OSCEs have been shown to be a valid tool in health care education when appropriately developed. This paper reports on the use of an OSCE in optometric education at a North American School of Optometry and Vision Science. Methods: A pilot OSCE was developed and administered to a volunteer group of graduating Doctor of Optometry Students. There were 11 active stations and 3 rest stations. Six of the active stations involved standardized patients (SP). Skills were also demonstrated. Development, administration and post-OSCE considerations are discussed. There were 90 students eligible to take the OSCE. Of those, 54 volunteered and 53 consented to have their examination results reported. Of the 53 students, 46 (87%) passed the examination. Results: The OSCE was shown to be valid using Kane's theory on validity which looks at scoring, generalization, extrapolation and decision making. Conclusion: This pilot project demonstrated that an OSCE is a feasible assessment method to use in optometric education to prepare students for external certification processes. This paper shows educators that a strong development process including blueprinting with appropriate case development and training to standardize the examiners and SPs can produce a valid examination with appropriate test interpretation.

Key Words: *OSCE, objective structured clinical examination, assessment, education, optometry*

Introduction

In health care education and curriculum development, it is essential to have strategic alignment between learning objectives, teaching methods and assessment methods.[1] When the learning objectives involve developing a set of clinical competencies, the assessment methods should align with those objectives. The practice of optometry requires cognitive, technical and interpersonal skills and, as such, requires a coordinated system of assessment methods that go beyond multiple-choice questions and a straightforward demonstration of technical skills.[2]

An objective structured clinical examination (OSCE) is an assessment format where students rotate from one station to the next and are expected to perform a series of clinical tasks.[3] OSCEs are widely used in high stakes assessment in health care[4,5] OSCEs have been described in medicine, pharmacy, physiotherapy, massage therapy, nursing, midwifery and dentistry.[6] They have been used in certification assessments in Canada and the United Kingdom.

The University of Waterloo, School of Optometry and Vision Science developed and piloted an OSCE with the aim of adding it to the assessment system used to determine end-of-program student competency. The results of the assessment were designed to inform future academic decisions and to give the students exposure to an assessment method used by the Optometry Examining Board of Canada (OEBC) for entry-to-practice eligibility.[7]

This paper reports on the feasibility of using an OSCE as an assessment tool in an optometry program through this pilot examination. It provides information to aid in developing and replicating the process within an optometric education context with best practice recommendations so that validity can be achieved.

Methods

A Learning Innovations and Teaching grant was awarded by the University of Waterloo, Centre for Teaching Excellence to fund the development and administration of the OSCE.[8] Research ethics approval was obtained from the Office of Research Ethics at the University of Waterloo, which follows the Declaration of Helsinki (See **Table 1**).

Step	Components
Preparation and Planning	• Organizational structure: OSCE examination team • Examination positioning within the curriculum • Blueprinting and examination length • Developing a bank of OSCE examination stations • Choosing a scoring rubric and standard-setting • Developing a pool of trained examiners • Developing a pool of trained SPs
Running the OSCE	• Choosing an objective OSCE venue • Setting up the OSCE circuit and equipment • OSCE circuit and troubleshooting
Post-examination considerations	• Handling results • The examination boards and ratification • Publication of the results • Complaints and appeals • Post-hoc psychometrics • Evaluation

Table 1. A summary of the organization and administration of an OSCE.[3] Click to enlarge

Preparation and Planning

The OSCE team consisted of four faculty members with a specific interest in assessment. An additional member was added during the analysis phase. The OSCE was proposed to be positioned in the curriculum as a new assessment to supplement the clinical assessment method used in the program's final year. The examination content blueprint was developed to reflect the competencies required by a graduating optometrist (as developed by the OEBC).[9] The practice areas of the competency profile are communication, professionalism, patient-centerd care, assessment, diagnosis and planning, patient management, collaborative practice, scholarship and practice management. The domains of competence thought to be best assessed were communication, professionalism, patient-centerd care, assessment (including psychomotor skills), diagnosis and planning and patient management. The content areas were refractive care, binocular vision and ocular disease. A two-dimensional matrix was created with the generic competencies along one axis and the content areas along the other (See **Table 2**). The weighting of the competencies being assessed were modeled on the weightings developed for the OEBC's examination using the frequency of a competency area in combination with the importance of that area, as determined by optometrists across Canada.[9]

Table 2. Blueprint: The content is blueprinted to the competencies to be measured. The “stars” are an individual measurable indicator as described by the Optometric Examining Board of Canada competency profile. The frequency of each indicator tested is dependent on the frequency and importance of the ability as judged by practicing optometrists. The Rigid Gas Permeable case (number 1) and allergic conjunctivitis (number 3) includes the exact indicators for the case as a examples. Click to enlarge

The length of the examination needed to be long enough to ensure the validity of the examination but short enough to be feasible.[3] We elected to use 11 active stations of 10-minute duration.[3] When including the three rest stations, the testing time for the examination was slightly less than 2.5 hours.

In developing a bank of OSCE stations consideration was given to the competencies that could realistically be assessed using the OSCE. The station writing was done by the team members.

Six of the 11 stations developed involved the use of SPs. The choice of having a SP depended on the competencies being assessed in that station. Not all competencies assessed required a SP. A station writing template was created based on the OEBC’s framework.[10] The components developed were the Case Information, Instructions to the Students, Summary of Patient Examination Record and Assessment Forms (See **Appendix A** for a sample). In addition, a comprehensive list of equipment, supplies and props was developed for each station, including the furniture and electrical sources required. Two team members piloted each station and adjustments to the stations were made to account for timing, clarity and difficulty level.

The development of a scoring rubric is critical for standardization. Scoring rubrics can be either analytical or holistic.[3] An analytical checklist is a series of statements outlining the performance that is expected. In alignment with what is generally accepted as appropriate in the literature, the psychomotor competencies (skills) were assessed using a checklist and the other competencies using global rating scales (holistic).[11] (See **Appendix B** for samples)

The passing score for the examination was determined using standard-setting.[12] This examination used the borderline group method to determine the passing score. The examiner rated the student’s overall performance on a station using a global rating scale holistically that included a borderline option independently of the grade from the scoring sheets. In stations where student performance was rated as

borderline on overall performance the average of the assessment scales was calculated and used as the pass grade for the station. This is different from arbitrarily setting a passing grade of, for example, 60%. The total of all borderline pass scores became the passing score for the examination.[11,12] In our examination, the overall performance scale was inadequate/poor/borderline/clear pass/outstanding.

The examiners attended a 3-hour training session to help standardize how the OSCE would be implemented and evaluated. The training covered 1) the principles of the OSCE, 2) the role of the examiners, 3) an explanation of the standard-setting method, and 4) an assessment of video-recorded OSCE stations[13], where three of the team members had been video recorded acting as the student, the examiner and the SP. The student was portrayed as either performing well, moderately, or poorly for one of the stations. The examiners viewed the videos and scored the student's performances. The scores were then shared between the examiners and discussed to try to develop a common framework for consistency.

An established SP program was contracted to provide the SPs. The trainer worked with the team to develop a script and train the SPs to portray the character in the clinical scenario for each station that used them. Each SP was asked to memorize their script and trained for approximately 1 hour. If more than one SP was used for the same station, they were trained together to ensure consistent performance. The SPs were experienced and compensated for their expertise.

Running the OSCE

We ran the OSCE in an optics laboratory hallway in adjacent rooms as clinic rooms were not available. We ensured that the rooms, additional classrooms and laboratories were booked exclusively for the OSCE for the 2 days. The examination was held between terms to decrease disruption. Rooms not used as stations were used for a briefing room for the students, space for examiners and SPs to report and administrative space to collect all scoring materials. A refreshment space was accessible, along with easy access to washrooms and water stations.[3]

Each station was set up in advance with the appropriate tables, chairs and equipment, ensuring sufficient space was available. In addition, any electrical or internet access needs were assured to be present. Each student was assigned a starting station number, which was clearly marked and easily seen on the door outside the station. We included the rest stations as starting stations for ease of coordination. The students moved in sequential order through the numbered stations until all stations were completed.

The examination instructions were posted outside the station on the wall in clear plastic protectors. In addition, the same instructions and other information were placed in clear plastic protectors and taped to the tables in the examination rooms to prevent writing on the materials or accidentally removing the materials after the end of the station.

Each examiner had station instructions and sufficient scoring sheets for the students. Recording forms were available and easily added to the binder with the scoring sheets after the student had finished recording. Each student had a sheet of identification stickers, which they handed to the examiner to affix to their recording sheet.

The required equipment was part of the documentation developed in the case writing stage.[3] Any new equipment was ordered and other equipment was determined to be in good working order well in advance of the examination. Back-up equipment was provided in case of malfunction or failure.

On the examination day, the students were given necessary instructions and expectations were reviewed. The SP and the examiners ran through their assigned station for a half hour before the examination started to ensure that they had similar expectations.

Movement of the students from one station to the next was managed by using a timed buzzer that was loud enough to be heard in the station rooms with the door closed. Before entering a station room, the student had 2 minutes to review the station instructions, at which time a buzzer sounded cueing the student to enter the room and begin. After 7 minutes, the buzzer sounded again alerting the student and examiner that there was 1 minute remaining. A double buzzer indicated the end of the station time. The students then moved to the next station. The examiners finished the assessment forms while the students were reading the instructions outside the room for 2 minutes. Hallway monitors were present to ensure that the students moved to the next station correctly, did not speak to one another and remained seated in a rest station.

Seclusion of the students could not be done, because we ran four circuits over 2 days. Ideally, we would have run two circuits simultaneously so that all students could be examined in 1 day. The students signed confidentiality agreements, agreeing not to disclose the content of the stations with other students. Security measures including barring cell phones and recording devices were in place.

Adverse event reporting forms were available for students to report if something happened that affected their performance. The forms included the name of the student, the station number, the date and time of the incident and a section to write what transpired. Instructions on how to submit it were also included. No forms were submitted by students.

Post-examination considerations

At the end of the examination all assessment sheets were collected and reviewed to ensure everything was complete before the examiners left. The data were entered manually into a spreadsheet. It was then coded for confidentiality, removing the student's name and replacing it with a numerical identifier in compliance with ethics approval.

If the examination had been part of the actual assessment system rather than a pilot, the team would have met to discuss the results and determine if they were acceptable. For example, was the pass rate adequate?

Of the 90 students who were eligible to take the examination, 54 volunteered and 53 consented to having their results reported. Of the 53 students, 46 passed the examination. The students did not receive results for this pilot as they needed to be analyzed first.

While not required for this pilot, a complaint process is necessary for an OSCE, to address any examination concerns or rescoring requests. If legitimate concerns are found regarding a specific station or if equipment malfunctioned, subsequent iterations of the examination can be informed. Also, this process could be used to reconsider scoring if necessary. We had developed an adverse event reporting form that could have been used if there was an incident.

In the post-hoc psychometric analysis of the OSCE results the reliability of the scores generated was determined. We used the Cronbach ?, which is a measure of internal consistency where the better students do well across all the items in the examination.[14] The Cronbach ? was 0.4 between stations. The interpretation is <0.50 unreliable, 0.50-0.80 borderline reliability, >0.80 reliable. However, all stations resulted in a lower ? when they were dropped from the analysis. Exploratory factor analysis identified three stations with negative factor loadings. For these stations, the individual student ratings were not well distributed across the global rating scale and had the poorest correlation with the overall OSCE score. A generalizability theory analysis could be added to the psychometrics to help define and attribute weight to various sources of error in the examination.[15]

The students were invited to give feedback on the examination. The student satisfaction survey results have been analyzed and published.[16] The overall satisfaction level was very high. Students were very

positive about the interactions with the SPs and the organization of the examination. They felt the examination used realistic clinical scenarios. There was mixed reaction to the use of simulators for skills assessment and the length of time available in each station to perform those tasks. Students were uncertain of how to prepare for the examination. The specific comments on the stations indicated that more examiner training is needed, especially with respect to the specific expectations in each station.

Results

Any test format, including the OSCE, does not have an inherent validity.[17] The understanding of validity has changed from considering separate types of validity to a single concept of construct validity.[18] In Kane's view, validity is a structured argument, in support of the interpretation of the score.[11] He has four components to this argument: scoring, generalization, extrapolation and decision making. The validity of this examination was evaluated using these components.

Scoring assures that there is evidence that the assessment data collected on each student (e.g., check sheets and global rating scales) have been scored accurately and collected appropriately. Also, the conditions of the examination should be standardized.[11] In this examination, the SPs were trained appropriately and monitored to ensure interpatient and intra-patient consistency. The examiners were trained appropriately in scoring methods and the assessment data were reviewed for missing information once the examiner submitted the forms. There was a threat to validity in that access to test content information was only controlled by having the students sign a confidentiality agreement. The score of a person who cheats on the examination is not representative of ability. Improvement in this aspect with sequestration of students who have completed the assessment should be considered.

Generalization focuses on the relationship between the observed scores and the true scores. The true score is the score that the student would receive if completing an unlimited number of assessments of the same type. It is important to remember that any test is only a sample of the content domain.[19] Therefore, the test items should be representative of the domain and consider the likelihood of obtaining similar scores if new items are used.[11,19] This examination achieved adequate sampling using an appropriate blueprint. The generalization concept also includes reliability or reproducibility of the numeric scores. As reported earlier, we used a Cronbach ? and achieved a reliability of 0.4. Reliability can be improved with more items, more stations, more raters or more occasions.[18] Indeed, if all students had taken the examination, the reliability may also have been higher. All of these aspects have to be balanced against feasibility constraints such as the size of the student pool, time, space and funding. Global rating scales might perform better than checklists.

Extrapolation inference looks at a sample of observations and generalizes it to the test-world universe, but how these scores represent real-world performance is paramount.[19] Cases should be developed that authentically represent the problem.[18] They should undergo review and piloting to ensure appropriateness to the students.[18] This examination achieved these goals and the student survey supported the view that the stations were authentic and would commonly be encountered in practice. Future work will look at how the OSCE scores correlate with other measures of performance throughout the program.

Inference speaks to interpretation of the evidence in making a decision.[18] This aspect of validity is achieved by appropriately determining the cut score or passing score for the examination.[18] In this test, the cut score was determined using the borderline groups method that is appropriate for this type of assessment.

Common challenges in utilizing an OSCE as an assessment format include the cost and the administrative and development time needed.[5,20] The cost includes direct costs such as paying SPs, buying equipment, supplies and catering.[4] Indirect costs are administrative and faculty time for

development and implementation.[4] In addition, administrative and faculty time may simply not be available. Another significant challenge is extremes in examiner judgement that result in a reduction in reliability of the examination.[19] Also, students find that the OSCE produces high levels of stress and anxiety.[22,23,24] Students may find that they are uncertain how to prepare for the examination especially when first exposed to the assessment format. A study by Müller et al.[25] showed that students should focus on skills labs and collaborative practice more than knowledge sources such as lectures and textbooks when preparing for an OSCE.

Conclusions

This project demonstrated that the OSCE is a feasible assessment method to use in optometric education. A strong development process can produce a valid examination. The currently preferred concept of validity as described by Kane explains that the collection of evidence is in support of the interpretations of test score.[11] There must be a structured and coherent argument that leads from the test administration to the interpretation.[11] “That structured argument is only as strong as its weakest component.”[11]

Our OSCE has carefully followed test development and administration protocol to meet this threshold for decision making. However, the examination results will allow for further refinement of the examination elements. It is recommended that attention be paid to developing faculty awareness and support, developing a pool of well-trained examiners, utilizing the abilities of the SPs well in advance of the administration of the examination and assuring that each station has sufficient time to complete the tasks.

References

1. Biggs J. Enhancing teaching through constructive alignment. Higher Education*:* 1996;32(3):347-64. doi: 10.1007/s10726-016-9285-4
2. Norcini J, Anderson MB, Bollela V, Burch V, Costa MJ, Duvivier R, et al. 2018 Consensus framework for good assessment. Med Teach*:* 2018; 40(11)1102-11. doi: 10.1080/0142159X.2018.1500016
3. Khan KZ, Gaunt K, Ramachandran S, Pushkar P. The objective structured clinical examination (objective structured clinical examination): AMEE Guide No. 81. Part II: organisation & administration. Med Teach: 2013;35(9):e1447-63. doi: 10.3109/0142159X.2013.818634
4. Patrício MF, Julião M, Fareleira F, Carneiro AV. Is the objective structured clinical examination a feasible tool to assess competencies in undergraduate medical education? Med Teach: 2013;35(6):503-14. doi: 10.3109/0142159X.2013.774330
5. Casey PM, Goepfert AR, Espey EL, Hammoud MM, Kaczmarczyk JM, Katz NT et al. Association of professors of gynecology and obstetrics undergraduate medical education committee. To the Point: reviews in medical education–the objective structured clinical examination. Am J Obstet Gynecol: 2009;200(1):25-34. doi: 10.1016/j.ajog.2010.04.035
6. Hodges BD. The objective structured clinical examination: three decades of development. J Vet Med Educ. 2006 Winter;33(4):571-7. doi: 10.3138/jvme.33.4.571
7. Optometric Examining Board of Canada [Internet]; Taking the exam. [cited 2019, May 21] Available from http://www.oebc.ca.
8. University of Waterloo Centre for Teaching Excellence [Internet]: LITE Grant Projects. [cited 2019, June 11] Available from https://uwaterloo.ca/centre-for-teaching-excellence.
9. Cane D, Penny M, Marini A, Hynes T. Updating the competency profile and examination blueprint for entry-level optometry in Canada. CJO*:* 2018;(2)80:25-34. doi: https://doi.org/10.15353/cjo.80.267

10. Optometry Examining Board of Canada [Internet]: Case template. [cited 2019, May 21] Available from http://www.oebc.ca/written-osce/preparing-for-the-exam.
11. Holmboe E, During S, Hawkins R. Practical Guide to the Evaluation of Clinical Competence. 2nd Ed. Philadelphia, PA: Elsevier; 2018.
12. Newble D. Techniques for measuring clinical competence: objective structured clinical examinations. Med Educ: 2004;38(2):199-203. doi: 10.1111/j.1365-2923.2004.01755.x
13. Stanwick T, Forrest K, O'Brien B. Understanding Medical Education: Evidence, Theory, and Practice. 3rd Ed. Hoboken, NJ: Wiley; 2019.
14. Pell G, Fuller R, Homer M, Roberts T. International Association for Medical Education. How to measure the quality of the objective structured clinical examination: A Review of Metrics – AMEE Guide no. 49. Med Teach: 2010;32(10):802-11. doi: 10.3109/0142159X.2010.507716
15. Blood A, Park YS, Lukas R, Brorson B. Neurology objective structured clinical examination reliability using generalizability theory. J Neurol*:* 2015;85(18):1623–29. doi: 10.1212/WNL.0000000000002053
16. Hrynchak P, Bright J, MacIver S, Woo S. Student satisfaction with an objective structured clinical examination in optometry. J Optom Educ*:* 2021:46(2):27-32.
17. Hodges B. Validity and the OSCE. Med Teach*:* 2003;25(3):250-4. doi: 10.1080/01421590310001002836
18. Daniels VJ, Pugh D. Twelve tips for developing an OSCE that measures what you want. Med Teach: 2018;40(12):1208-13. doi: 10.1080/0142159X.2017.1390214
19. Cook DA, Brydges R, Ginsburg S, Hatala R. A contemporary approach to validity arguments: A practical guide to Kane's framework. Med Ed*:* 2015;49(6):560-75. doi: 10.1111/medu.12678
20. Kreptul D, Thomas RE. Family medicine resident OSCEs: A systematic review. Educ Prim Care*:* 2016;27(6):471-7. doi: 10.1080/14739879.2016.1205835
21. Fuller R, Homer M, Pell G, Hallam J. Managing extremes of assessor judgment within the OSCE. Med Teach*:* 2017;39(1):58-66. doi: 10.1080/0142159X.2016.1230189
22. Young I, Montgomery K, Kearns P, Hayward S, Mellanby E. The benefits of a peer-assisted mock OSCE. Clin Teach*:* 2014;11(3):214-8. doi: 10.1111/tct.12112
23. Brown J. Preparation for objective structured clinical examination: A student perspective. J Perio Pract: 2019;29(6):179-84. doi: 10.1177/1750458918808985
24. Bevan J, Russell B, Marshall B. A new approach to objective structured clinical examination preparation – ProOSCE. BMC Med Educ: 2019;19:126. doi: 10.1186/s12909-019-1571-5
25. Müller S, Koch I, Settmacher U, Dahmen U. How the Introduction of objective structured clinical examinations has affected the time students spend studying: Results of a nationwide study. BMC Med Educ: 2019;19(1):146. doi: 10.1186/s12909-019-1570-6

Appendices

Appendix A: Case description for case #1. Click to enlarge

Appendix B: Examiner scoring sheets as developed for station #1. Section A is an analytical checklist for a psychomotor skill. Sections B and C are holistic assessments (global rating scales) with the answers provided for the examiners to aid in grading. Click to enlarge

Dr. Patricia Hrynchak is a clinical professor emeritus at the University of Waterloo, School of Optometry and Vision Science. She has a master's degree in health practitioner teacher education and a Diplomate in Optometric Education from the American Academy of Optometry.

Dr. Jenna Bright is currently in independent private practice. At the time of this study she was the Director of the International Optometric Bridging Program, University of Waterloo, School of Optometry and Vision Science. Prior to completing her Doctor of Optometry, Dr. Bright completed a master's in science with a focus on patient centred communication in an optometric setting. Dr. Bright has a special interest in optometric education and cultural competency.

Dr. Sarah MacIver is a clinical associate professor at the University of Waterloo, School of Optometry and Vision Science with a special interest in the treatment and management of chronic ocular disease, specifically glaucoma and dry eye. She has been invited to speak at various education events including inter-professional conferences and public education events to disseminate knowledge about eye health and vision care. Areas of research include glaucoma, dry eye disease, inter-professional collaboration with primary healthcare and optometric education.

Dr. Natalie Hutchings is the Associate Director for Academics and Student Affairs at the University of Waterloo, School of Optometry and Vision Science. She has a special interest in optometric education. She works in the areas of ocular imaging, scaling and clinical assessment and spectacle lens adaptation.

Dr. Stanley Woo is the Director of the University of Waterloo, School of Optometry & Vision Science. He is a Diplomate in low vision with the American Academy of Optometry and Diplomate with the American Board of Optometry. His research interests include vision rehabilitation, ophthalmic imaging, public health policy and systems for optimizing patient care outcomes.

PEER REVIEWED

To Be Here or Not to Be Here, That is the Question. Use of recorded lectures in healthcare education: A review

Darryl Horn, PhD, FAAO, Jamie A.E. Neiman, OD, FAAO, Helene Kaiser, OD, FAAO | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Abstract

The use of recorded lectures in the health professions classroom is on the rise in recent years. It is important for educators to know why students are watching, which students are watching, and when students are watching these lectures. In addition, does the use of recorded lectures affect student performance on assessments or attendance of live content? This review is intended to shed light on these questions with the intent to help faculty tailor their pedagogy and for academic programs to modify their curricula to the students of today.

Keywords: *recorded lectures, live lectures, health professions, perceptions*

Introduction

The classrooms that students are part of today look vastly different from the typical classroom of years past. As the classroom has changed from “chalk talks” to slides and overhead projectors to the use of PowerPoint and most recently recording lectures for off-site viewing, lecture styles have evolved to meet the changes seen in the classroom. In the landscape of modern education, students now face a choice between attending live lectures or seeking alternative methods of learning. This paper is a review of the use of recorded lectures in healthcare education. This potentially controversial topic has become relevant at many institutions in the past decade but especially because of the required modifications to pedagogy during the COVID-19 pandemic.

Why are students using recorded lectures?

Live lectures have served as the cornerstone of traditional education and they offer the advantages of an interactive learning environment, a structured approach and networking opportunities for students. Despite the benefits, there are many reasons a student would prefer to view a recorded lecture. Some reasons are as straightforward as not liking a faculty’s lecture style, or the subject being presented.[1] Other reasons can be more complicated such as weighing the time spent in a live lecture to using that time to study for other exams. Some students even view the time spent traveling to class as wasted time and inconvenient.[2]

Online resources and digital learning platforms have made it possible for students to access lecture material remotely. Hussain et al. found that of 103 medical students surveyed, 78% of the them used the recordings when they missed class due to illness or another school related activity such as shadowing a clinical preceptor.[3] Topale reports that of 281 medical student respondents, 58.7% of surveyed students indicated missing class necessitated the use of recorded lectures.[4] Interestingly, Emahiser et al. surveyed 145 medical students and found more first-year medical students admitted to skipping class to

study for another class's exam than second-year students even though more first-year students would attend mandatory classes.[1]

Virtual alternatives offer the ability to tailor the learning experience to individual preferences. A survey by Topale et al. indicated students use recordings because it gives them flexibility to view or review content at their own pace and allows them to use other resources at the same time when viewing the recordings. Of the students surveyed, 55.9% use the recordings to clarify material after attending the lecture and 43.8% would use recordings to clarify material before an assessment. These same students also indicate that the recordings can lead to too much wasted time, and they can be frustrating since the recordings can be incomplete and not always reliable.[4] Hussain et al. found that not only are students using the recordings to relearn difficult material, but they are also using them to rewrite class notes.[3]

Physically attending lectures can provide valuable networking opportunities to form connections with peers and faculty members. The vast majority of the 101 medical students surveyed in a study by Eisen et al. indicated that the social expectation of attending live lectures was their main motivational reason. This is interesting because they also found that less than one-third of the students preferred recorded lectures. Some students did indicate that the presence of recorded materials was one of the reasons for not attending live lectures.[2]

Balancing the demands of rigorous coursework and personal commitments often leaves students with limited time. Analysis of student perceptions on the use of recorded lectures often indicates that students think the recorded lecture can increase their "efficiency." Students like to increase the playback speed, stop the lecture to record notes, or search other resources to clarify information presented in the recording. Students were able to stay more focused on the material and could learn more according to a study of 204 medical students by Cardall et al.[5]

The COVID-19 pandemic forced a change in pedagogy and the result was an unplanned increase in data that allowed researchers to compare 'the why, the which and the when' students used online learning. Dost et al. compared the use and reasoning of 2721 students who used online learning before and after this change. Flexibility was indicated as the greatest advantage, but the presence of family distractions and internet connection issues were the largest barriers.[6] These student perceptions are echoed elsewhere.[1,7,8]

Students often express the ability to modify the playback speed as one of the main reasons they prefer using recorded lectures. However, a change in the playback speed could affect the students' ability to comprehend the material being presented. Song et al. compared scores of a written assignment of two groups (54 total students) who watched a recording lecture on ultrasonography artifacts. The group who watched the recording at 1.5X speed had significantly lower scores than the group who watched the recording at normal speed.[9]

Which students are using recorded lectures?

A student's performance level might be one indicator about who is using recorded lectures. Arain et al. found that one-third of the 209 medical students they polled were satisfied with using online learning methods, but fewer higher-performing students indicated that was the method they preferred.[10] A similar trend has been observed in optometric education. Not only do higher-performing students spend less time watching recorded lectures than the lower-performing students, but a poll found that the higher-performing students preferred to learn via live lectures rather than the recordings. Lower-performing students on the other hand preferred the recorded lectures over the live lectures.[7]

Gupta and Saks surveyed 213 medical students and found that first-year medical students will attend more live lectures than second-year medical students despite both groups having an equal number of

views of the recorded lectures.[11] This would suggest that some second-year students decided that the recorded lectures were as effective as live lectures at conveying the presented material. Gupta and Saks also found that more female students attended the live lectures and thus used the recordings less.[11] Barco et al. found the opposite in that males used lecture recordings less than females but when the males did view lectures, they spent more time watching them.[12]

Professional students have diverse learning styles. We know that students will use recordings in place of attending class, but do students also use recordings to supplement what they learned in class? Daud et al. found that 80% of dental (n = 202) and medical students (n = 680) will use the recordings even if they went to class.[13] Azab et al. on the other hand found that dental students who regularly attend class are less likely to watch recorded lectures.[14] Recorded lectures offer the ability to tailor the learning experience to individual preferences. Lovell and Plantegenest surveyed 351 first-year and second-year students at a medical school in the US. Almost 80% of the first-year students and a little more than half of the second-year students used the recordings in addition to attending the live lecture.[15]

Differences in viewership observed might also be the result of the subject being taught as suggested by Barco et al. who surveyed first-year US medical students. They found that about 66% of the students in Cell Biology/Histology and Physiology courses viewed lecture recordings. Of the 66% of students who viewed lecture recordings, almost half of them were low frequency viewers. A Neuroscience course in the same curriculum had an 82% viewership with only 35% of the students classified as low frequency viewers.[12] A survey of 222 students by Danielson et al., however, found that the subject did not influence the veterinary students' decisions to use recorded lectures. The researchers did note that students who used recordings in basic science courses scored better on assessments than students who did not use the recordings. This difference in assessment scores was not observed in non-basic science courses.[25]

When do students watch recorded lectures?

Would it be beneficial to give students assigned times to watch recorded lectures? A study of 80 dental students by Jackson et al. would suggest that students do not use that allotted time for viewing recorded lectures. The dental students were given four lectures as recordings and had time set-aside in the academic schedule for the students to watch the recordings. They found that no student watched more than 30% of the recordings during the allotted time. Most students watched less than 20% of the recordings during the designated viewing time.[16]

If students do not use time that has been set aside for them to review recordings, then when do they watch them? Jackson et al. saw a significant increase in the number of views right before an assessment as compared to several days before that exam.[16] A medical school survey conducted by Topale revealed that 29.2% of students did not or rarely use the recordings while only 5.7% would use the recordings just before an assessment. This same study indicated the frequency of use with 39.1% using the recordings more than 3 times a week and 26% using the recordings once or twice a week.[4] A curious result by McAndrew et al. found that 80% of the 94 dental student respondents they surveyed indicated that they have more productive studying in the morning, but most indicated they did their studying in the evening or at night.[17]

Faculty concerns for the use of recorded lectures

The student perception of the availability of a recorded lecture is for the most part a positive one, but many faculty have several concerns. Some faculty feel that the cost of implementing and then maintaining the recording system is too costly for some institutions and that the presence of the recordings "adversely affects the morale of educators".[18] Kwiatowski and Demirbilek identified four reasons that faculty resist recording their lectures despite students demanding them to be recorded:

- the recording is incompatible to their pedagogy
- the faculty have technical concerns
- the faculty are unaware of how to use the technology or that it was an option to use
- concern for a reduction in class attendance[19]

Other studies also suggest faculty are hesitant to record their lectures for fear of the reduction in class attendance.[18] These observations lead to two related questions: does the availability of recorded lectures reduce class attendance and does a reduction in class attendance or increase in recording views result in a reduction in class performance?

Many studies have been performed to answer the question of whether access to recorded lectures diminishes attendance during the live lecture. The results of these studies are so varied that it is hard to come to a consensus. These studies are also from many different disciplines and years of study. For example, medical schools located in the US[20,21], medical schools located in other countries[22] and dental schools[14] show no significant difference in attendance when lectures are recorded or only available live. Bollmeier et al. had 72% of their 122 surveyed pharmacy students indicate that the presence of online material did not influence their decision to attend the live lecture.[20]

Other studies have reported significant differences in attendance when recorded lectures are available. Kauffman et al. found that in a second-year medical pathophysiology course, only 25% of the 48 students who completed the survey would attend a live lecture and 33% did not attend any lectures.[23] A recent study of medical students gives us some insight into the change in class participation. Topale found that 88.3% of students surveyed indicated that they would regularly attend class prior to matriculation into medical school, but once in medical school, that number drops to 68.3%.[4]

Student reactions to the ability of recorded lectures to substitute for live lectures are also varied. A study of medical and dental students in the United Kingdom indicated that 66% and 76% respectively thought that live traditional lectures should not be mandatory because the recorded lectures were adequate.[13]

Reports on the effects of recorded lectures on performance also vary, but some of the differences could be the result of student perceptions. Orellano and Carcamo compared the results of 25 medical students' comprehension of material present both as recorded and face-to-face lectures via pre- and post-tests. They found no difference in knowledge gained between the different delivery methods.[36] The lack of performance differences between students who watch recordings and those who attended live lectures observed by Orellano and Carcamo has also been recognized by others.[12,20,24-30] McHulty et al. on the other hand did find a relationship between students who used more recordings resulting in poorer performance.[31] This results in a chicken vs egg scenario: do poorer performing students need to use more recordings or does use of more recordings lead to a poorer performance?

Of note, students who used a mixed method of live and lecture capture recordings had worse academic outcomes than students who strictly used live or recorded lectures. Zureick et al. report no difference in performance between the live only lecture and recording only groups of 439 medical students surveyed. One possible explanation that the researchers allude to is that the students using the mixed strategy might be less focused because of social media use, interruptions in watching the recordings and feeling sleepy.[32] As Jackson et al. discovered, it does not matter if the students were given scheduled time to view recording lectures. There was no significant association between accessing lectures during an allotted time and course performance.[16]

Others have observed statistically significant differences between groups of students who use recorded lectures and those that do not. Demir et al. found that 235 students that were taking a second-year medical physiology course did score significantly better on questions from lectures they attended as compared to questions from lectures they viewed as recordings. They went on to point out that this

increase in score was present not only for students who were taking the course for the first time but also for students who were repeating.[33] Kaufmann et al., however, saw a better performance from students who did not attend the live lecture. They did point out that most of the students who did not attend had higher MCAT scores and GPAs than the group who did attend the lecture, so this group may be a stronger cohort of students.[23]

What about students who have access to the live lecture that was also lecture captured for viewing later by the student? Baillie et al. compared student performance between two cohorts of students in which one received a live lecture (n = 414) that was also lecture captured and another cohort in which the lecture was only available live (n = 433). They found that students that had access to the lecture capture material showed a decline in performance on exams and the overall final grade in the course. It should be noted that the presence of the lecture capture did not influence student attendance at the live sessions.[34] This could possibly suggest that some students view the lecture capture as a safety net and might not remain as focused during the live lecture.

Interactive virtual platforms can facilitate real-time engagement during a recorded lecture. One possible technique for faculty to use with recorded lectures is to include polling questions embedded within the recording. Vuk et al. found that giving pre-clinical medical students self-paced polling questions during a recorded lecture increased student comprehension of the material and improved exam scores.[35] As with many aspects of recorded lectures discussed in this review, others have observed no difference in student outcomes if inserted questions are present or absent.[36]

Discussion

The landscape of higher education has witnessed a significant shift with the widespread adoption of recorded lectures in healthcare education. This transition, largely accelerated by the COVID-19 pandemic, technological advancements and the demands of a modern, flexible learning environment, has sparked a debate among students, educators and policymakers alike.

The obvious benefits of recorded lectures offer students greater flexibility and the freedom to access course content at their own pace, accommodating diverse learning styles and individual schedules. The unique responsibilities of a graduate student in a healthcare program, including personal and professional obligations, benefit significantly from the flexibility that recorded lectures provide. Accessibility, decreased travel time, and faster playback speeds allow students to manage and utilize their time at their discretion including course prioritization and possible illness.

The convenience of recorded lectures allows students to revisit recorded material to reinforce their understanding of complex topics, contributing to enhanced retention and comprehension. Having the live lecture recorded for review can supplement the knowledge acquired in the initial live attendance. This reinforcement is invaluable for graduate students engaged in advanced coursework, where in-depth understanding is crucial for success. The recorded lecture also allows students to tailor their viewing to suit their time constraints, whether they have free mornings or evenings, and of course, before the assessment on the material.

Not attending live lectures, however, does have its drawbacks. Studies have shown that higher performing students prefer the live lecture environment; meeting their classmates, developing a relationship with their professors and the opportunity to ask questions about the presented material are lost in the secluded home environment. Graduate education often thrives on dynamic discussions and the asynchronous nature of recorded lectures may hinder the immediacy of student-teacher engagement.

The autonomy granted through the availability of recorded lectures leads to challenges in terms of

student accountability. Some students may procrastinate or struggle to stay disciplined without the structure of traditional, live lecture despite asynchronous scheduling. Improper time management in conjunction with the uprising of social media generates unprecedented obstacles for this generation of health professional students.

Along with the uprising of social media, the heightened utilization of technology in education may result in connectivity, software or hardware issues potentially disrupting the learning experience. Many schools do not have adequate technical support and resources that are essential to ensure a reliable recorded lecture format. Striking a balance between flexibility and interactive engagement is key to maximizing the benefits of this educational approach. This ongoing discourse surrounding the role of recorded lectures in health professional education reflects a broader conversation about the future of learning and the adaptability of academic institutions in the digital age.

Conclusion

This review highlights some aspects of higher education that health profession educators might want to consider when designing or redesigning their courses. First, which instructional style should be used by the professor? Much of this can depend on the professor's style, course content or course structure. Second, whether the lecture is going to be a traditional live face-to-face or recorded for the student to view at any time and whether or not the use of live lecture capture is warranted? Many pros and cons exist for the affirmative use of recordings, but other studies suggest that lecture capture may have a negative effect on learning. Neither students nor instructors can agree. It is important to think about how the students learn. Students often prefer one style but might learn better with another. In addition, no two students are exactly alike in their learning styles. We recommend offering live lectures that are livestreamed and lecture captured for later viewing. As discussed above, this does run into the risk of students not attending class, students not keeping up with the lecture material, or students sacrificing performance in one class for another. However, we feel live lectures with live streaming and lecture capture gives the most options to students. We would still highly encourage students to attend the live lecture since some research indicates this results in fewer distractions to the student and better overall performance in the course. In fact, some faculty in our program will administer low-stakes in-class quizzes to encourage students to attend lectures. If a recorded lecture is the only option for course content delivery, we recommend implementing self-paced quizzes that students would use while watching the recorded lecture. This would ensure they stay on track and perhaps motivate them to not only watch the lecture but also stay engaged in the lecture content.

As most educators are aware, it can be very difficult to change the mindset of a student, especially on topics of study habits and lecture attendance. Simply stating recommendations to the students on lecture attendance is not enough. Optometry programs should dedicate time during orientation activities to highlight research results showing the benefits of attending live lectures. Programs can also use this opportunity to indicate how recorded lectures should be used as an additional learning tool or making up a missed lecture because of illness and not as a primary source for collecting information.

For recorded lectures to have any benefit to the pedagogy of an optometric educator, the educator needs to have as much support as possible with these new and emerging technologies. Universities and programs need to provide the necessary internet access and bandwidth to allow for live streaming and the recording of lectures. In addition, the school needs to be willing to invest in the newest technologies, which could enhance the learning experience. If possible, these technologies should allow for control and monitoring of student utilization of recordings such as playback speed and provide options for self-paced polling questions during the lecture to help maintain student focus on the material. We also want to highlight that for this technology to be effective, students are required to have adequate computers, etc. themselves. Optometry schools should have minimum computer requirements with appropriate hardware and software for students matriculated into their programs if they do not already have it.

Faculty need to advocate for as much support as they can get since they can only give to the students as much as they are supported themselves.

Research and answers to these questions proposed above are only starting to emerge. As stated earlier, the COVID-19 pandemic and instructional style changes that had to occur for outside the classroom viewing resulted in a vast amount of comparative data to be collected. The examination of the topics mentioned above should be a priority within healthcare education so we can maximize the information our students will retain and thus make them better healthcare providers. To our knowledge, only one study in an optometry school has been published looking at student exam outcomes comparing information presented in live verses recorded lectures. This study looked at a basic science course. Would the same results of this study hold true for a course with optometry specific or clinically related content such as clinical skills? From the literature reviewed and discussed here, the takeaway message is that we have much to learn about how to best educate our health profession students.

References

1. Emahiser J, Nguyen J, Vanier C, Sadik A. Study of live lecture attendance, student perceptions and expectations. Med Sci Educ. 2021;31:697-707. doi: 10.1007/s40670-021-01401-z
2. Eisen DB, Schupp CW, Isseroff RR, Ibrahimi OA, Ledo L, Armstrong AW. Does class attendance matter? Results from a second-year medical school dermatology cohort study. Int J Dermatol. 2015;54(7):807-16. Epub 2015/06/26. doi: 10.1111/ijd.12816
3. Hussain A, Tabrez E, Basu A, D'Silva CSM. Medical Students' Perception of the Usage of Lecture Recording Software. Cureus. 2018;10(7):e2963. Epub 2018/09/14. doi: 10.7759/cureus.2963
4. Topale L. The strategic use of lecture recordings to facilitate an active and self-directed learning approach. BMC med educ. 2016;16(1):1-9. doi: 10.1186/s12909-016-0723-0
5. Cardall S, Krupat E, Ulrich M. Live lecture versus video-recorded lecture: are students voting with their feet? Acad Med. 2008;83(12):1174-8. Epub 2009/02/10. doi: 10.1097/ACM.0b013e31818c6902
6. Dost S, Hossain A, Shehab M, Abdelwahed A, Al-Nusair L. Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students. BMJ open. 2020;10(11):e042378. doi: 10.1136/bmjopen-2020-042378
7. Horn D. Recorded lectures are not for everyone: lower-performing students benefit from attending live lectures. Optom Educ. 2020;46(1):1-9.
8. Paw?owska IJ, Paw?owski L, Krzy?aniak N, Koci? I. How to teach pharmacology to medical students during the COVID-19 pandemic? Eur J Transl Clin Med. 2022. doi: 10.31373/ejtcm/142534
9. Song K, Chakraborty A, Dawson M, Dugan A, Adkins B, Doty C. Does the Podcast Video Playback Speed Affect Comprehension for Novel Curriculum Delivery? A Randomized Trial. West J Emerg Med. 2018;19(1):101-5. doi: 10.5811/westjem.2017.10.36027
10. Arain SA, Ali M, Arbili L, Ikram MF, Kashir J, Omair A, et al. Medical Students and Faculty Perceptions About Online Learning During COVID-19 Pandemic: Alfaisal University Experience. Front Public Health. 2022;10. doi: 10.3389/fpubh.2022.880835
11. Gupta A, Saks NS. Exploring medical student decisions regarding attending live lectures and using recorded lectures. Med Teach. 2013;35(9):767-71. Epub 2013/07/23. doi: 10.3109/0142159X.2013.801940
12. Barco TG, M.; Fitzharris, T. Evaluation of a Lecture Recording System in a Medical Curriculum. Anat Sci Educ. 2010;3:300-8. doi: 10.1002/ase.183
13. Daud A, Bagria A, Shah K, Puryer J. Should Undergraduate Lectures be Compulsory? The Views of Dental and Medical Students from a UK University. Dent J (Basel). 2017;5(2). Epub 2018/03/23. doi: 10.3390/dj5020015

14. Azab E, Saksena Y, Alghanem T, Midle JB, Molgaard K, Albright S, et al. Relationship Among Dental Students' Class Lecture Attendance, Use of Online Resources, and Performance. J Dent Educ. 2016;80(4):452-8. Epub 2016/04/03.
15. Lovell KP, G. Student Utilization of Digital Versions of Classroom Lectures. Med Sci Educ. 2009;19(1):20-5.
16. Jackson TH, Zhong J, Phillips C, Koroluk LD. Self-Directed Digital Learning: When Do Dental Students Study? J Dent Educ. 2018;82(4):373-8. Epub 2018/04/03. doi: 10.21815/JDE.018.040
17. McAndrew M, Morrow CS, Atiyeh L, Pierre GC. Dental Student Study Strategies: Are Self-Testing and Scheduling Related to Academic Performance? J Dent Educ. 2016;80(5):542-52. Epub 2016/05/04.
18. Zandona AF, Kinney J, Seong W, Kumar V, Bendayan A, Hewlett E. Should Lecture Recordings Be Mandated in Dental Schools? Two Viewpoints: Viewpoint 1: Lecture Recordings Should Be Mandatory in U.S. Dental Schools and Viewpoint 2: Lecture Recordings Should Not Be Mandatory in U.S. Dental Schools. J Dent Educ. 2016;80(12):1468-73. Epub 2016/12/10.
19. Kwiatkowski AC, Demirbilek M. Investigating Veterinary Medicine Faculty Perceptions of Lecture Capture: Issues, Concerns, and Promises. J Vet Med Educ. 2016;43(3):302-9. Epub 2016/04/15. doi: 10.3138/jvme.0615-090R1
20. Bollmeier SG, Wenger PJ, Forinash AB. Impact of online lecture-capture on student outcomes in a therapeutics course. Am J Pharm Educ. 2010;74(7). doi: 10.5688/aj7407127
21. Roberts JK, Chudgar SM, Engle D, McClain EK, Jakoi E, Berkoben M, et al. Digital chalk-talk videos improve knowledge and satisfaction in renal physiology. Adv Physiol Educ. 2018;42(1):146-51. Epub 2018/02/16. doi: 10.1152/advan.00131.2017
22. Rae MG, O'Malley D. Do prerecorded lecture VODcasts affect lecture attendance of first-yearpre-clinical Graduate Entry to Medicine students? Med Teach. 2017;39(3):250-4. Epub 2016/12/29. doi: 10.1080/0142159X.2017.1270436
23. Kauffman CA, Derazin M, Asmar A, Kibble JD. Relationship between classroom attendance and examination performance in a second-year medical pathophysiology class. Adv Physiol Educ. 2018;42(4):593-8. Epub 2018/09/27. doi: 10.1152/advan.00123.2018
24. Courteille O, Fahlstedt M, Ho J, Hedman L, Fors U, von Holst H, et al. Learning through a virtual patient vs. recorded lecture: a comparison of knowledge retention in a trauma case. Int J Med Educ. 2018;9:86-92. Epub 2018/03/31. doi: 10.5116/ijme.5aa3.ccf2
25. Danielson J, Preast V, Bender H, Hassall L. Is the effectiveness of lecture capture related to teaching approach or content type? J Comp Edu. 2014;72:121-31. doi: 10.1016/j.compedu.2013.10.016.
26. Fleagle TR, Borcherding NC, Harris J, Hoffmann DS. Application of flipped classroom pedagogy to the human gross anatomy laboratory: Student preferences and learning outcomes. Anat Sci Educ. 2018;11(4):385-96. Epub 2017/12/29. doi: 10.1002/ase.1755
27. Hua LG, D.; Weiss, A. Traditional vs. Blended Learning of Pharmacology. Optom Educ. 2013;39(1):28-34.
28. Sanchez-Diaz P. Impact of interactive instructional tools in gross anatomy for optometry students: a pilot study. Optom Educ. 2013;38(3):100-5.
29. Shiau S, Kahn LG, Platt J, Li C, Guzman JT, Kornhauser ZG, et al. Evaluation of a flipped classroom approach to learning introductory epidemiology. BMC med educ. 2018;18(1):63. Epub 2018/04/04. doi: 10.1186/s12909-018-1150-1
30. Vaccani JP, Javidnia H, Humphrey-Murto S. The effectiveness of webcast compared to live lectures as a teaching tool in medical school. Med Teach. 2016;38(1):59-63. Epub 2014/10/14. doi: 10.3109/0142159X.2014.970990
31. McNulty JH, A.' Chandrasekhar, A.; Espiritu, B.; Gruener, G.; Price Jr., R.; Naheedy, R. A three year study of lecture multimedia utilization in the medical curriculum: associations with performances in the basic sciences. Med Sci Educ. 2011;1:29-36. doi:10.1007/s11423-015-9406-5
32. Zureick AH, Burk-Rafel J, Purkiss JA, Hortsch M. The interrupted learner: How distractions during

live and video lectures influence learning outcomes. Anat Sci Educ. 2018;11(4):366-76. Epub 2017/11/28. doi: 10.1002/ase.1754
33. Demir EA, Tutuk O, Dogan H, Egeli D, Tumer C. Lecture attendance improves success in medical physiology. Adv Physiol Educ. 2017;41(4):599-603. Epub 2017/11/16. doi: 10.1152/advan.00119.2017
34. Baillie LD, Banow R, Botterill JJ. The impact of lecture capture availability on academic performance in a large biomedical science course. Educ Inf Technol. 2022;27(5):7183-203. doi:10.1007/s10639-022-10903-1
35. Vuk J, Anders ME, Rhee SW. Self-paced polling increases medical student engagement in recorded lectures and improves examination performance. Adv Physiol Educ. 2022;46(4):728-34. doi: 10.1152/advan.00083.2022
36. Orellano C, Carcamo C. Evaluating learning of medical students through recorded lectures in clinical courses. Heliyon. 2021;7(7):e07473. doi: 10.1016/j.heliyon.2021.e07473

Dr. Darryl Horn holds a PhD in Biochemistry and Molecular Biology from the University of Miami. He currently is a faculty member in the Pennsylvania College of Optometry at Salus University.

Dr. Jamie A.E. Neiman received an OD degree from the Pennsylvania College of Optometry and she is currently a faculty member at the Pennsylvania College of Optometry at Salus University.

Dr. Helene Kaiser received an OD degree from the Pennsylvania College of Optometry and she is currently a faculty member at the Pennsylvania College of Optometry at Salus University.

PEER REVIEWED

Does it Make the Grade? Clinical Grading in an Optometric Program

Marc B. Taub, OD, MS, EdD | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Abstract

Background: In this naturalistic and formative evaluation, the main research question of the study related to the effectiveness of the clinical grading system as a method of grading and teaching at Southern College of Optometry (SCO). Sub-questions included how the system impacts student learning and performance, and whether it meets the needs of students, faculty, and administration. The Experiential Learning Theory, which involves a four-stage learning cycle of experience, reflection, conceptualization, and experimentation, was used to view clinical grading as an opportunity for reflection and investigated whether the grading system was being used for that purpose.

Methods: Three administrators were interviewed and focus groups were conducted with both faculty and student with six participants each. Thematic analysis was used to code the qualitative data.

Results: Five themes developed: (1) Faculty expectations develop with experience, are highly personal, and have an impact on learning; (2) Faculty feedback can have a positive or negative impact on student learning; (3) The clinical grading system is used in a variety of ways and for different reasons by the faculty, administrators, and students; (4) Clinical grading is subjective and has challenges that inhibit its effective use; and (5) The clinical grading system continues to evolve and grow to meet the needs of all parties.

Conclusion: The current clinical grading system at SCO is partially effective for grading and teaching but has barriers that hamper student reflection. It has a variable impact on shaping student learning and performance based on how it is being used by both faculty and students. The grading system mostly meets the needs of the various stakeholders, but recommendations that are both specific to SCO and more broadly, to optometric education are presented.

Key Words: *Clinical grading, clinical optometry, experiential learning theory, feedback, reflection*

Background of the Study

The ultimate goal of any program is to produce competent practitioners; optometry programs are no different. Since the four-year curriculum is split between didactic and clinical experiences, different assessment and grading methods are required. In clinical courses, grading protocols are specific to the optometric program. In discussions with residents and colleagues from various institutions over the past 20 years, it became evident that the programs generally attempt to assess the same types of information, they do so in very different manners. Some programs use Likert grading scales, others use written comments and others use a combination of the two. The frequency of grading and feedback also occurs at various times, depending on the program. There is a lack of uniformity on many fronts and, hence, a lack of best clinical grading practices in optometric programs.

A grade is completed for each patient encounter at Southern College of Optometry (SCO). After the

student sees a patient, they log the encounter and a request for an evaluation or grade is sent to the faculty member with whom they worked with for that patient encounter. The faculty member is then responsible for completing the grade, which is sent back to the student. The clinical grading presented below is used throughout the student's third and fourth years and is the same rubric, regardless of the clinical service in which the patient care takes place. There are two components to each grade (**Figure 1**). The first component consists of six categories, with a Likert scale of 1 to 3 to indicate performance. The faculty member also indicates whether the student was professional during the examination in a yes/no format. The second aspect of the grade consists of two text boxes where the faculty can speak directly to the student, letting them know precisely what they have done well and what needs improvement.

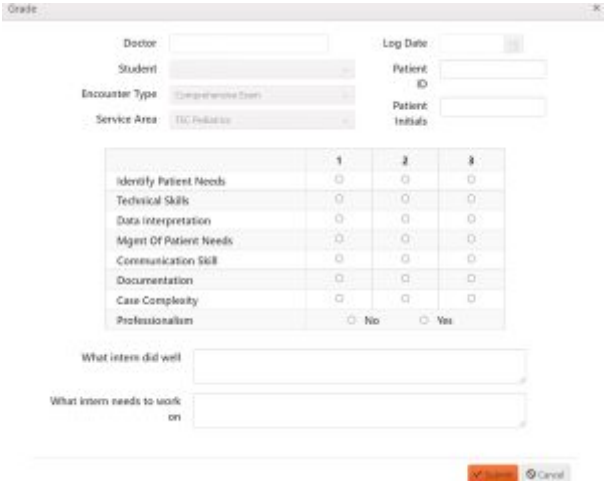


Figure 1. Example of the Grading Form Completed by the Faculty Member at SCO. Click to enlarge

There are issues inherent with this system employed by SCO. There is guidance provided within the grading program, in the form of pop-up boxes, as to what each of the categories includes, however, there is no indication of what constitutes a grade of 1, 2, or 3. This decision-making is left solely up to the faculty member. There is a wide disparity in average grade and standard deviation in examining the database related to grading by faculty member. Some faculty grade high and have a tight standard deviation; these are easier graders who poorly discriminate between excellent, acceptable and poor performance. Others tend to grade lower and have larger standard deviations, perhaps indicating that they are better discriminators of performance. This is based on their expectations for the student at that point in their careers and the difficulty/type of patient encounter. The administration offers little guidance on how to grade; this is purposeful and aims to promote academic freedom and decision making on the part of the faculty.

Even though the clinical grading system is consistent among the different clinical services, and the grading rubric remains unchanged, what constitutes a 1, 2, or 3 can also differ based on the clinical service in which the patient is seen. This is related to the skills needed to provide the care and the demands of the faculty in those services.

The entire system of grading at SCO has not been evaluated from both a top-down and bottom-up approach since being created more than 20 years ago. A grading committee is convened every 2 years, but only small alterations are made to the grading matrix. While this allows for fixes on a micro-level, it does not address macro-level issues and concerns. In this study, through interviews with administration and focus groups with students and faculty, my hope is to create an understanding of how the grading system is being used by the various parties and whether it is effective when examined through the lens of the experiential model. This understanding may lead to the creation of a set of best practices for other colleges to mirror.

Theoretical Framework

Experiential Learning

Experiential Learning Theory originates in the work of educator John Dewey. Dewey[1] espoused the concept that learning occurs during and from experience. He states in his article, "My Pedagogic Creed" from 1897, "…education must be conceived as a continuing reconstruction of experience…the process and goal of education are one and the same thing."[2] This became the foundation for what is now known as progressive education. According to Dewey,[1] not all experiences produce learning; some may miseducate, leading to less-than-meaningful experiences where learning or growth does not occur. For learning to occur, the learner must connect with the experience and the experience must be genuine.[3]

Kurt Lewin, an American psychologist, had a profound influence in the fields of social psychology and organizational behavior. The T-Group laboratory method and action research they conceived is a four-stage cycle in which "learning, change, and growth are seen to be facilitated best by an integrated process that begins with here-and-now experience followed by collection of data and observations about that experience." The data is analyzed and used to modify behavior and the choice of new experiences. The concrete experience and feedback processes were key factors in this model.[4]

Jean Piaget, a Swiss psychologist, is a well-known in the field of child and cognitive development. He identified four major stages of cognitive growth that begin at birth and continue to about ages 14 to 16. The sensory-motor stage occurs with learning occurring through touch in the environment. In the representational stage, the child develops reflective orientation, transferring the internalized actions to images to be manipulated. In the stage of concrete operations, the child uses their powers of induction, relying on concepts and theories to give shape to their experiences. In the stage of formal learning which takes place during adolescence, the child returns to active orientation, but with the ability to engage in deduction and reasoning. Now, they can develop theories and test their validity. These concepts can be extrapolated to the general learning process during adulthood.[4]

Drawing upon the works of Dewey,[1] Piaget,[5] and Lewin,[6] Kolb[7] defined experiential learning as the process whereby knowledge is created through the transformation of experience. The Kolb learning model consists of four stages through which learners progress during the learning process: concrete experience, reflective observation, abstract conceptualization and active experimentation. Learning is effective when there is a progression by the learner through these four stages. The model is more complicated than a circular cycle, in any case. It is composed of two modes of grasping experiences (concrete experience and abstract conceptualization) that are oppositional and two modes of transforming experiences (reflective observation and active experimentation) that are also oppositional.

The learning cycle is conceptualized as the individual starting the process by having a concrete experience, which is the basis for observations and reflection. The reflections are integrated into abstract concepts from which implications can be drawn and actively tested and experimented in future experience. Zull provided a connection between Kolb's cycle and neurology.[8] In viewing the four stages of the Kolb experiential learning cycle concerning the clinical optometric learning experience, the following connections emerge as seen in blue in **Figure 2**.

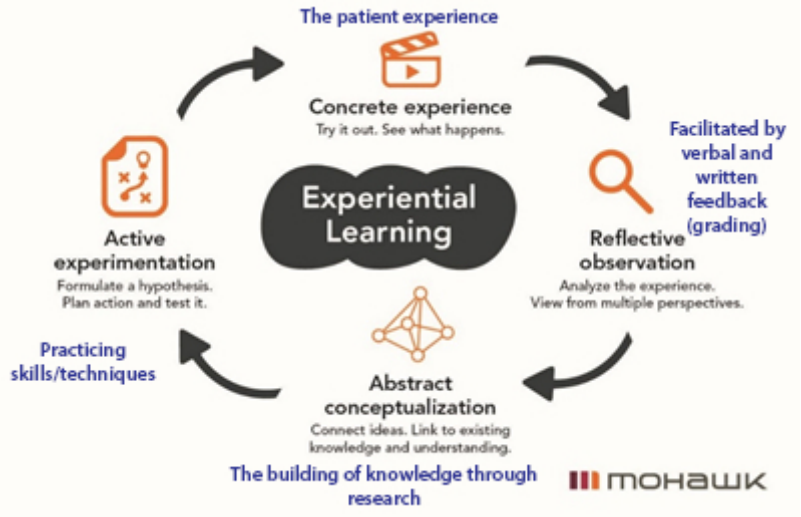


Figure 2. Kolb's Experiential Learning Theory Modified to Include Clinical Grading ("Experiential Learning," n.d.). Click to enlarge

In looking more closely at the reflection component of the process, the question arises as to whether clinical grading offers the opportunity for reflection to take place at a deep enough level.

The true purpose of this study is education. Optometrists, who are also educators, strive to produce the best-trained optometrists. Clinical grading, in theory, should support the notion that the role of the teacher is to support learning in order to guide the student in having meaningful experiences. Yes, it has a purpose in assigning grades of pass and fail, but whether the clinical grading system at SCO is fulfilling the first mission is a major question. Not only was this study concerned with the effectiveness of our clinical grading, but it also explored how that grading influences the learning process and overall student education.

Research Questions

These are the research questions directing this study:

- How effective is the current clinical grading system as a method of grading and teaching at the Southern College of Optometry (SCO)?
    - How does the clinical grading system at SCO shape student learning and performance?
    - How does the current system used for clinical grading at SCO meet the needs of students, faculty, administration and Accreditation Council on Optometric Education (ACOE)?

Research Design

In this naturalistic and formative evaluation study, data collection consisted of two methods, interviews and focus groups, to gather information from a variety of sources: students, faculty and administration. Using a semi-structured interview process, three members of the SCO administrative team who played a role in establishing the clinical grading paradigm currently in use were interviewed. The interview questions for this group are representative of the types of questions asked for all groups and can be found in **Appendix A**. The second group studied was the clinical faculty as they provide the grades in the clinical grading system. This group of six faculty was studied through one focus group and chosen by purposeful sampling,[9] based on the length of time teaching at SCO and specific area of expertise. The third group, who took part as a different focus group, was made up of the students. In the clinical programs, 3rd- and 4th-year students see patients and submit evaluations (which will later be graded) for each clinical encounter to the faculty. Three students were included in the focus group for each, for a total of six students who participated. Students were selected based time of response to an email

request for participation to both the third- and fourth-year classes; those who responded first were chosen. Administrators taking part are identified as A1-A3. Faculty are identified as F1-F6 and students are identified as S1-S6. All interviews and focus groups took place via Microsoft TEAMS (Redmond, WA) online instead of in-person in accordance with the COVID protocols at the time. This study was deemed exempt by the IRB at the University of Memphis and SCO and was completed in compliance with the Helsinki Accords. Informed consent was completed by each subject electronically.

The most appropriate method of analysis to understand the data in this study was thematic analysis. Thematic analysis involves the identification of recurring patterns that are presented as overarching statements or themes.[10] Braun and Clark[11] define thematic analysis as “a method for identifying, analyzing, and reporting patterns (themes) within data”.

Findings

Five themes, each with multiple subthemes were identified (**Table 1**) and described in more detail below.

Table 1. Summary of Themes and Subthemes Developed in this Study.
Click to enlarge

Theme 1: Faculty expectations develop with experience, are highly personal and have an impact on learning

In the interviews and focus groups, participants from all three groups in the study continually spoke about faculty expectations of student performance and how those expectations impacted use of the clinical grading system. Faculty grading is very much a “moving target” based on numerous factors including their experience in patient care and teaching. Since every faculty has a different path of development, their expectations are personal. A1, a 30+ year faculty member describes his process of how his expectations of student performance matured:

> You know, it was unconscious because I can’t provide you with a rational step of how I developed it [his expectations of student performance]. I have obviously been doing this

> [clinical grading] very long time. I'd spent virtually all of my time in clinical teaching, and so really it was built up over years. (A1, Para. 43)

In contrast, F5, who has been teaching for three years, highlighted the need for experience and how that impacts the grading process in the following statement: "You just need a year or two of working in the clinic to see what is truly, you know, what's typical for a student, what's atypical for a student" (F5, Para. 154).

Many of the faculty personalized the concept of expectations, making comments like, "perform higher than what I would have expected" (F4, Para. 61), "being outside of my expectations," (F4, Para. 58), "where I think they should fall" (F6, Para. 61), and "I expect them" (F2, Para. 65). A2 also made a similar comment: "below the level at which I would expect them to be performing" (A2, Para. 25).

The expectations can change based on service specialty service in which the patient is seen, the student's level of experience, and the complexity of the patient, causing issues in how the students use the grading system and their ability to learn from its use. Comments such as "I've learned what they expect for me" (S1, Para. 29) and "I do feel like I kind of tailor my [patient eye] exams to who I'm working with in a way" (S1, Para. 98), highlight this issue.

The administrators highlighted that "not everybody [referring to faculty] was using this [clinical grading] system appropriately" (A2, Para. 34). For example, A2 brought up how some faculty were unable to differentiate between good versus bad student performance and "would give the exact same grade hundreds of times in a row" (A2, Para. 34), which is obviously not reflective of student performance, since even one student does not perform in the same manner with different patients.

Theme 2: Faculty feedback can have a positive or negative impact on student learning

Faculty feedback having a positive impact on student learning centered around two main topics: building student confidence and faculty feedback. The concept of building student confidence came up in a number of quotes from the students and how the feedback they received within the grading system helped in creating and building that confidence. S3 related the concept of confidence and how the grading system helped build her confidence in this quote, showing the importance of the concept in her education.

> My goal out of the grading system, it's like giving me that confidence. Tell me what I need to grow on and if I do something wrong, yeah, I'd like to know definitely. But in a constructive criticism way rather than harsh. (S3, Para. 184)

These student comments show the impact on learning that can occur in giving feedback through the clinical grading system. F1, an almost 30-year faculty member hits on confidence and the importance of developing it from the teaching side of the equation. This individual uses the grading system with building confidence as a specific goal and makes comments that assists the students in creating the mental scaffolding to be excellent clinicians. "I think that confidence is built when you reaffirm that they're doing proper behaviors and really stepping outside the norm and identifying themselves as an exceptional individual" (F1, Para. 105). The building of confidence is evident and shows the positive impact on learning that is possible in the use of the clinical grading system at SCO.

The students had thoughts on how the feedback made them feel, the types of feedback that they received and appreciated, as well as the impact of the feedback on their desire to learn and interact with the faculty. S3, a 4th-year student, highlighted the level of detail in the feedback that they prefer and how

they learned to view the feedback through a learning lens. While feedback that is critical in nature can be seen as negative by students, this student sees them as a growth opportunity.

> So, if they see maybe something they need work on just like this whole broad situation where it's like I can pinpoint like, OK, in this particular case you can work on this. So, I guess seeing it narrowed down to where I need to learn and looking at it. And then I guess it comes into looking at it as a learning opportunity. (S3, Para. 131)

Looking at grades, both bad and good, as a learning opportunity and not punitive in nature is important for student development as clinicians. Looking at grades as a learning or growth opportunity, shows that the students do in fact understand the point of grades as being for development.

As part of the use of the text boxes, many faculty take the opportunity to disseminate information to illustrate certain learning points or resources for the student to continue their growth. S4 not only talks about the giving of the resources for the student to explore, he connects them with the opportunity to learn and grow as a clinician: "They also include some articles or some publications that are relevant to that case to help you reach that growth." (S4, Para. 53)

While the goal of the feedback provided as part of the clinical grading system is hoped to have a positive impact on student learning, unfortunately, that is not always the case. In discussing the types of feedback that the students like and that is helpful in the learning process, they also were honest about what manner of feedback was not beneficial and even detracted from their use of the clinical grading system. Also included was the impression that the timing of the grade completion influenced the potential impact on learning and actually had the potential to become negative in nature.

Student observations emphasize the lack of detailed comments from faculty limiting their ability to grow and learn from the clinical experiences. "I've had multiple encounters where the doctor writes in that 'need to work on' box, LOL (laugh out loud) I have to write something here or there has to be words here -that's happened multiple times" (S6, Para. 73). This poor level of feedback seems to halt the reflective aspect of the experiential learning cycle for students.

S2's comment takes the poor feedback quality a step further and shows his frustration since they feel that there is always something that he can learn from every patient he examines. They make the leap that perhaps the lack of comments is a sign that the faculty are not spending an appropriate amount of time in the grading process:

> So, when you get a staff doctor that doesn't give you anything in that section, it's almost, I almost kind of look at it as all the like, they're not spending too much time working on this feedback for this encounter. (S2, Para. 24)

Other comments highlight that some of the faculty are not creative and use the same feedback over and over. Several students felt that those faculty copy and paste their phrases that are general in nature, limiting the growth opportunities; "But there are also some docs that have pre-done little things that they copy and paste into your 'what they like' section" (S5, Para. 8). S4, a 4th-year student, responded with "Great job. What needs work on…nothing" (S4, Para. 69) when questioned about what types of comments are not helpful. Without feedback that enables reflection, there once again is a break in the experiential learning cycle.

Faculty are given leeway to complete grades within a few days. They are encouraged to do this as

quickly as possible, but it does not always happen as requested as evidenced in the following student statements. The comment from A1 shows the variability in how long grades take for completion, “Sometimes before you’re even done, they’ll grade it. Sometimes it’s like a week later” (S1, Para. 8). S6 made two comments during the focus group, “a week later when they’re grading me” (S6, Para. 106) and “it might take them a week to put it in my grade” (S6, Para. 47). The impact of the lack of timely feedback directly relates to the ability to learn from those encounters. Having immediate feedback when the exam experience is fresh is quite different than getting that same feedback a week later after that student has seen a number of additional patients and they might not recall the details of the patient encounter. Grading that takes an extended period of time is not well-received by the students and has the opportunity to foster negative experiences and learning.

Theme 3: The clinical grading system is used in a variety of ways and for different reasons by the faculty, administrators and students

The administrators use the grading system to assess and document student performance for both legal reasons, in case a student failure is contested, and to ensure they are graduating well-rounded students who can gain licensure in all 50 states. The grading system enables the administrators to assess faculty grading ability by tabulating grading statistics such as average and standard deviation for each faculty member. For accreditation purposes, the grading system serves a dual role in of patients the students see by year/semester and type (age, gender, ocular condition, etc.).

Accreditation needs are relatively straightforward, but the exact construction of a grading system is left to the institution. A3 elaborates how SCO meets the needs of ACOE and used ACOE requirements as a base on which to build the SCO system.

> We have to demonstrate that we are assessing the individual’s [student] knowledge and skill in certain areas and we do that based on ACOE, and graduate attributes that are internal graduate attributes that have been created using ACOE as a starting point. (A3, Para. 57)

Part of assessing progress is related to accreditation as highlighted above but there is something deeper in terms of patient care and the college needing to attest to the public that this doctor is safe and capable of treating patients. We need to check off the accreditation box, but we must also use the grading system to ensure a well-rounded and safe clinician.

> And yes, we’re saying that they [students] satisfy the requirements of our educational program…but…we’re also giving our acknowledgement that we believe they’re safe to independently see real human beings in the care of their eyes. (A2, Para. 26)

As an offshoot of attesting that the student is safe to practice and treat patients, the administration also uses the tracking aspect of the system to make sure that students see a variety of patients, so that they can treat the widest array of conditions and be well-rounded. A2 states, “It allows us to track clinical experience, also, at a moment’s notice that keeps time so that we could, if we needed to, redirect certain patient types of certain students.” (Para. 63)

Having a record of student progress is crucial but almost as important is “having defensible records for grades that are assigned, documentation” (A3, Para. 57). There have been instances over the years of students failing a clinical course or the entire program and challenging the grades legally.

In terms of assessing faculty grading ability, administration noted that some faculty were not using the

grading system effectively as mentioned in Theme 1. Since feedback and assessment is an important part of a faculty member's job description, it was decided that the system could be used "to evaluate the effectiveness of the clinician who's doing the grading" (A3, Para. 57) and "could be part of our [SCO's] yearly review" (A2, Para. 34). By using the grading system in this manner, it provides not only an assessment of student clinical performance, but also faculty grading functions.

The faculty at SCO is diverse in years spent teaching, specialty areas of interest and background, but they were consistent in the reasons they gave for grading clinically. The most common answer centered around feedback on what the student did well and on what that they need to improve. The faculty also use the grading system to document student performance and to share information/resources with the students. This was highlighted by F3 who stated, "giving students direct feedback about patient encounters" (F3, Para. 8), F2 who stated, "[grading] gives consistent feedback on every encounter" (F2, Para. 143), and F4 who stated, "most of the time it's just feedback, so they know how they're doing" (F4, Para. 9).

Beyond student feedback, F5 identifies the need for documentation of performance as an important aspect of grading related to ensuring adequate performance. This indicates that the faculty is aware of the grading system perhaps being used in a legal nature. He stated, grading is a way "to help the student identify when they're not performing the way they should be and to properly document if the student is consistently not performing where they should be and it potentially warrants further intervention" (F5, Para. 4).

"Sharing information" (F5, Para. 4) was also a common reason provided by several faculty. F2 connected the dots between providing that type of feedback and the potential impact on learning: "Additional things or pearls that I … try to give them those little pearls that might help him next time or just things from experience that that maybe we didn't talk about during the encounter" (F2, Para. 10).

Feedback is a crucial aspect of what the students want out of the clinical grading system. They take the concept of the feedback in the grading system and up it a level by connecting it to its impact on learning. S2 highlighted correcting his actions to best serve the needs of the patient based on faculty feedback: "To know that the things that I'm doing in clinic are the correct things are the right things and I'm doing them in a way that's effective and working for that specific patient" (S2, Para. 24). S3 internalizes the feedback and relishes the opportunity to improve her performance but also links this growth to the need for independence once they graduate, stating, "it is great for you to improve, and that's almost the way you have to look at it. It's kind of like they just want you to be better and you're about to be on your own" (S3, Para. 14).

There is progression in how the students use the grading system as they move throughout their clinical careers. The 4th-years in the focus group, who returned for their final semester of schooling at the clinic spoke about how they currently used the system and gave some contrast to their use in third year.

> I did read more of what they wrote my third year when I was more anxious about what I was doing and how I was. But now I'm more confident in who I am as a doctor. (S5, Para. 31)

S5 continued and discussed how they went from looking for specific faculty feedback to looking for more general feedback as they grew in confidence in the 4th year after they returned from off-campus externships.

> So, I did that for about the first 2 or 3 weeks coming back into the clinical setting here, but now I am more comfortable with what the doctors want, so I go look, oh, they put the grade

> and it's met, everything is probably fine, so I did check it a little more at the beginning. (S5, Para. 49)

Similar to the administrators, the students also use clinical grading to track their patient encounter numbers and the types of patients they have seen. In tracking needs, as it is for the administrators, it is to ensure that a wide variety of patients are being seen. S3 focuses on the number of encounters and types of patients.

> Uh, definitely for patient tracking. I think it like catches two birds with one stone. You type in all their demographics, so we have this excel sheet we can export at the end that lets us know how many patient encounters we've had. (S3, Para. 18)

S4 adds in the fact that knowing the types of eye conditions being seen is also an important component of the tracking aspect of the grading system, in saying, "being able to kind of keep track of how many people I'm seeing and kind of what I'm seeing as well" (S4, Para. 22).

Theme 4: Clinical grading is subjective and has challenges that inhibit effective use

Clinical grading is subjective in nature. F1 sums up this concept in this statement about clinical grading on a global level: "I think all assessment systems have flaws, particularly when you're dealing with subjective determinations of performance" (F1, Para. 185). They focus directly on the issue of subjectivity. This sentiment was repeated several times by both faculty and administrators: "I think to a certain extent it is subjective" (F5, Para. 154), "There's a lot of soft skills and those are very subjective and difficult to interpret" (A2, Para. 6), and "The big challenge with clinical grading is that it is pretty much 100% subjective" (A1, Para. 7). The most important takeaway from these statements is the acknowledgement from both the faculty and the administrators that grading is subjective. When it is accepted that there is inherent bias in some form or another in the clinical grading process, only then an approach correcting for that bias be addressed. A3 points out that attempts have been made toward standardization, and with the help of technology, they feel that things have improved, and they are satisfied with it.

> I think our system is a good system and it's much better than what we used when I first got here. I mean, it was so very subjective back then. It's still subjective but given the assistance of automation, of technology to try to standardize, what we're looking at, I think I, I mean, I've been very satisfied with the system. (A3, Para. 163)

Even still, there is still the sentiment that faculty struggle with certain aspects of grading such as making meaningful comments and trouble with discernment in performance, which has been covered previously.

The average student to faculty ratio in the clinical programs at SCO is 4 to 1. This means that there can be four patient exams going on at the same time with four different students and a single faculty supervisor. Therefore, there is literally no way for the faculty to be 100% involved in a student's examination and in some cases, the faculty–student interaction is quite limited based on the student and difficulty of the patient. A2 highlights not only the fact that the faculty is not in the room for the entire encounter but the difficulty that poses from the doctor's standpoint, "I also understand that we're not in the exam lane watching everything live. We're interpreting what's going on" (A2, Para. 69). S2 shows the impact of the faculty not being present in the room for the entire encounter on the usefulness of the grading system.

> They're [faculty] not with you the whole encounter, they're only in there for the very end, so to just kind of get a boost [from faculty that] … what you're doing throughout the majority of the encounter is the right thing is not very helpful. (S2, Para. 25)

This begs the question of how the grade can be accurate and appropriate if the faculty is not observing much of the testing, patient interaction and communication between the student and the patient when most of the graded quantitative categories require some aspect of student/faculty interaction. The faculty must rely on their experience in patient care and teaching to know when testing needs to be repeated and when to trust the student's results.

The faculty at SCO are teachers. They want the students to perform at a high level and be the best doctors. The faculty are also human and have emotions. Telling a student that they are lacking in certain skills, have poor communication, or interpreted test results incorrectly does not come easily for some. Giving negative feedback or constructive criticism, from an emotional standpoint, can be painful for the faculty and difficult for the students to hear. It can also be uncomfortable and strain the student/faculty relationship if not done with compassion and empathy and interpreted by the student as the faculty trying to teach and be helpful. The future interaction possibilities between faculty and students can weigh heavily on the faculty member doing the grading and perhaps could lead them to not be as honest and tough as needed as highlighted by A1: "Many faculty are reluctant to even point out negative things to students for fear of having to deal with the student face to face the next day in the clinic or the next week in the clinic" (A1, Para. 48).

Prior to starting in the clinical programs, all students undergo an orientation to the physical building as well as the clinical processes and policies, including how the grading system works. This is done in a large lecture style format. Faculty are also provided an orientation, which is part of a larger orientation to the college. Since faculty hiring is sporadic, the orientation may be as part of a small group or solo. A prominent subtheme is the perceived lack of a proper orientation and guidance in grading provided to students and faculty. This was addressed by the students, faculty and an administrator. F2, a relatively new faculty member describes how he learned about the grading system and the frustration felt: "I felt a little just thrown in…they didn't give me really any much insight other than me just watching them interact with students" (F2, Para. 150).

The lack of a formal orientation and inadequate guidance is highlighted by both F1, a long-time faculty member that has administrative experience, stating, "I think the thing I don't like about it [grading] is this a lack of comfort that faculty have, the lack of guidance that they get" (F1, Para. 181). A3, a long-time administrator who has faculty experience, corroborates that sentiment saying, "We have never provided consistent support to the graders. We don't provide an orientation on how the system functions to new faculty. We don't give them an overview of clinical grading" (A3, Para. 43).

From the student side of the grading equation, these problems of poor understanding due to inadequate orientation exist as well. They highlight the lack of what they consider to be an adequate orientation, which explains not only how to use physically use the clinical grading system but what the various levels of 1, 2, and 3 actually mean and how they need to perform to be at those different levels. S4 highlighted the issue of a learning curve, which can take quite some time, in understanding the clinical grading system and what the various levels on the scale actually mean in the following statement:

> The 1, 2, 3 scale is easy to interpret if you figure out what each one means…. You know, the 1st 100 encounters I had, I was still like, what do these mean? And you have to like really sit down and look at it. But once you kind of get it to where you're like, "OK, I understand what's going on here. (S4, Para. 129)

In the clinical grading system, after the grades are completed by the faculty member, the data is turned from a 1 to 3 scale into a 100-point scale. This happens automatically behind the scenes. While this information could be provided during the formal orientation, it is purposely hidden “so that it doesn’t introduce an observer bias in doing those gradings” (F1, Para. 181). The students, like the faculty, are unsure how the system works in the creation of the encounter and final grades. S5 is more global in her comment, saying, “I don’t totally understand how that works” (S5, Para. 9). S1, specifically tackles the “how” of the grade stating, “I don’t know like how it’s calculated or how you get met or below” (S1, Para. 101).

A1, in two separate comments corroborates the comments by the students that “there is a veil of secrecy over how grades are assigned” (F1, Para. 181). He stated, “I don’t know that there’s a lot of explanation or transparency to the faculty as a whole into how the numbers get converted” (A1, Para. 47) and “I don’t think that faculty often have a good idea of how the numbers they turn in for clinical encounter grades eventually turn into a course grade” (A1, Para. 48).

Theme 5: The clinical grading system continues to evolve and grow to meet the needs of all parties

The current clinical grading system has been in use for about 18 years. It has evolved since that time to meet the needs of the students, faculty and administration, and continues to evolve. Having a grading system that is dynamic is quite important to all three administrators. A3 reported that the notion of a dynamic system was part of their plan all along: “Our goal was to look at it [the clinical grading system] and upgrade it every three to five years (A3, Para. 21) and “the product that we have today has gone through at least three significant revisions” (A3, Para. 35). A1 went a step further than the other administrators, stating, “There’s always been a continual push to change it and I think what we have now, I don’t think there’s been any backward steps” (A1, Para. 3) since the new system was implemented in 2005.

As the current grading system went through a wholesale change many years ago, but has continued to evolve since that time, it is logical that future changes can be made towards the goal of further improvement. All parties involved offered suggestions that, in their opinions, would make the system not only more user friendly but also have a better impact on learning. The faculty suggestions centered around changing the quantitative grading scale to allow for greater discernment of student performance, not having to give feedback on all encounter types and a more formal orientation of the grading system in combination with education concerning best practices. The students focused on getting a higher level of feedback from the faculty and improving the language surrounding the grades. In these requests, the students are looking for ways to enhance opportunities for two aspects of the experiential learning cycle, reflective observations and abstract conceptualization.

Discussion

In looking at the three research questions posed, it would be easy to simply answer that the current clinical grading system is partially effective for grading and teaching, has a variable impact on shaping student learning and performance, and mostly meets the needs of the various stakeholders, but more detail is needed. For this process, the two sub-questions will be answered first, building them as a foundation to answer the main research questions. The first sub-question—how the clinical grading system used at SCO meets the Accreditation Council on Optometric Education (ACOE), students, faculty and administration needs—will be tackled first. The answer to this question is found in several of the themes.

Theme 3 outlines distinct ways the grading system is used by each group, administrators, faculty, and students, as well as the overlap among the three groups. Administration has broader uses for clinical grading, including assessment and documentation of student performance for legal reasons, but also to

meet the needs of accreditation. Administration also use it to evaluate faculty performance. Faculty and students both use grades for feedback on performance, but on opposite ends of the equation. Faculty provide the feedback as a means of teaching and the students use it to gauge their performance and to gain new knowledge. The clinical grading process is a tool through which these undertakings occur, but it is by no means the only way faculty encourage critical thinking and reflection in students. Verbal feedback happens as well. The faculty spoke about providing both verbal and written feedback and how both types of feedback supported each other, especially in terms of students performing poorly. The students talked about having verbal interactions with the faculty in the moment and how that impacted their clinical learning. They also felt that faculty would often use the written feedback to support what was discussed verbally with them. Students and administration also use the grading program, which records patient demographics and diagnosis to track patient encounter data.

Theme 1 and Theme 4 show some of the weaknesses and limitations in the grading system that have an impact on its ability to meet needs and that cause frustrations for the three groups. The subjectivity and variability in faculty expectations are frustrating to the students. The level of orientation and guidance provided in using the system, as well as having a poor understanding of how the grading system works on both the front and back ends, is frustrating both to the students and faculty. The administrators confirm these frustrations as well and, in some cases, have attempted to address the issues.

Theme 5 brought up suggestions for further improvement of the system from all three groups. The desire for further change should not be interpreted as the system not working for the various groups, but rather that improvements could be made to suit the needs of all parties better. While there are inherent challenges in clinical grading globally and at SCO, the overall sentiment is that the grading system does in fact meet the needs of the various parties. There is room for process improvement and change, as a system that stays the same and is not examined through a needs-based lens becomes stale and obsolete.

The findings for the second research questions addressing how the current clinical grading at SCO meets needs of the students, faculty, administration and ACOE comes mostly from Theme 2. In Kolb's Experiential Learning Theory,[7] which was modified to include clinical grading and introduced previously, the four stages of the cycle to different aspects of the patient care experience and how clinical grading can be seen through the experiential learning lens were connected (Figure 2). If faculty were more aware of the cycle and the four stages, they could work with the students to encourage them in moving through the cycle successfully. The opportunity to provide written feedback is one tool that they have in this process. Administration should work with the students and faculty to enhance the opportunities for experiential learning in general and be aware of the cycle in creating time for the students to make their way through it. While the quantity of patient encounters is important on many fronts, the quality of the patient interactions and time with the faculty is just as crucial.

Even though the four stages are introduced as separate stages by Kolb, in reality, there is opportunity for constant movement within the cycle even while the patient is undergoing an eye examination. Reflection, one of the stages of Kolb's[7] experiential learning cycle, takes place through faculty feedback, both verbal and written. While the written feedback is part of the after-exam experience in the grading system, verbal feedback can and should occur as the student works with the patient. For example, when the student does a set of testing and presents the proposed diagnosis and treatment to the faculty member, there is an opportunity for discussion in which the faculty member can offer their opinion and guide the student. Another example is when the student's testing of the patient is checked by the faculty member. Not only does this offer the student the opportunity to watch proper procedure, the discussion of the result and how to interpret it in light of other data can be illuminating for the student. If the student then has the opportunity to practice that skill in the moment, which many faculty members insist upon, they are tapping into the active experimentation aspect of the cycle.

The goal is for constructive criticism to be offered, through which the student can reflect on their performance and grow as clinicians. It is natural to give specific verbal feedback and instruction as the student is making their way through the patient eye examination process, allowing for immediate reflection. With written feedback, as per the students in the study, often lacks detail and is more general in nature. Feedback that is rich and specific in detail builds student confidence, while feedback that lacks detail or is perfunctory does not enable reflection and hampers the impact of the clinical grading system on student learning.

The timing of the grading also takes away from the potential learning aspect as well. Considering the experiential learning cycle again and looking at the feedback and grades as an opportunity for reflection, the sooner that opportunity is provided to the students the better. Grades completed weeks later are considered “out of sight, out of mind” by the students. For example, students typically see 20-30 patients weekly and, if a grade is not completed for 2 to 3 weeks, they have to attempt to recall the graded patient and what took place during that experience. Personally, most would find it quite challenging to do so in the midst of seeing more patients and studying for classes or boards. This delay essentially strips the student of the opportunity to reflect in a meaningful way.

Theme 1 also shows how the grading system can have an impact on learning. Faculty expectations of students generally change throughout the 2 years that the students are in the clinic. They change based on service, student experience and patient difficulty. These expectations are individualized to the specific faculty member and are not standardized clinic-wide or even service-wide. While there are general lists of expectations built into the clinical service syllabi by the chiefs of service, the course masters for the clinical courses, these are not typically distributed to the general faculty and are not service-specific. These are, in fact, available to the students via an online learning platform, but students are not required to read them or even acknowledge that they have looked at them. The students nonetheless find it challenging to focus on seeing patients and meet the ever-changing and variable faculty expectations. Compounding this issue, as seen in Theme 4 (Clinical grading is subjective and has challenges that inhibit effective use), is the lack of an adequate orientation and guidance in using the system and not understanding how it truly works behind the “veil of secrecy” to produce a grade.

While the clinical grading system was designed to provide quality feedback to the students, in some cases, that is either simply not happening, or it is indeed happening, but the feedback is not viewed. In other cases, it is occurring, and the impact is felt by the students and faculty. Suggestions made by the students, faculty and administration have the potential to increase the likelihood of the latter.

The answers to the two sub-questions lead to the following conclusion about the main research question: the clinical grading system at SCO meets the overall needs of the students, faculty and administration. This finding supports the idea that the administration had about the current clinical grading system that even though some minor changes were needed and have been made to finetune the system to meet better the needs of the students, faculty and administration, no significant changes were necessary or seem to be necessary currently. For the faculty, the system meets their general needs, but they have recommendations to remove barriers to (a) improve the quality of student feedback they provide, (b) enhance the potential for student reflection, (c) better understand how the system works, and (d) increase the consistency of how the faculty use the system. For students, it meets their needs, but they also made recommendations to remove barriers that hamper effective use of it in their learning process, limiting the opportunity for reflection. When looking at the clinical grading system through an experiential learning lens, the system is used to enhance student learning through reflection. However, the recommendations made are aimed at improving those opportunities for the students. Having an understanding of the experiential learning cycle, the opportunities for faculty teaching and student learning throughout the patient care experience, and how those opportunities can be enhanced is a crucial first step in clinical instruction at SCO.

Even though the ACOE guidelines for clinical grading allow for optometric programs such as SCO to craft its own system, based on the findings of this study, a general set of recommendations were formulated and are listed below. I hope these suggestions allow other programs to look at how they accomplish their clinical grading and encourage them to look at it through an experiential learning lens that emphasizes reflection. Feedback is vital to promote and enhance reflection and must be included within every health professional clinical grading system, including optometry.

Connecting the Findings to the Literature

Many of the themes and concepts that developed from this research can be connected to the literature concerning clinical grading. As discussed previously there is a dearth of literature related to optometric clinical grading, so the connections will be made to other health professions, such as nursing, dentistry and medicine.

Expectations

One of the main themes that emerged is related to faculty expectations, the development of these expectations, and their impact on student learning. In a review of the literature on evaluation, Orchard[12] identified six factors that had the potential to be barriers to the evaluation of student nurses' performance in the clinic. Three of the factors link to expectations in some manner:

- The relationship between the complexity of the student's clinical performance expectations and the degree of subjectivity of appraisals
- Evaluator's expectations of student's professional socialization
- Personal values of the evaluators

If clinical supervisors are indeed the "experts" at helping students learn the knowledge needed before graduation and serve to help fill in the gap between school and practicing,[13] it is important to also acknowledge, at the same time, that evaluators are human and not perfect. As Herbers et al.[14] concluded: "Evaluators may vary considerably in their abilities to discern strengths and weaknesses in residents, and they may apply different standards when judging a resident's performance". While this quote references residents, it can be inferred that the same could be true about judging student performance. Herbers et al.[4] went one step further, making the connection to expectations: "Evaluators may be positively or negatively influenced in their assessments of residents because of expectations or biases". This quote aligns with the expectation issue in this study: faculty members, including those at SCO, each have different expectations for their students that developed over their careers based on their own clinical experiences and instincts.[15] Faculty may emphasize different aspects of performance,[16] disagree on treatment philosophy and differ on the choice of testing procedures. What one faculty member deems as an acceptable skill level or diagnostic ability, another may not.

Another issue identified in this study is that faculty expectations are dynamic. The faculty in the focus group offered that they altered their expectations based on the student year, the service in which they were seeing patients and the difficulty level of the patient. Kern and Mickelson[17] identified different objectives or expectations for physical therapy students based on their year in the program. Mays[185] found that the importance of various aspects of the examination process also changed with the faculty evaluating physical therapy students. While basic knowledge and the ability to write notes were vital as a junior, in the senior year, critical thinking and interpersonal relations were of greater importance. While the grading system at SCO does in fact alter the importance and weighting of various aspects of the grading categories between the third and fourth years; this is part of the "veil of secrecy" to which the faculty alluded. According to one of the administrators, not allowing the faculty to know that a change takes place in the weighting of categories, and what that change is, was done so as not to inject bias into the grading process. Consideration should be given to whether this policy should be revisited and allow

both faculty and students a better understanding of the grading system's inner workings.

The issue of expectations changing with patient difficulty was questioned in relation to the validity and reliability of assessing the performance in legal education by Grimes and Gibbons.[19] Their question was regarding legal clinics and clients of varying type and difficulty, but the concept is the same with optometry. Patient difficulty links to the service in which the patient is examined as well. For example, a patient who has an eye tracking issue may be deemed as easy by faculty experienced in such conditions but considered challenging by faculty who are more experienced with retinal disease. Those faculty members typically work in different clinical services at SCO and, based on the focus group, have different expectations for the student based on the perceived difficulty of the patient and the service in which they were seen.

The influence of changing or unclear expectations voiced by the SCO students was also a concern in a study by Rafiee et al.[20] of nursing students and instructors. One student stated the following, which could easily be heard coming out of the mouth of an optometry student in this study's focus group.

> Each instructor has his/her own special rule. Each instructor acts as she/he wishes. We don't know what the nursing instructors want us to do. We don't know what we are supposed to learn since the instructors score the students based on their speculations. (p.46)

Overall, unless graders are using the same standards in grading based on a specific set of parameters and are outlining those expectations to the students, there is bound to be confusion and variability in outcomes. This is an issue in many professional programs where clinical grading plays a part in the educational process. Many of the issues that emerged in this study related to expectations are of concern in other health professions as well.

Feedback

Even though there are connections between feedback and reflection, there is a lack of literature on the use of feedback in a formal grading situation. Taylor and Hamdy[21] discussed adult medical education and the use of feedback in assessment. They indicate that "any assessment system will provide learners with an indication of where they are going wrong, and which areas they should focus on for clarification of their understanding". The role of the educator, in their opinion, is to inspire reflection via written feedback. It is the written feedback aspect of the SCO grading system that I believe fulfills this requirement. The quantitative 1 to 3 scale in the SCO system simply gives a grade for that aspect of the clinical experience, but it is the qualitative feedback in the form of what the student did well and what they need to improve that has the potential to spur on student reflection and learning. The concept of clinical grading being used as a method of reflection toward the building of knowledge and clinical skills is lacking in the health profession literature and is absent in the optometric literature. Since good-quality feedback in clinical grading has the potential to lead to reflection, and reflection is part of the cycle of experiential learning,[3] it is logical, in my opinion, to connect clinical grading with experiential learning. Viewing clinical grading through an experiential learning lens has the potential to produce a greater number of opportunities for student learning and growth while enabling the optometric program to fulfil its needs and those of its stakeholders.

One of the big themes that emerged in this research centered on faculty feedback having a positive and negative impact on the learning opportunity afforded through the clinical grading system. As Dennick[22] concluded, "Reflection is fundamentally enhanced by feedback … Feedback can enable the learner to analyze their actions and understanding and to plan for future learning". However, based on the student focus groups in this study, the lack of feedback or low-quality feedback can also have a negative impact. The students participating in the focus group indicated that lack of feedback, poor quality of feedback

and poor timeliness of grades caused them to decrease how much they looked at their grades and even caused them to think less of certain faculty. If one of the goals of the clinical grading system is to provide feedback on which students can build confidence and learn from or reflect on what they did well or poorly, providing high-level, specific feedback with actionable points is crucial. The concept of the negative impact of the faculty feedback relates to Kolb's[3] theory of experiential learning—specifically the reflection part of the cycle. Students discussed the negative impact of the feedback they received and how it did not enhance their reflection but instead hampered it; this indicates that the reflection link in the experiential learning cycle broke due to the lack of or poor quality of the feedback. Several studies have examined the characteristics of the feedback made in medical clinical grading. Canavan et al.[23] collected 970 surveys of clinical performance from 256 observers. In 210 surveys, comments were considered to be non-behavioral or global assessment and contained comments on the individual's traits or attitudes (fantastic guy, great physician, etc.). Specific behaviors or instances of behaviors were commented upon in 102 surveys. Comments offering strategies for improvement were both general (33 surveys) and specific (26 surveys) in nature. Based on the findings, the authors stated, "Most feedback comments were positive, self-oriented, and lacked actionable information that would make them useful to learners".[23] The SCO students in the focus group highlighted the issues with feedback quality and how the poor feedback that they received led to them not using the system for personal growth. Like in study by Canavan et al,[23] the students in this study complained of feedback that was general in nature, that lacked specific areas of weakness on which to focus or the potential for improvement, and that was repetitious in nature.

Pulito et al.[24] reviewed evaluation forms from medical students' clerkship rotations. Of the 331 forms analyzed, 115 contained no written comments. The remaining 216 forms contained 1,056 specific comments. The top comment-garnering category by far was professionalism/dependability (412 comments), followed by surgical/medical knowledge (88 comments) and communication skills with other health care professionals (78 comments). Not one comment was made concerning history taking and physical examination skills, ordering or lab tests, or surgical technical skills; these are actionable areas for growth in which specific feedback would prove most beneficial to student growth. Comments related to these three topics would likely have the greatest impact and opportunity to enhance reflection.

Lye et al.,[25] in a study of pediatric medicine clerkships, collected 261 evaluations on 157 students. Thirty-four evaluations were eliminated due to lack of comments or a statement by the evaluator that they were "unable to judge the student's performance" (129). Of the remaining 227 evaluations, 1,017 comments were analyzed. Comments categorized under learner and personal characteristics accounted for 519 (51%) of the total comments made, followed by overall clinic performance (95) and knowledge base (70). Only 311 (31%) comments were related to clinical performance and only 134 of those offered specific details.

The results of these two studies match those of Canavan et al.[23]: low-quality feedback is not productive and offers little opportunity for student reflection and growth. One interesting statistic from Lye et al.[25] is the high number of evaluators who admitted that they were not able to judge the performance of the student. While the paper does not surmise why this might be, perhaps it is related to the fact that the evaluator is typically not with the student and the patient at all times. This was an issue found in the current study as a challenge related to clinical grading.

One topic that emerged from this study related to feedback was timeliness. The SCO students indicated that one of the barriers to getting and incorporating the feedback into their practices was that there was often a delay in when they would get that feedback. In some cases, students waited weeks for their grades to be completed. Timely feedback is listed by Romani and Krackov[26] as one of their 12 imperatives for feedback. If provided too late for the student to make use of it, it potentially becomes less relevant.[27] The student has already moved past that experience and has seen a multitude of other patients on which their attention is focused and for which feedback may have been timelier. The poor

timeliness of the feedback has the ability to stop or to hinder the experiential learning cycle,[28] which has an obvious impact on the learning opportunity.

As discussed by the students in this study, clinical grading has the ability to give them confidence and to build them up emotionally. Skinner et al.[29] found that students' confidence and interpersonal skills improved following experiential learning opportunities. By giving constructive criticism, the hope is that it will boost self-esteem and motivation. There is always the worry that negative criticism may detract from this goal, but this should not stop the faculty member from providing the needed feedback.[30] In contrast to the concept of negative feedback having a negative impact on student confidence, Clynes[31] found that negative feedback did not have a negative impact on the mentor/student relationship. Plakht et al.[32] found that "students suggest that a good supervisor is someone who provides constructive criticism rather than allowing inaccurate practice to continue". Clynes and Raftery[33] reported that students exhibit maturity in their appreciation of the importance of receiving feedback and value the chance to focus on noted weaknesses to improve practice. This concept was echoed by the SCO students on several occasions. Several students acknowledged getting critical feedback, which might have stung at first, but they realized that the feedback was meant to help them recognize their weaknesses and offer the opportunity for growth.

According to Kohn,[34] "The best evidence we have of whether we are succeeding as educators comes from observing behavior rather than test scores or grades." Yorke,[35] in discussing formative assessments, under which clinical grading would fall, asks two questions regarding effectiveness, one of which is whether the assessment influenced behavior. This topic was addressed briefly by several of the faculty members in this study. They indicated that they had indeed seen a shift in behavior as a result of the formative assessment, the clinical grades. I have seen these changes personally as well. This is an indication that at least some of the time, the students were indeed reading their grades, reflecting on what was written and making beneficial changes in their knowledge or skills.

Subjectivity and Challenges

The theme that encompassed subjectivity in grading and challenges that inhibit effective use contains subthemes that are evident in the literature. Subjectivity in clinical assessment or grading is not an issue limited to an optometric curriculum such as SCO's. Even though the grading system was designed to be objective, it definitely struggles to be anything but subjective. Grading is based on values, experiences and expectations, which are personal in nature, as was discussed previously.[36] In a qualitative study of 11 clinical nursing faculty by Amicucci,[37] the term "gray" was specifically used by nine of the participants in their discussion of clinical grading. In this study, three of six faculty members and all three administrators used the term "subjective" to describe clinical grading.

Not only can the subjectivity affect the reliability and credibility in the assessment system, it also has the potential to impact learning negatively, as the students' takeaway is that the system is arbitrary and they subsequently devalue it.[38] The subjectivity or changing expectations was a notable frustration for the SCO students and played a part in their lack of use of the grading system as their training progressed.

Connected to subjectivity is the ability of the faculty to assess everything that takes place in the patient encounter. Pulito et al.[24] asked medical student preceptors to rate, out of ten, how effectively they witness or infer from other performances and their ability to evaluate each of the 11 performance categories. Professionalism/dependability, knowledge and clinical reasoning/judgement were rated as observable. Categories such as basic clinical skills, history/physical examination skills and interpersonal skills with patients were considered usually not observable and the most likely to be difficult to evaluate and inferred from other performance. The issue with the faculty member not being in the room is a barrier to effective grading as per the SCO students. This impression is supported by Canavan et al.[23] in a study of medical residents. It was specifically noted that 8.2% of surveys contained comments

remarking limited or lack of exposure or hearsay in the grading process. While in a perfect world, the faculty/student ratio would be 1:1, with no division of attention, that is all but impossible. At SCO, the ratio is typically 1:4, which is fairly standard throughout clinical optometric practice. It is simply impossible, as shown by Pulito et al.,[24] to observe every aspect of the examination process, leading to an even greater level of subjectivity injected into the clinical grading process.

Another challenge in clinical grading assessment that is by no means limited to SCO is that those individuals doing the grading hesitate to fail deserving students. Essentially, nobody wants to be the bad person. Duffy[39] found that preceptors continued to pass students, allowing the student's personal issues to cloud their judgement. Dudek et al.[40] identified four major barriers to failing medical trainees (students or residents), including lack of documentation, lack of knowledge about what specifically to document, anticipating an appeal process, and lack of remediation options. Other reasons for not failing students include lack of staff training or inadequate support, negative consequences for those doing the grading including potential litigation, hostility and manipulation by students, staff shortages,[41] and hesitation on the part of the preceptor to identify or to resolve the concerns early enough in the clinical rotation.[42]

Failing a student can be emotionally stressful and can conjure feelings of loneliness for the faculty member. This is especially true for novice or part-time faculty.[43] On the positive side, in a survey of 390 nurse faculty, "nearly half the sample reported changes in their teaching practices following the deliberation to assign a failing grade".[44] The changes made were in areas related to communication, remediation, documentation and professional growth, among others. While failing a student can be a challenge, the opportunity to alter behavior and to grow from the experience is not limited to the student.

Not Understanding the Clinical Grading System

Not understanding the clinical grading system appeared in the data from all three groups. The student and faculty frustration focused on a lack of training and having to determine on their own what the different quantitative variables mean. The faculty also expressed an issue with the lack of guidance in grading and how to set their expectations. The administration corroborated the lack of training and guidance on a continual basis after the initial onboarding process of both students and faculty. In a study of nurse assessment, one theme that arose was a poor understanding of the assessment tool, despite a required training. This concern was voiced by both the students and faculty.[45]

McDonald,[43] in a discussion of grading fairly and consistently, highlights the idea of discussing grading criteria with all graders in order to align perceptions of the grading system and bring consistency to perspectives. He suggests giving a few samples for grading, comparing the grades and then discussing the grading criteria. Clement and Raleigh[47] reviewed 38 studies on nursing clinical assessment. They recommend regular training and peer review. Alpine et al.[48] performed a before-and-after study with 58 nursing instructors. The participants watched videos of poor and good performance and graded performance on several factors. They then underwent a training and a discussion of the criteria and the videos that they previously graded. They were asked to reconsider their grades if they felt it was appropriate. About 50 to 55% of the participants changed their grades. Interestingly, a larger number changed their scores in the negative direction, lowering scores, both for the poor (53.5%) and good performance (37.4%). There was a four-times-greater chance of the good performance score going up in contrast (12.9% vs. 3.1%). The authors showed the immediate impact of training on grading outcomes, including reliability and validity. Proper orientation and continued training and guidance is a must in order for an assessment system to function effectively,[47] especially as the faculty changes from year to year. Having routine training would also help reduce errors and grade inflation, a concern in the assessment process.[49]

Limitations

As there are more than 270 students in the third and fourth year in the SCO population, despite attempts to get a wide variety of input based on academic standing, I struggled to get participation in the focus groups, but I ultimately succeeded. The question of whether the opinions expressed by this group of students truly represents the greater number of students is a potential limitation. The same question exists regarding whether the group of faculty members selected represents the greater opinion and is also a potential limitation. Since the focus group contained a variety of faculty based on service and years at SCO, this is less of a concern. Another limitation related to the students in the focus group. The 4th-year students were all in the final semester of their final year and were quite close to graduation. The question as to their being comparable to a student earlier in their fourth year is a potential limitation. A potential limitation for all groups is comfort using Microsoft Teams, but since this study was conducted after the pandemic, during which individuals gained significant time using this meeting software, this limitation should be minimal.

Recommendations Based on the Study

One of the goals of this study was to make recommendations to the administration for potential changes to improve the functionality and impact on learning of the clinical grading system at SCO. Based on the three interviews and two focus groups, the following recommendations should be considered and are linked back to the results of the study themes and subthemes in Table 2:

- An enhanced orientation on the clinical grading system for all new faculty should be initiated to ensure a good understanding prior to grading students. This would include case examples based on the services in which the faculty would spend a significant amount of time, a detailed orientation on the history of the grading system, how it works, including category weighting changes between third and fourth year, and a better understanding of the grading expectations from an administrative viewpoint. The orientation period would also include a review of a new faculty member's grades to catch and correct inconsistencies, as well as to provide guidance as new situations arise, throughout their first year of teaching.
- A regular discussion of the grading system by the faculty as a whole, including enhanced guidance from the administration, should be initiated and done yearly. This should include a better understanding of how the grading system works behind the scenes for the faculty and a series of examples to encourage discussion on grading expectations in order to reduce subjectivity and variability. This would allow faculty to be immediately aware of any changes made to the grading system.
- Eliminate the requirement for feedback on certain types of follow-up eye examinations like simple dilated fundus examinations, spherical contact lens checks and basic examinations, reducing the number of perfunctory comments like "good job" and "well done." This will allow students to focus more on feedback that enhance learning and reflection and not have to sift through to find such comments. This will also allow faculty more time to spend making feedback on encounters to enhance learning and student reflection. Another consideration would be to add the option of "NA" for the quantitative categories since one of the challenges is that the faculty are not present for the entire patient encounter.
- An enhanced orientation on clinical grading for all students, including case examples of what the various levels (1-3) equate to clinically, how the grading system works, and how they can use it for learning purposes, should be initiated to ensure a good understanding prior to starting patient care in the third year, as well as a follow-up to ensure an appropriate level of understanding as they progress throughout their careers.
- Require all faculty members to write and deliver to students, prior to working with them, detailed expectations for patient care. If the faculty member's expectations vary based on the student's experience (third or fourth year) or on the service in which the care is delivered, they should be prepared with different versions of their student expectations.
- Written faculty feedback to students should corroborate and support their verbal feedback and be

as specific and detailed as possible. Faculty should attempt to include resources such as articles, online videos and websites to encourage students toward life-long learning and enhance the ability for reflection.

- Clinical course syllabi expectations should be updated and made as service-specific as possible. The syllabi must be shared with both the faculty and students so that they can coordinate service expectations with their own. The service expectations should be presented during student orientations.
- Add opportunities for the students to ask questions of the faculty within the grading system. As indicated by the students, this would enhance their ability to use the system for learning. This would be a key step to take to help the students in the reflection phase of the experiential learning cycle as the questions are essentially a first step as they have already reflected about the patient experience and would already be asking for more explanation and resources.
- Require all grades to be completed within a short time period (within 3 business days) to enable students the maximum level of reflection.
- Require all grades to be acknowledged in some manner by the students, especially grades marked as “below expected.” Ensuring that students are seeing their grades, good and bad, increases the likelihood that they see the feedback and consciously or subconsciously have the opportunity to reflect on what written feedback from faculty.
- Increase the importance of clinical grading in the faculty evaluation with an emphasis on grading as teaching. If the mission of the college is to educate students, and clinical grading is a means of doing so, then not completing that task should be punitive to the faculty. While it already is on some level, perhaps that is not enough and the importance of properly completing clinical grades should weigh heavier in the annual review process.

Table 2. Summary Recommendations Linked with Themes and Subthemes Developed in this Study. Click to enlarge

The above bullet points are specific to improving the clinical grading system at SCO, but they can also be used by other colleges of optometry to ensure that they learn from the ways in which SCO can improve. The following are some checkpoints for other colleges to consider in looking at their own grading systems.

- A clinical grading system must have consistent and timely summative feedback for the students that can be used for reflection. This is done for the student’s learning benefit and the college’s

ability to assess student performance, as well as legal documentation of that performance, good or bad.
- Expectations for performance as relates to clinical grading should be provided to the faculty and students and be as objective and specific as possible. This will reduce variability in the grading output, allowing a more consistent educational product.
- An understanding of the grading system, including an orientation, should be provided to the students and faculty prior to using the clinical grading system. Regular guidance must be provided by administration for the faculty in how to use the system and how the faculty is performing in the task of clinical grading.
- The clinical grading system must include the ability for the students to ask questions and to obtain feedback that is meaningful, which enhances self-learning and self-reflection.

Areas of Future Study

My initial goal as the researcher was to standardize clinical grading in optometry. While this goal was quite lofty and always remains a goal, it was important to understand better how clinical grading was being done at SCO. Further study at SCO should take place with a greater number of faculty and students to get a wider array of opinions and feedback using what has been learned in this study as a template for guidance. Other future studies could include a comparison of clinical grading at sister institutions to understand better how they accomplish the grading process and how their systems developed to their current status.

References

1. Dewey J. Experience and education. Kappa Delta Pi Lecture Series. Collier-MacMillan Books, 1938.
2. Dewey J. My pedagogic creed. The School Journal 1897:77-80.
3. Murray R. An overview of experiential learning in nursing education. Adv Soc Sci Res J. 2018;5(1):1-6. doi: 10.14738/assrj.51.4102
4. Kolb AY, Kolb DA. Experiential learning theory: A dynamic, holistic approach to management learning, education and development. In S. A. Armstrong & C. V. Fukami (Eds.), The Sage handbook of management learning, education and development (pp. 41-67). Sage, 2011. doi: 10.4135/9780857021038.n3
5. Piaget J. The Place of Sciences of Man in the System of Sciences. New York: Harper & Row, 1970.
6. Lewin K. Field Theory in Social Sciences. New York: Harper & Row, 1951.
7. Kolb DA. *Experiential learning: Experience as the source of learning and development*(Vol. 1). Prentice-Hall, 1984.
8. Zull JE. The art of changing the brain: Enriching teaching by exploring the biology of learning. Sterling, VA: Stylus Publishing, 2002. doi: 10.1080/1937156X.2009.11949644
9. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Adm Policy Ment Health. 2015;42(5):533-544. doi:10.1007/s10488-013-0528-y
10. Lochmiller CR. Conducting thematic analysis with qualitative data. Qual Rep. 2021;26(6):2029-2044. doi: 10.46743/2160-3715/2021.5008
11. Braun V, Clark V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101. doi:10.1191/1478088706qp063oa
12. Orchard C. Factors that interfere with clinical judgements of students' performance. J Nurs Educ.1992;31:309-313. doi: 10.3928/0148-4834-19920901-07
13. Sand, J N, Elison-Bowers, P, Wing, TJ, Kendrick, L. (2014). Experiential learning and clinical

education. Academic Exchange Quarterly, 18(4), 43-48.
14. Herbers JJ, Cooper GS, Pangaro LN, Weaver MJ. How accurate are faculty evaluations of clinical competence? J Gen Intern Med. 1989;4(May/June):202-208. doi: 10.1007/BF02599524
15. Krichbaum K, Rowan M, Duckett L, Ryden MB, Savik K. The clinical evaluation tool: A measure of the quality of clinical performance of baccalaureate nursing students. J Nurs Educ. 1994;33(9):395-404. doi: 10.3928/0148-4834-19941101-05
16. Gingerich A, Ramlo SE, van der Vleuten CPM, Eva KW, Regehr G. Inter-rater variability as mutual disagreement: identifying raters' divergent points of view. Adv Health Sci Educ Theory Pract. 2017;22(4):819-838. doi: 10.1007/s10459-016-9711-8
17. Kern BP, Mickelson JM. The development and use of an evaluation instrument for clinical education. Phys Ther. 1971;51(5):540-546. doi: 10.1093/ptj/51.5.540
18. Mays MJ. Reliability of a method of evaluating the clinical performance of a physical therapy student. *Phys Ther.* 1973;53(12):1298–1306.
19. Grimes RH, Gibbons J. Assessing experiential learning – us, them, and the others. Int J Clin Legal Educ. 2016;23(1):111-131. doi: 10.19164/ijcle.v23i1.492
20. Rafiee G, Moattari M, Nikbakht A, Kojuir, J, Mousavinasab M. Problems and challenges of nursing students' clinical evaluation: A qualitative study. J Nurs Midwifery Res. 2014;19(1):41-49. doi: 10.1007/s13151-014-0173
21. Taylor DCM, Hamdy H. Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83. Med Teach. 2013;35(11):e1561-e1572. doi: 10.3109/0142159X.2013.828153
22. Dennick R. Twelve tips for incorporating educational theory into teaching practices. Med Teach. 2012;34(8):618-624. doi: 10.3109/0142159X.2012.668244
23. Canavan C, Holtman MC, Richmond M, Katsufrakis PJ. The quality of written comments on professional behaviors in a developmental multisource feedback program. Acad Med. 2010;85:S106-S109. oi: 10.1097/ACM.0b013e3181ed4cdb
24. Pulito AR, Donnelly MB, Plymale M, Mentzer Jr RM. What do faculty observe of medical student's clinical performance? Teach Learn Med. 2006;18(2):99-104. doi: 10.1207/s15328015tlm1802_2
25. Lye PS, Biernat KA, Bragg DS, Simpson DE. A pleasure to work with-An evaluation of written comments on student evaluations. Ambul Pediatr, 2001;1(3):128-131. doi: 10.1367/1539-4409(2001)001<0128:aptwwa>2.0.co;2
26. Ramani S, Krackov SH. Twelve tips for giving feedback effectively in the clinical environment. Med Teach. 2012;34(10):787-91. doi: 10.3109/0142159X.2012.684916
27. Wiggins G. Seven keys to effective feedback. Education Leadership. 2012;70(1):11-16.
28. Ledvinka G. Reflection and assessment in clinical legal education: Do you see what I see? J Legal Educ. 2006;9:29-56. doi:10.19164/ijcle.v9i0.86
29. Skinner KL, Hyde SJ, McPherson KBA, Simpson MD. Improving students' interpersonal skills through experiential small group learning. Journal of Learning Design. 2016;9(1):21-36. doi: /10.5204/jld.v9i1.232.
30. Wells, L, McLoughlin, M. (2014). Fitness to practice and feedback to students: A literature review. Nurse Educ Pract. 2014;14(2):137-141. doi: 10.1016/j.nepr.2013.08.006
31. Clynes M. Providing feedback on clinical performance to student nurses in children's nursing: Challenges facing preceptors. J Child Young People's Nursing. 2008;2(1):29-35. doi:10.12968/jcyn.2008.2.1.28070
32. Plakht Y, Shiyovich A, Nusbaum L, Raizer H. The association of positive and negative feedback with clinical performance, self-evaluation and practice contribution of nursing students. Nurse Educ Today.2013;33(10):1264-8. doi: 10.1016/j.nedt.2012.07.017
33. Clynes MP, Raftery SE. Feedback: An essential element of student learning in clinical practice. Nurse Educ Pract. 2008;8(6):405–411. doi: 10.1016/j.nepr.2008.02.003
34. Kohn A. Grading: The issue is not how but why. Ed Lit. 1994;52(2):1-7. doi:10.1007/978-3-319-23398-7_10

35. Yorke M. Formative assessment in higher education: Moves towards theory and the enhancement of pedagogic practice. Higher Ed. 2003;45(6):477-501. doi:10.1023/A:1023967026413
36. Dolan, G. Assessing student nurse clinical competency: will we ever get it right? J Clin Nurs. 2003;12(1):132-141. doi: 10.1046/j.1365-2702.2003.00665.x
37. Amicucci B. What nurse faculty have to say about clinical grading. Teach Learn Nurs. 2012;7(2):51-55. doi: 10.1016/j.teln.2011.09.002
38. Taylor C.L, Grey N, Satterwaite JD. Assessing the clinical skills of dental students: A review of the literature. J Ed Learn. 2013;2(1):20-30. doi:10.5539/jel.v2n1p20
39. Duffy K. A grounded theory investigation of factors which influence the assessment of students' competence to practice. Nursing and Midwifery Council (NMC), 2004.
40. Dudek, N. L., Marks, M. B., & Regehr, G. (2005). Failure to fail: The perspectives of clinical supervisors. Acad Med. 80, S84-S87. doi: 10.1097/00001888-200510001-00023.
41. Bush HM, Schreiber RS, Oliver SJ. Failing to fail: Clinicians' experience of assessing underperforming dental students. Eur J Dent Educ. 2013;17(4):198-207. doi: 10.1111/eje.12036
42. Luhanga F, Yonge OJ, Myrick F. "Failure to assign failing grades": Issues with grading the unsafe student. Int J Nurs Educ Scholarsh. 2008;5(1), Article 8. doi:10.2202/1548-923X.1366
43. McGregor A. Academic success, clinical failure: Struggling practices of a failing student. J Nurs Educ. 2007;46(11):504-511. doi: 10.3928/01484834-20071101-05
44. Couper J. The struggle is real: Investigating the challenge of assigning a failing clinical grade. Nurs Educ Perspect. 2018;39(3):132-138. doi: 10.1097/01.NEP.0000000000000295
45. Calman L, Watson R, Norman I, Redfern S, Murrells T. Assessing practice of student nurses: Methods, preparation of assessors and student views. J Adv Nurs. 2002;38(5):516-523. doi: 10.1046/j.1365-2648.2002.02213.x
46. McDonald D. Grading and providing feedback: Consistency, effectiveness, and fairness. Wiley University Services. (2016, July 14). https://ctl.wiley.com/grading-and-providing-feedback-consistency-effectiveness-and-fairness/.
47. Clement VJ, Raleigh M. The validity and reliability of clinical judgement and decision-making skills assessment in nursing: A systematic literature review. Nurse Educ Today. 2021;102.104885. doi:10.1016/j.nedt.2021.104885
48. Alpine LM, O'Connor A, McGuinness M, Barret EM. Performance-based assessment during clinical placement: Cross-sectional investigation of a training workshop for practice educators. Nurs Health Sci. 2021;23(1):113-122. doi: 10.1111/nhs.12768
49. Paskausky AL, Simonelli MC. Measuring grade inflation: A clinical grade discrepancy score. Nurses Educ Pract. 2014;14(4):374-379. doi: 10.1016/j.nepr.2014.01.011

Appendix

Appendix . Click to enlarge

Dr. Marc Taub is a professor at Southern College of Optometry. He teaches in the vision therapy and pediatric clinics. He is also the co-supervisor for the Pediatric and Vision Therapy Residency.

Dr. Taub is the Editor-in-Chief of the *Optometry & Visual Performance* and serves on the review board of *Optometry Times*. He has written numerous peer reviewed articles and has lectured and presented posters at international, national, and local conferences. He is the lead editor and a multiple chapter author on *Visual Diagnosis and Care of the Patient with Special Needs* and editor and chapter author on *Visual Development, Treatment, and Diagnosis of the Pediatric Patient*.

Dr. Taub is a Diplomate of the American Academy of Optometry and Fellow the College of Optometrist in Vision Development and National Academies of Practice and is active in the Optometric Extension Program Foundation.

PEER REVIEWED

Optometric Peer Chart Review for Quality Assurance in an Academic Healthcare Setting

Amy Roan Moy, OD, FAAO, CPCO, FNAP, Crystal Lewandowski, OD, FAAO, FNAP | *Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)*

Abstract

Optometric institutions providing clinical care in their facilities and extended clinical networks are held to the same regulatory standards as other healthcare organizations. This article describes the importance of peer chart reviews and quality assurance in the academic optometric setting in relation to providing opportunities for improving quality of care, setting an example for optometric students, and setting clinical standards as an institution in parallel with federal healthcare guidelines.

Key Words: *compliance, chart review, audit, quality, assurance, optometry*

Introduction

In recent years, patient safety and quality of care have become increasingly important in healthcare as there has been an increased focus on improving clinical outcomes, as well as reducing healthcare disparities across the United States.[1] According to the Health Resources and Services Administration (HRSA), quality improvement (QI) is a continuous improvement process focused on processes and systems, whereas quality assurance (QA) measures compliance against certain necessary standards, typically focusing on individuals in clinical practice.[2]

Healthcare organizations and oversight agencies have prioritized clinical chart reviews (also known as audits) as a tool to assess to improve the delivery of healthcare services and implement quality improvement (QI) initiatives. Several types of chart audits exist, including external audits completed by accreditation bodies and other authorities, and internal audits conducted from within an organization sometimes in preparation for an external audit and commonly organized by a quality committee, supervisor or peer.[1,2] Regularly scheduled, formal peer chart reviews help to assure patient safety and quality of care in compliance with federal and state regulations, as well as provide some protection for organizations against litigation. Collection of patient care data during a chart audit process, in combination with reports of adverse events (an incident that results in an undesirable outcome for a patient), can help quantify clinical performance in relation to quality standards and evidence-based research recommendations and help improve professional practice. Peer (clinical) chart review refers to evaluation of chart samples by a colleague, usually to provide feedback with the goal of improvement and maintaining quality of care. This system of quality assurance usually involves two or more providers using a structured method (checklist, survey, or questionnaire) to evaluate another provider's work. Ideally, this process is part of a long-term and continuous quality improvement program, meant to regularly address potential problems, formulate goals for good care, measure actual care, consider the need for any changes, implement the changes and perform a follow up.[3,5]

Evidence has shown that chart audits paired with feedback from organizations can be an effective tool to changing individual behaviors in clinical practice. The effectiveness of chart audits paired with feedback is greater when healthcare professionals actively participate in the process, when feedback is given by a

person of seniority both with written and verbal feedback, and when feedback is given in repeated cycles as opposed to one single event. Since 1952, the Joint Commission on Accreditation of Hospital Organizations (JCAHO) has required accredited institutions to perform peer reviews to maintain their status.[3] Peer chart reviews have gone through many evolutions in the United States, and remain an important tool to measure performance and drive quality improvement initiatives in healthcare.[4]

Academic institutions can use chart reviews as opportunities to create a gold standard for patient care and preceptor documentation to serve as a model for quality patient care for their student interns. Regular peer chart reviews also offer ongoing education for providers to improve their quality of care. In this optometry school, annual processes have evolved over the years for peer chart review among faculty in clinical practice. This article reviews the methods and trends of the New England College of Optometry's chart reviews from 2014-2023 and discusses criteria, adjustments made to the process over the years, and the impact on the Clinical Network as a whole. In an effort to understand the impact of the annual peer chart review process on the faculty, a survey was initiated by the Quality Assurance Committee (QAC). As an optometric teaching institution, it is important to model the standard of care and quality assurance for students as they represent optometry among other professions.

In articles as early as 1976, there have been reports of including quality assurance and chart review education in medical schools with the goals to "increase the acceptance of quality assurance activities among student physicians, inculcating in them the importance of peer review at an early stage in professional development."[6] Literature search using the following Medical Subject Headings did not return much literature regarding chart reviews in the profession of optometry: optometry school and quality and assurance, as well as peer and chart review and optometry. In a sole article by JP Ruskiewicz, A DiStefano reviews the quality assurance process at Pennsylvania College of Optometry, now known as Salus University, in 1977.[7] Additionally, on the University of California Berkeley School of Optometry and Vision Science website, a bi-annual Quality Assurance process is described;[8] five clinic charts are reviewed from a particular period by the QAC chair to assist the Clinic Chiefs and Associate Dean of Clinical Affairs in maintaining quality of exams at their facility. To our knowledge, this is the first peer reviewed publication describing an optometry institution's quality assurance and annual chart review audit process and process improvements over the course of a decade.

Methods

Chart Review Methods and Process Evolution

Chart reviews can help address the following competencies: medical knowledge, patient care, professionalism, interpersonal communication skills, practice-based learning and improvement and systems-based practice.[9] At the New England College of Optometry (NECO), the peer chart review system is two-pronged. For new hires, a chart review is performed by the Quality Assurance Committee (QAC) at least three times in their first year. A copy of the review criteria is provided to them at their orientation. The annual peer review occurs at the same time each year, and participation is mandatory for all clinical providers in the clinical system. Vision screening and resident preceptors are excused from this process.

Members of the QAC are appointed by the Senior Director of Community Health Initiatives and Optometric Compliance with the goal of representation from all sectors and specialties of the Clinical Network. The Clinical Network is defined as the clinical sites either owned by NECO or contracted with NECO for optometric services by the faculty as their clinical assignment. NECO's Clinical Network is distributed across Massachusetts, mostly centered around the greater Boston area. The disseminated nature of the Clinical Network lends more complexity to how chart samples are obtained, due to multiple electronic health record systems and multiple healthcare facilities.

In the early 2000s, the institution's chart review criteria was focused on basic requirements, dealing with necessary elements including legibility, completion, updated testing and appropriate treatment plans.

While the basic criteria were important from a compliance perspective, there was a desire from the Quality Assurance Committee to add elements that would influence a move toward more cohesive standards of care and compliance across the clinical network. The current list of review questions can be found in **Appendix A** (General Chart Criteria) and **Appendix B** (Low Vision Criteria).

As Medicare's Physician Quality Reporting System (PQRS) measures were released, the QAC realized that this was a good structural opportunity to re-evaluate the overall criteria for standards of care. Thus began an evolution over the years with the result of a core set of questions to address the following specialties:

- Primary Care/Community Health
- Pediatrics/Vision Therapy
- Contact Lens
- Intellectual and Developmental Disabilities
- Low Vision

In addition, a separate set of questions was modeled after Medicare's Physician Quality Reporting System (PQRS), which later transitioned to the Merit-based Incentive Payment System (MIPS).[10] These questions did not count towards a provider's score, but informed the committee on overall institutional performance in standards of care. In cases where there were no measures for specialties like Pediatrics or Contact Lens, the committee developed criteria that would also measure standards of care more relevant to their expertise.

Each provider would be reviewed according to the core set of questions and then depending on the type of chart sample and their specialty, they would branch off into a specific set of clinical standard questions geared towards their specialty. See Appendix A for example of 2023-2024 chart review survey questions for primary care, pediatrics and contact lens charts and Appendix B for low vision survey questions.

The questions for chart review have a few main goals:

1. To ensure appropriate tests are being done for comprehensive eye exams and problem-specific exams
2. To promote proper documentation as preceptors working with students
3. To engage clinical faculty in thinking about clinical standards for the institution

Diagnostic Criteria for Peer Chart Review

Each faculty member with varying clinical foci (primary care, contact lens, pediatrics, low vision, etc.) was asked to submit a certain number of comprehensive eye exams and problem-specific exams each year, with specified diagnostic criteria, which has varied over the years. Historically, each provider self-selected 3 exams with three different, specific diagnoses requested by the QAC. A group of acceptable diagnoses/International Classification of Diseases Codes (ICD) were provided to all faculty members participating in the chart review, and one exam from each diagnostic category was requested (see Appendix C for an example list of acceptable diagnoses). The basis for the primary care group was formed by the main ocular disease categories in the MIPS measures relevant to eye care providers.

- Primary Care/Community Health
    - Diabetic Retinopathy
    - Glaucoma/Glaucoma Suspect
    - Age-Related Macular Degeneration (this was later discontinued due to lack of significant

number of AMD patients in most of our clinics)
    - A medical exam chart coded 99213
- Pediatrics/Vision Therapy
    - Convergence Insufficiency, Convergence Excess, or Accommodative Insufficiency
    - Amblyopia
    - A medical exam chart coded 99213
- Contact Lens
    - Dry Eye, Punctate Keratitis, or Keratoconjunctivitis sicca
    - Regular Astigmatism
    - A medical exam chart coded 99213
- Intellectual Disabilities
    - Decided on a case-by-case basis, depending on whether the provider works with mostly adults or pediatric patients
- Low Vision
    - A consultation visit with diagnosis of Age-related macular degeneration
    - A consultation visit with diagnosis of Diabetic Retinopathy
    - A medical exam chart coded 99213

The general timeline goes as follows for the peer chart review cycle:

- *September*: QAC reviews criteria and decides on chart sample requirements
- *October*: Chair of QAC sends out request for required randomly self-selected chart samples from each provider and begins assigning 2 peer providers to review each provider, generally within their own specialty.
- *November*: Chart samples are reviewed for quality by QAC, ensured for de-identification of Protected Health Information (PHI), and sent securely and electronically to assigned providers. Criteria are found on Survey Monkey, where peer reviewers (not a blind review) enter the scores for each chart sample.
- *December*: All raw data for scores are analyzed and summarized.
- *January*: Individual score letters with “pass” or “not pass” designation and reviewer feedback/comments are sent to all faculty who participated in the process. Findings are also presented to faculty and Board of Trustees and sent to contracted health center partners.

The quality of samples is key to a successful chart review process without delays. The onus is put on providers that in submitting these samples, they are agreeing to be scored as-is. Points are taken off for not fully de-identifying PHI. Over the years, providers have been asked to select their chart samples themselves due to the complexity of the geographically distributed clinical network. There is potential for bias in providers selecting their own samples, and this will be discussed later in the article. Moving from paper chart samples to digitized chart samples in a secure drive made the process much smoother and more efficient in order to coordinate the samples of 40 providers in geographically different locations.

Other adjustments to the process over the years have included a growing Quality Assurance Committee, with representation of various specialties throughout our institution. There have also been adjustments to survey questions and eligible diagnoses acceptable for chart review over the years, to reflect most frequently encountered diseases in our clinics. Also, there has been an increase in the number of charts evaluated from various EHR platforms, which has led to discussions of functionality, limitations and various nuances of different EHRs as they pertain to chart documentation and quality measures.

Merit-Based Incentive Payment System (MIPS) Measures

The institution regularly monitors adjustments to the MIPS measures as issued by the Centers for Medicare Services (CMS).[11] These quality measures are a useful tool for assessing standard of care in

the clinical network.

The official MIPS standards that have applied to optometrists are listed below:

- Measure 12: Percentage of patients aged 18 years and older with a diagnosis of primary open-angle glaucoma (POAG) who have an optic nerve head evaluation during one or more visits within 12 months
- Measure 14: Age-Related Macular Degeneration (AMD): Dilated Macular Examination
- Measure 18: Diabetic Retinopathy: Documentation of Presence or Absence of Macular Edema and Level of Severity of Retinopathy
- Measure 19: Diabetic Retinopathy: Communication with the Physician Managing Ongoing Diabetes Care
- Measure 117: Dilated Eye Exam for patients 18-75 years old with diabetes in the past year
- Measure 130: Documentation of Current Medications in the Medical Record
- Measure 140: Age-Related Macular Degeneration (AMD): Counseling on Antioxidant Supplement
- Measure 141: Primary Open-Angle Glaucoma (POAG): Reduction of Intraocular Pressure (IOP) by 15 percent OR Documentation of a Plan of Care

Please note: As of 2023, Measures 117 and 130 have been removed from claims-based reporting

Other measure that may apply are as follows:

1: Diabetes: Hemoglobin A1c (HbA1c) Poor Control (>9%)

226: Preventive Care and Screening: Tobacco Use: Screening and Cessation Intervention

236: Controlling High Blood Pressure

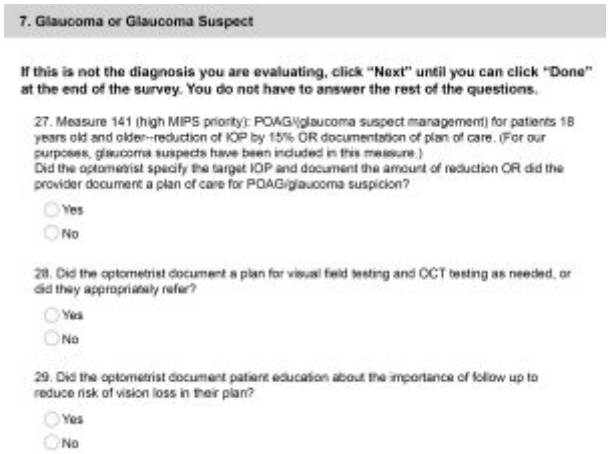
238: Use of High-Risk Medications in Older Adults

317: Preventive Care and Screening: Screening for High Blood Pressure and Follow-Up Documented

318: Falls: Screening for Future Fall Risk

374: Closing the Referral Loop: Receipt of Specialist Report

In addition to the criteria for required documentation elements, all comprehensive eye exams have specific standard of care questions applied to them from the list above, to be adjusted by the Quality Assurance Committee depending on prioritized initiatives for that year. Primary Care providers will use official MIPS measures, while the specialties have other standard of care questions specific to their modalities. Low Vision practitioners have a separate set of criteria in a different survey, tailored to their specialized exam elements. **Figure 1** shows an example of a condition-specific MIPS question geared towards a chart sample for the diagnosis of glaucoma or glaucoma suspect.


7. Glaucoma or Glaucoma Suspect

If this is not the diagnosis you are evaluating, click "Next" until you can click "Done" at the end of the survey. You do not have to answer the rest of the questions.

27. Measure 141 (high MIPS priority): POAG\\glaucoma suspect management) for patients 18 years old and older--reduction of IOP by 15% OR documentation of plan of care. (For our purposes, glaucoma suspects have been included in this measure.)
Did the optometrist specify the target IOP and document the amount of reduction OR did the provider document a plan of care for POAG/glaucoma suspicion?

Yes
No

28. Did the optometrist document a plan for visual field testing and OCT testing as needed, or did they appropriately refer?

Yes
No

29. Did the optometrist document patient education about the importance of follow up to reduce risk of vision loss in their plan?

Yes
No

Figure 1. An example of standard of care questions for Primary Care optometry faculty. Click to enlarge

A summary of the institution's collective performance is reported to the faculty and Board of Trustees each year. Plans are developed and implemented to improve these scores each year as part of our quality improvement process.

Results of Chart Review Process

Over time, the pass rate has trended upwards towards 100% pass rate for all faculty (**Figure 2**). An average score of 85% or higher was deemed a "pass." The total average score for all charts reviewed in 2022-2023 was 97.8%. Specialties were broken down into categories and provided their own specialties' score ranges and standard deviations. For example, the breakdown of scores by specialty for the year 2022-2023.

- Primary Care average score: 97.3% with 0.05 std dev
- Pediatrics/Vision Therapy average score: 99.3% with 0.03 std dev
- Low Vision average score: 2% with 0.05 std dev
- Contact lens average score: 97.4%% with a 0.04 std dev

The scores are then set individually and to each faculty member, along with secure links to their chart samples. With a consistently high pass rate in the last 5 years, the QAC implemented a faculty survey to better understand the impact of the chart review process on faculty.

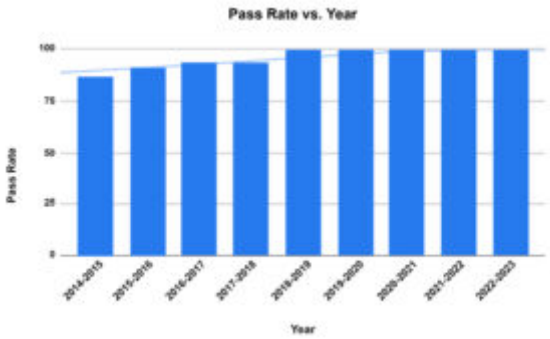


Figure 2. Peer Review Pass Rate Trending Over Time Click to enlarge

Faculty Survey of Chart Review Process

The impact on the Clinical Network has been measured by an upward trend of improvement in pass rate.

In addition, anecdotally there have been fewer student comments regarding wide differences in documentation behavior by preceptors. As the average pass rate consistently settles at 100% over the last few years, we continue to look for ways to measure, maintain and improve standard of care across our sites. A survey was conducted to measure the impact of the annual peer chart review process on various aspects of faculty behaviors, decision-making and compliance.

Feedback on the peer clinical chart review process was solicited in 2022-2023 to assist the QAC with next steps, since the pass rate has consistently been high in the past few years. A 13-question survey was developed to ask the clinical faculty for their feedback.

Faculty Survey Methods

Survey Monkey was used to build validated core questions and then tailored to the purposes of the survey. A link to the survey was sent out to all clinical faculty in the Clinical Network. Responses were anonymous.

Faculty Survey Results

31 out of 34 clinical faculty responded. 38.7% were based in the main clinics, while 51.6% were based in the community health center network. 3.2% saw patients in the Outreach clinics, and 6.5% were from other parts of the Clinical Network. The level of experience in practice was essentially evenly distributed in the faculty sample. **Figure 3** shows the number of years the faculty had practiced optometry, showing a generally even distribution.

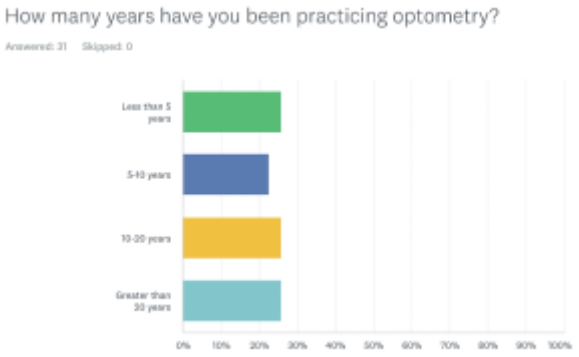


Figure 3. Number of years in clinical practice reported by faculty. Click to enlarge

A survey goal was to measure the impact of the peer review process on the faculty members. 80.8% responded that the process impacted their own chart documentation, and there was additional impact on teaching of interns about chart documentation, understanding of billing with respect to charting and quality of care (see **Figure 4**).

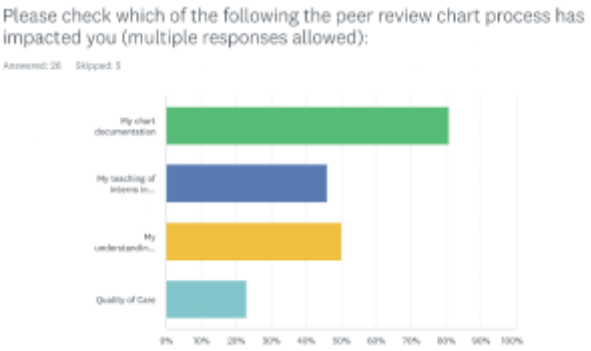


Figure 4. Impact of peer review chart process. Click to enlarge

77.3% of respondents also answered that using digitized chart samples via a secure Google Drive link was Very Easy or Easy compared to paper chart samples.

Discussion

When Standard of Care is in Question

Faculty members who score 85% or lower meet with the Chief Compliance Officer and a Performance Improvement Plan is developed. A subsequent chart review is done several months later and reviewed by members of the Quality Assurance Committee. Department chairs are notified of the plan as well. Upon second review after generally a 3-month remediation period, 100% of those on a performance improvement plan have passed the review.

Lessons Learned

Differences in Electronic Health Records made for some reviewer error when looking at peer chart samples from an EHR system with which they were unfamiliar. A common complaint was that a reviewer had missed an element such as medications and allergies being documented, because it was elsewhere than expected. While several EHR systems are used within our diverse core clinical network of 13 sites, we were unable to assign providers solely based on their familiarity with the EHR systems due to logistics and numbers of providers.

A question was added on implicit provider bias to determine whether there was a perception that their reviewer might have implicit bias affecting the scoring of the samples (**Figure 5**). In general, most faculty felt that implicit bias of the reviewer was not a significant factor in their score.

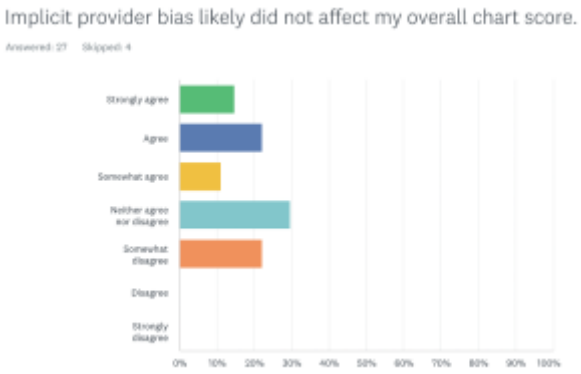


Figure 5. Faculty perception on whether reviewer bias impacted their overall chart score. Click to enlarge

Randomizing chart samples has been a historic struggle for the Clinical Network due to the distributed nature of our clinical sites. As the trend of persistent 100% pass rates has occurred over the past few years, the committee pivoted to pursuing randomized chart samples, relying on clinic directors at each site (and a chosen colleague for themselves) to assign a colleague to randomly select chart samples for their assigned peers. Those who were sole providers at a few sites still provided their own samples for logistical purposes. It was anticipated that the passing rate would decrease with this new system, but interestingly, the pass rate was still 100%, albeit with no significant difference in scoring among each primary care and specialty category.

In the faculty survey, about 27.6% of optometrists noted that the survey was “not so relevant” to their role as an OD. We presume some explanations for these responses could be due to the following potential

reasons: some providers do not see Medicare patients (i.e. Pediatric specialists), they may not be aware of the relationship between MIPS and Medicare payments and incentives, and some may be ignorant of specific MIPS requirements and reporting implications.

Influence on Optometric Education

The impact of the peer chart review process on teaching interns about chart documentation needs further investigation. Heiman and Raminsky et al reported surveying 163 third-year medical students at one medical school about their observations, practices and attitudes regarding electronic documentation efficiency tools. 86% of respondents reported at least sometimes observing residents copying data from other providers' notes, and 60% reported observing their attendings doing so. Only 10% stated that copying from other providers was acceptable.[6] The need for completeness of chart documentation has elicited various workarounds and methods for efficiency such as copying and pasting or auto-insertion of data. When asked if the chart review was relevant to how optometrists review student charting, faculty were widely spread on their responses. 59.3% of respondents agreed that the process had some impact on how they review student chart documentation (**Figure 6**). This was the first time that the faculty had been asked this question.

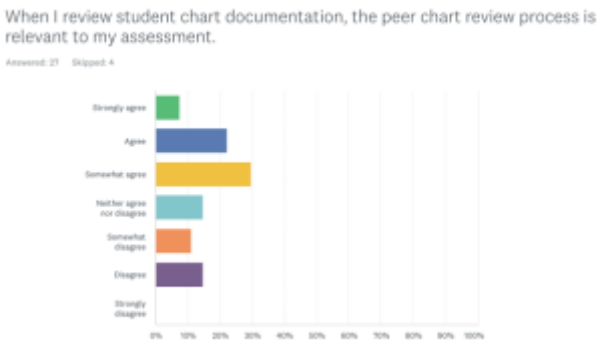


Figure 6. Faculty response to whether the peer review process is relevant when reviewing student documentation. Click to enlarge

Chart review and simulated chart reviews can be used as a starting point for clinical preceptors to assess students' clinical reasoning skills and clinical documentation. When attendings document in their charts and notice details relevant to quality measures have not been documented by students, it provides a teaching opportunity to discuss clinical decisions and thought processes, best practices, EHR usage as it pertains to compliance and audits in optometric practice, billing and coding with various insurance plans and vision discount plans, practice management and business revenue, and public health outcomes and health care quality.[7]

Routine chart review also provides an opportunity for attendings to give interns prompt, meaningful feedback, which can serve as a positive, motivational form of interaction between the preceptor and intern. This learning tool can help students improve their clinical reasoning, be a hands-on teaching strategy to teach the impact of documentation and help hold students accountable in clinic and can provide a communication model for students on how to give feedback in the future. If conducted by peers or in a group setting, a culture of teamwork and collaborative learning may occur. Ultimately, healthcare students may benefit from clinical chart audit simulations in helping them prepare for realistic practice where they will be held to regulatory standards; students can reflect on their documentation skills, identify areas where they may need improvement, and learn from their mistakes in a safe and supportive learning environment.

Potential preceptor questions in the clinical setting for students about their documentation are as follows:

- What is a more clinical term or description for the wording you used here? (Ex. Instead of gray deposit, write “gray flat lesion, 1 mm wide and 2 mm long, 1 DD superior temporal to macula”)
- It looks like you recorded that the patient was having flashes lately, but no other information is written about it. What other information do we need to document to show that these were flashes from pressing on their eye?
- What are relevant pertinent negatives that should be documented in your slit lamp and dilated fundus exam for the systemic conditions that your patient has?
- I see that your assessment and plan is comprehensive, but would you check to see if your chief complaint matches your assessment and plan?
- If the patient’s vision was reduced, was there a diagnosis with reasoning for reduced vision documented or a plan to investigate the cause for reduced vision further?
- Let’s talk about follow up intervals for each of your plan elements. Some of them are missing.
- What other healthcare professionals might you consider communicating exam findings to (and document that you did so) after a patient’s visit, and under what circumstances might you do so?

Future initiatives will also investigate how to incorporate student learning about chart documentation into the curriculum or their clinical rotation experience. Some studies suggest that involving medical students in chart audit processes may help improve student understanding about the importance of chart documentation and clinical practice guidelines and can also have a significant impact on improving quality indicators for care delivered in practice.[1]

Involvement of students in the chart auditing process is the next step in embedding clear documentation principles and practices across all sites. Some strategies may include: introducing chart audits in first year before entering rotations, requiring chart auditing exercises in second-year as students matriculate into clinical rotations, or conducting a mock audit in third-year as students have more frequent and in-depth clinical assignments. Embedding chart review in a clinical reasoning seminar may also invite opportunities for small group discussions.

Optometric institutions must educate the next generation of optometrists to understand the importance of charting compliance, standard of care and continuous quality assurance and quality improvement processes. In doing this, we protect our patients, ourselves and our institutions.

Conclusion

There may be many reasons for academic and healthcare organizations to conduct regular chart audits: to evaluate performance measures and Healthcare Effectiveness Data and Information Set (HEDIS) requirements, to be in compliance with federal regulations requiring that health care documentation justifies billing and coding, for clinical or operational research, or to measure and compare quality of care among organizations. Through internal chart review and audit processes, at-risk areas and systemic challenges can be identified and then addressed to improve quality of patient care. Compliance information can be disseminated on a wide-reaching scale while facilitating discussions about standard of care, quality of care and healthcare outcomes, and optometric education in a clinical setting. Internal chart reviews processes are an important undertaking that can help support organizations in achieving healthcare objectives and when involving students and residents, can aid in educating the next generation of clinicians.

Acknowledgements

The authors would like to thank Dr. Aurora Denial for her valuable guidance, as well as our Quality Assurance committee members over the years.

References

1. Hut-Mossel L, Ahaus K, Welker G, Gans R. Understanding how and why audits work in improving the quality of hospital care: A systematic realist review. PLoS One. 2021;16(3):e0248677. Published 2021 Mar 31. doi:10.1371/journal.pone.0248677
2. Office of Justice Programs. [cited 2024 May 7]. Available from: https://www.ovcttac.gov/saneguide/maintaining-a-quality-program/quality-assurance-and-quality-improvement/#:~:text=According%20to%20the%20Health%20Resources,focused%20on%20processes%20and%20systems.
3. Vyas D, Hozain AE. Clinical peer review in the United States: history, legal development and subsequent abuse. World J Gastroenterol. 2014 Jun 7;20(21):6357–63. doi: 10.3748/wjg.v20.i21.6357
4. Edwards MT. In pursuit of quality and safety: an 8-year study of clinical peer review best practices in US hospitals. Int J Qual Health Care. 2018 Oct 1;30(8):602–7. doi: 10.1093/intqhc/mzy069
5. Grol R. Quality improvement by peer review in primary care: a practical guide. Qual Health Care. 1994 Sep;3(3):147–52. doi: 10.1136/qshc.3.3.147
6. Heiman HL, et al. Medical Students' Observations, Practices, and Attitudes Regarding Electronic Health Record Documentation. Teaching & Learning in Medicine, [s. l.], v. 26, n. 1, p. 49–55, 2014. Accessed: 24 May 2024. doi: 10.1080/10401334.2013.857337
7. Barr DM, Wollstadt LJ, Goodrich LL, Pittman JG, Booher CE, Evans RL. The Rockford School of Medicine undergraduate quality assurance program. Journal of Medical Education 51(5):p 370-7, May 1976. doi: 10.1097/00001888-197605000-00003
8. Ruskiewicz JP, DiStefano A. An optometry course on quality assurance. Am J Optom Physiol Opt. 1977 Dec;54(12):852–5. doi: 10.1097/00006324-197712000-00009
9. University of California–Berkeley, Optometry. Clinic Policies and Procedures. [cited 2023 Sep 12]. Quality Assurance. Available from: https://optometry.berkeley.edu/clinicmanual/clinic-policies-and-procedures/quality-assurance
10. Philibert I. Using Chart Review and Chart-Stimulated Recall for Resident Assessment. J Grad Med Educ. 2018 Feb;10(1):95–6. doi: 10.4300/JGME-D-17-01010.
11. American Optometric Association. American Optometric Association. 2023 [cited 2023 Sep 12]. 2023 AOA MIPS Guidebook Road Map for Doctors. Available from: https://www.aoa.org/AOA/Documents/AOA%20More/AOA_2023%20MIPS%20Guidebook_Road%20Map%20for%20Doctors%20-%20final.pdf
12. Centers for Medicaid and Medicare Services. Explore Measures and Activities. 2022 [cited 2023 Oct 26]. Quality Payment Program. Available from: https://qpp.cms.gov/mips/explore-measures
13. Gould BE, Grey MR, Huntington CG, et al. Improving Patient Care Outcomes by Teaching Quality Improvement to Medical Students in Community-based Practices. Acad Med 77(10):p 1011-1018, October 2002. doi: 10.1097/00001888-200210000-00014

Appendices

Appendix A. Peer Review Chart Survey for Optometrists in Primary Care, Contact Lens, Pediatrics / Vision Therapy, and Myopia Control Clinics

Appendix A. Case description for Case #1. Click to enlarge

Appendix B. Survey questions and answers. Click to view

Appendix C

Eligible diagnoses for chart submissions based on practice specialty

A. Primary Care:

1. Diabetic Retinopathy (E11.319, E08.355, E10.319, E11.355, E11.321, E11.331, E11.351, E11.329, E11.339, E11.349, E11.341, E13.331 (not comprehensive list)
2. Primary Open Angle Glaucoma (H40.11) or high risk Glaucoma Suspect (H40.0, H40.01-, H40.00-)
3. A chart that had been coded 99213 within the past 6 months (any diagnosis)

B. Contact Lens:

1. Dry Eye (H04.129), Punctate Keratitis (370.21, K. Sicca (H16.149), Blepharitis (H01.00-)
2. Regular Astigmatism (H52.223)
3. A chart that had been coded 99213 within the past 6 months.

C. Pediatrics/Vision Therapy/Pediatric Rehabilitation:

1. Convergence Insufficiency (H51.1), Convergence Excess (H51.12), or Accommodative Dysfunction (H52.529, H52.539)
2. Amblyopia (Strabismic H53.03 or Refractive H53.02)
3. A chart that had been coded 99213 within the past 6 months (any diagnosis)

D. Low Vision / Pediatric Practices that only see children with disabilities

1. Diabetic Retinopathy (E11.319, E08.355, E10.319, E11.355, E11.321, E11.331, E11.351, E11.329, E11.339, E11.349, E11.341, E13.331 (not comprehensive list)
2. Age-related Macular Degeneration (H35.31, H35.32)
3. A chart that would have been coded 99213 within the past 6 months (any diagnosis)

- For the above specialties A-C, two comprehensive exam notes were requested with a diagnosis from each of the numeric lists numbered 1 and 2
- For specialty D, two 40-60 minute consultation exam notes were requested from each of the numeric lists numbered 1 and 2
- For all specialties, a third problem focused exam or follow up coded as a 99213 with any diagnosis was also requested.

Appendix C. Eligible diagnoses for chart submissions based on practice specialty. Click to enlarge

Dr. Amy Moy is the Senior Director of Community Health Initiatives and Optometric Compliance for the New England College of Optometry (NECO) and Chief Compliance Officer. She was the Director of Optometry at the Martha Eliot Health Center and now enjoys clinical teaching as an Attending Optometrist and Associate Professor of Clinical Optometry. Dr. Moy is a Board member of the Massachusetts Health Council, Chair of the Community Health Special Interest Group of the American Academy of Optometry, and is a Fellow of the American Academy of Optometry and the National Academies of Practice.

Dr. Crystal Lewandowski is the Clinical Director of Vision Services at North End Waterfront Health, an Associate Professor of Clinical Optometry at the New England College of Optometry, and a clinical preceptor to optometry students. She is a Fellow of the American Academy of Optometry and the National Academies of Practice. Her professional areas of interest include public health, optometric education, and interprofessional collaboration.

PEER REVIEWED

Demographic Trends in the Optometry School Applicant Pool from 2014-2021

Raymond Chu, OD, MS, FAAO, Kristine Huang, OD, MPH, FAAO | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Abstract

This paper describes trends within geography, gender and race/ethnicity in the optometry applicant pool from 2014 through 2021. Demographic data from the Optometry Centralized Application Service was analyzed and compared to applicant pool data for medical and dental school and bachelor's degree data from the National Center for Education Statistics. The optometry applicant pool reflected patterns in bachelor's degree conferral data with exception to a higher-than-expected proportion of female applicants and a lower-than-expected proportion of Black applicants. The disparity trends in the optometry applicant pool reflect current recruitment and retention practices, alongside broader societal challenges in education and opportunity distribution during the formative kindergarten through high school education period.

Key Words: *applicant pool, race, ethnicity, gender, geography*

Background

The higher education system in the United States has a longstanding history of disparities. Before the enactment of Title IX of the Education Amendments of 1972 and Title VI of the Civil Rights Act of 1964, overt discrimination prevented many women and ethnic minorities from attending college, resulting in significant gender and racial disparities among student and faculty bodies.[1,2] By 1980, female students surpassed male students for the first time, comprising 52% of undergraduate enrollment; however, White students continued to be the overwhelming majority at 83.5%.[3,4] From 2009 to 2019, female students consistently represented 57% of total undergraduate enrollment.[5] Similar to the trends in undergraduate institutions, in the 1971-1972 application cycle, only 5% (n=115) of applicants to U.S. schools and colleges of optometry were female.[6] However, this proportion steadily increased over the following decades, and by 2010, female applicants comprised 66.8% of the applicant pool.[7] Today, female students comprise the majority of matriculants to optometry, medical and dental schools.[8–10] Despite this progress in gender equity, disparities persist in terms of ethnicity and race, particularly among Black and Native American ethnic groups. From 2009 to 2019, enrollment of Black undergraduate students fell by 17% (from 14.7% to 13.2% of total undergraduate enrollment), while enrollment of American Indian/Alaska Native dropped by 38% (from 1.0% to 0.7% of total undergraduate enrollment).[4,5] Fortunately, the proportion of Black applicants to U.S. schools and colleges of optometry have not experienced a similar decline. It was 5% in the 2009-2010 application cycle and increased slightly to 5.96% during the 2020-2021 application cycle. However, this proportion has remained relatively stagnant and Black applicants continue to be underrepresented relative to the undergraduate and U.S. census population.[11,12]

Zadnik and Reich reported on academic qualification trends in the overall pool of optometry applicants and matriculants.[13] The purpose of this paper is to further explore optometry applicant trends by

examining demographic data, specifically focusing on geographic location, gender and race/ethnicity. Furthermore, this study conducts a comparative analysis of these trends to the applicant pools in medical and dental schools, revealing broader patterns within the three health professions.

Methods

The Association of Schools and Colleges of Optometry provided both published and unpublished data from the Optometry Centralized Application Service (OptomCAS).[12] The data used for this analysis included each verified applicant's demographic information during the 2014-2015 through 2020-2021 application cycles.

When examining geographic data, only applicants from the United States and Puerto Rico, as reported by their state of residence, was used. Applicants from other U.S. territories, international applicants and those with an unknown state of residence were not included in this analysis. For gender and race/ethnicity classification, demographic information provided by the applicant was used. Those applicants who did not report race/ethnicity and/or gender were not included in this analysis. For trend analysis and comparison to medical and dental schools, demographic data from the Association of Schools and Colleges of Optometry was compared to applicant data from the Association of American Medical Colleges (MD-Granting Medical Schools only) and the American Dental Education Association.[9,10] Additionally, for trends related to geographic location, gender and race/ethnicity, the study compared applicant data from these three health professions to bachelor's degrees conferral data from the National Center for Education Statistics.[14]

Results

Geographic Disparities

The number of unique applicants from the United States and Puerto Rico as a function of application cycles (2014-2015 through 2020-2021) by state of residence is shown in **Table 1**. During this period, the mean number of optometry applicants originating from the United States and Puerto Rico was 2408 (standard deviation = 114). The range in the number of applicants showed a high of 2577 applicants during the 2015-2016 cycle and a low of 2242 applicants during the 2018-2019 cycle.

From 2014-2015 through 2020-2021, the states with the largest proportion of optometry applicants were consistently:

1. California (average: 15% of the total applicant pool)
2. Texas (average: 10% of the total applicant pool)
3. Florida (average: 7% of the total applicant pool) and New York (average: 7% of the total applicant pool)

The geographic distribution of applicants to optometry, medical and dental schools during the 2019-2020 application cycle is reported in **Table 2**. Like the optometry applicant pool, the states where the most applicants to medical and dental schools resided were:

1. California (Optometry: 14%, Medical: 12%, Dental: 12%)
2. Texas (Optometry: 10%, Medical: 9%, Dental: 9%)
3. Florida (Optometry: 7%, Medical: 7%, Dental: 9%)
4. New York (Optometry: 6%, Medical: 7%, Dental: 7%)

In 2020, the Association of American Medical Colleges reported that 68.5% of matriculants to MD-granting medical schools had undergraduate majors in biological sciences (57.8%), physical sciences (10.1%) or math and statistics (0.7%).[15] Given that graduates in natural sciences and mathematics

(including biological and biomedical sciences, physical sciences, science technologies/technicians and mathematics and statistics) are likely to be the majority of potential applicants to optometry, medical or dental schools, **Table 2** shows proportional alignment between states with the largest number of bachelor degree recipients in these fields and applicants to optometry, medical and dental schools during the 2019-2020 application cycle and graduation year. The states with the highest distribution of recipients with bachelor's degree in natural sciences and mathematics were:

1. California (13%)
2. New York (7%) and Texas (7%)
3. Pennsylvania (5%) and Florida (5%)

Table 2 assumes that the year of bachelor's degree conferral aligns with the application year to either optometry, medical or dental school. While applicants may not necessarily apply to one of the three health professions in the year they graduate, data from the National Center of Education Statistics remains consistent for the years surrounding it.[14]

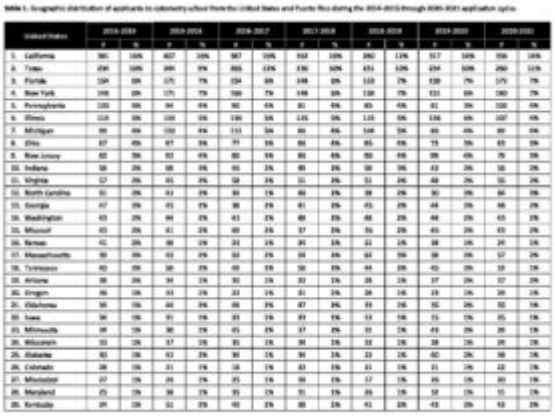


Table 1. Geographic distribution of applicants to optometry school from the United States and Puerto Rico during the 2014-2015 through 2020-2021 application cycles.Click to enlarge

Table 2. Geographic distribution of applicants to optometry, medical and dental school from the United States and Puerto Rico during the 2019-2020 application cycle as compared to bachelor's degree conferred in natural sciences and mathematics during the 2019-2020 academic year. Click to enlarge

Gender Disparities

Over the six application cycles, from 2014-2015 through 2020-2021, the mean percentage of female applicants to optometry school was 70% (standard deviation = 1.51) (**Table 3**). The proportion of female applicants remained consistent with a high of 72% female applicants during the 2020-2021 cycle and a low of 67% female applicants during the 2016-2017 cycle.

During the 2019-2020 application cycle (**Table 4**), the distribution of female applicants to optometry school (71%) surpassed the proportion of female applicants to medical school (53%) and dental school (55%). Assuming the potential applicant pool was represented by the percentage of female bachelor's degree recipients in biological and biomedical sciences (64%), female optometry applicants (71%) exceeded expectations, while the female applicant pools for medical (53%) and dental (55%) schools were lower than anticipated.

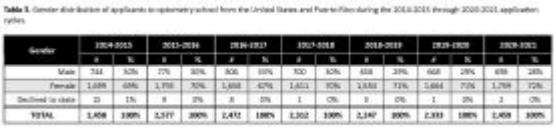


Table 3. Gender distribution of applicants to optometry school from the United States and Puerto Rico during the 2014-2015 through 2020-2021 application cycles. Click to enlarge

Table 4. Gender distribution of all applicants to optometry, medical and dental school during the 2019-2020 application cycle as compared to all bachelor's degree conferred in biological and biomedical sciences during the 2019-2020 academic year. Click to enlarge

Racial/Ethnic Disparities

The distribution of race/ethnicity among optometry school applicants from the 2014-2015 through the 2020-2021 application cycles is shown in **Table 5**. Across these cycles, the racial/ethnic distribution remained unchanged with a substantial portion of the optometry applicant pool composed of White applicants, constituting a mean percentage of 48% (standard deviation = 1.39). This was followed by Asian applicants at 28% (standard deviation = 1.05), Hispanic applicants at 10% (standard deviation = 1.27), Black applicants at 5% (standard deviation = 0.98) and both Pacific Islander and Native American applicants each at <1% (standard error of the mean = 0.11 and 0.09 respectively).

Medical and dental schools had a slightly higher percentage of Black applicants at 8% and 7% respectively, as compared to optometry applicants (5%). When considering bachelor's degree recipients in biological and biomedical sciences during the 2019-2020 academic year (**Table 6**), there was an underrepresentation in the expected proportion of applicants within certain ethnic groups, including White and Hispanic. Black applicants were also underrepresented, particularly within the optometry applicant pool. Conversely, there was an overrepresentation in the expected applicants from Asian ethnic groups across all three health programs.

Table 5. Race/ethnicity distribution of applicants to optometry school from the United States and Puerto Rico during the 2014-2015 through 2020-2021 application cycles. Click to enlarge

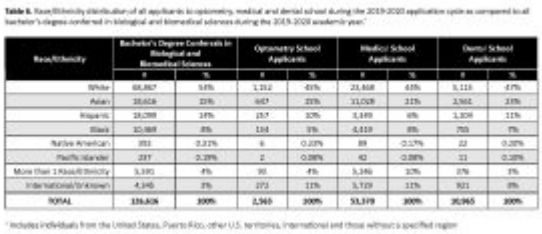


Table 6. Race/Ethnicity distribution of all applicants to optometry, medical and dental school during the 2019-2020 application cycle as compared to all bachelor's degree conferred in biological and biomedical sciences during the 2019-2020 academic year. Click to enlarge

Discussion

Improving diversity, equity and inclusion among the healthcare workforce is frequently linked to the delivery of quality healthcare services, especially among underrepresented populations.[16,17] Therefore, when examining the current and future supply of healthcare providers, it is crucial to consider diversity within the profession, including factors such as gender, racial and ethnic representation and geographic

distribution. Additionally, it is important to explore the root causes of inequitable representation. Chu et al. noted that the path to increasing diversity among doctors of optometry begins with collecting data on diversity among optometry applicants, students and faculty.[18]

Geographic Disparities

Based on our study, the future supply of optometrists, medical doctors and dentists largely originate from California, Texas, Florida and New York. Despite having the largest proportion of applicants residing in these states, California, Florida and Texas are projected to face some of the most significant physician shortages among all states by 2030.[19] The impending national physician shortage has prompted healthcare professions to expand the number of seats and schools. However, this growth has yet to address the maldistribution of primary health care services, which disproportionately afflicts rural and underserved communities.[13,20–22] From 1995 to 2017, Feng et al. found that although the overall optometrist density increased from 11.06 to 16.16 optometrists per 100,000 individuals, there continued to be a shortage of eyecare providers in rural counties.[23]

Although Grobler et al. emphasized the need for greater scientific rigor to more accurately assess interventions influencing physicians' decision to practice in underserved areas, educational institutions have demonstrated some success in addressing physician shortages in these areas.[24] Rabinowitz et al. identified certain physician characteristics as strong predictors for practicing in underserved areas, which include being part of an underrepresented minority group, male gender and foreign language fluency.[22] Underrepresented minority physicians were nearly three times more likely to practice in underserved areas.[22] Physicians who self-identified as fluent in Spanish or an Asian language had a higher likelihood of practicing in geographic areas with limited English proficiency.[25] Verma et al. suggested changes to admissions practices, emphasizing the value of applicants with experiences of growing up in or intending to practice in underserved communities.[26] Additionally, the inclusion of experiential training sites in rural or underserved areas (e.g., community health centers, rural health clinics, federally qualified health centers or critical access hospitals) is cited as an effective intervention in influencing future physician practice location.[26–28] Quin et al. noted optometric residency training increased both interest to practice within a community health centers and higher placement rates within community health centers among residency-trained alumni.[29]

Gender Disparities

Compared to engineering and computer science, the healthcare professions of optometry, medicine and dentistry have a greater representation of female health care workers. A 2020 report, Promising Practices for Addressing the Underrepresentation of Women in Sciences, Engineering, and Medicine (STEM), cited structural, cultural, and institutional patterns of bias, discrimination, and inequity as major barriers to the recruitment of women in engineering and technology fields.[30] Cheryan et al. proposed a psychosocial model, identifying three key factors as to why female undergraduate students may gravitate towards biological and biomedical sciences and away from majors in engineering, computer and information sciences. These factors include pre-existing stereotypes, insufficient early experiences and self-perception of abilities and skills.[31] In a study by Google, pre-college experiences were the most influential factor correlating with young women pursuing a career in computer science.[32] During the 2018-2019 academic year, the California Department of Education reported 2.8 times more schools (1,058 versus 376) offered advanced placement (AP) or international baccalaureate (IB) courses in science as compared to computer education within the state.[33] Within these courses, female enrollment was 52.8% in science and 34.2% in computer education.[33] Similarly, during the 2021-2022 academic year, the New York State Education Department reported a greater number of male students enrolled in AP courses in Computer Science A and Computer Science Principles as compared to female students (6,320 female students versus 10,419 male students) with a greater proportion of male students

achieving a 3 or higher on the respective AP exams.[34] In fact, the introduction of the AP Computer Science Principles (CSP) course and exam during the 2016-17 academic year was a means of addressing underrepresentation of Black, Hispanic and female students in computer science related college majors.[35]

The National Academies of Sciences, Engineering and Medicine (NASEM) cited evidence that family friendly policies, including considerations for marriage, family and career interruptions, were effective in the retention and advancement of female professionals in STEM fields.[30] Jolly et al. observed that among recipients of K08 and K23 research grants, female physician-researchers reported dedicating an additional 8.5 hours per week to parenting or domestic activities compared to their male counterparts.[36] While this example is not exclusive to female physician-scientists, optometry as a profession has made notable strides in fostering workforce equity as compared to other STEM fields. The importance of work-life balance was evident in the 2017 National Optometry Workforce Survey, where both male and female optometrists showed no significant differences in hours worked, weeks worked, productivity or satisfaction regarding career options and professional growth.[37] This may contribute to the higher proportion of female applicants and matriculants to optometry school as compared to medical and dental schools.

Racial/Ethnic Disparities

Laurencin and Murray characterized the absence of Black males in medical school as an American crisis, posing a threat to health equity due to the challenge in achieving and sustaining a diverse physician workforce.[16] Special interest groups, like Black EyeCare Perspective, have advocated for more representation of Black doctors as a means for addressing racial and ethnic health disparities. In line with this, Mertz et al. found that among underrepresented minority dentists (American Indian/Alaska Natives, Black and Hispanic/Latino), 54.1% of their patient base were racially concordant.[17,38]

The 2023 Supreme Court ruling on affirmative action has reignited discussion about admissions reform to promote equity among all ethnic groups.[39] In July 2018, the University of California examined the use of standardized testing in its admission criteria due to public concerns of potential ethnic bias in the exams.[40] While the findings of the task force did not substantiate that claim, the University of California decided in May 2020 to remove the requirement for American College Test (ACT) / Scholastic Aptitude Test (SAT) scores, opting for a more holistic review process.[41] In August 2023, the University of California reported its largest class of underrepresented freshmen in its history.[42] Similarly, the Medical College Admission Test (MCAT) was reviewed for ethnic bias after findings showed that Black and Latino examinees had lower average scores compared to White examinees. However, this disparity in test performance was attributed to family and neighborhood influences that limited academic opportunities spanning from kindergarten through high school.[43]

While most medical school admission practices subscribe to the notion that higher MCAT scores predict success on the United States Medical Licensing Examination Step 1 exam, Elks et al. concluded that standardized admission tests were not a fixed attribute.[44] Proponents of a holistic admission process advocate for the balanced consideration of academic metrics, along with the evaluation of experiences and attributes, in measuring the potential for academic success.[45,46] Bates et al. emphasized that personal attributes and life experiences should be taken into account and aligned with the program's mission, which embraces a broader concept of diversity beyond just race and ethnicity.[47] A holistic admission process combined with a supportive curriculum that included strong faculty-student relationships, opportunities for remediation of poor performing exams during the pre-clinical curriculum, addressing explicitly the necessary study and time-management skills needed, and monitoring of academic progress resulted in student success beyond what would have been predicted based on MCAT scores alone.[44]

Conclusion

Leila Janah is credited with the quote “Talent is equally distributed, but opportunity is not.”[48] Current trends in geographic, gender and racial/ethnic disparities among applicants to optometry, medical and dental schools reflect similar disparities within the undergraduate pipeline. Understanding and addressing these disparities is essential to fostering a more inclusive and diverse healthcare workforce. Future studies should assess the impact of holistic admission practices and interventions aimed at promoting greater diversity, including public awareness campaigns, such as Optometry Gives Me Life, on the optometry applicant pool.[49]

References

1. U.S. Department of Health and Human Services. Title IX of the Education Amendments of 1972. October 27, 2021. Accessed September 27, 2023. https://www.hhs.gov/civil-rights/for-individuals/sex-discrimination/title-ix-education-amendments/index.html#:~:text=Title%20IX%20of%20the%20Education%20Amendments%20of%201972%20(Title%20IX,activity%20receiving%20federal%20financial%20assistance.
2. U.S. Department of Health and Human Services. Civil Rights Requirements- A. Title VI of the Civil Rights Act of 1964, 42 U.S.C. 2000d et seq. (“Title VI”). July 26, 2013. Accessed September 27, 2023. https://www.hhs.gov/civil-rights/for-individuals/special-topics/needy-families/civil-rights-requirements/index.html
3. National Center for Education Statistics. Total undergraduate fall enrollment in degree-granting postsecondary institutions, by attendance status, sex of student, and control and level of institution: Selected years, 1970 through 2026. https://nces.ed.gov/programs/digest/d16/tables/dt16_303.70.asp
4. National Center for Education Statistics. Fall enrollment of U.S. residents in degree-granting postsecondary institutions, by race/ethnicity: Selected years, 1976 through 2031. https://nces.ed.gov/programs/digest/d22/tables/dt22_306.30.asp
5. National Center for Education Statistics. *Undergraduate Enrollment. Condition of Education*. U.S. Department of Education, Institute of Education Sciences; 2023. Accessed September 12, 2023. https://nces.ed.gov/programs/coe/pdf/2021/cha_508c.pdf
6. Levine NR, Levine L. A study of applicants to colleges of optometry in the U.S. J Am Optom *Assoc*. 1976;47(5):616-623.
7. Association of Schools and Colleges of Optometry. Gender of doctor of optometry applicants, U.S. schools and colleges of optometry 2008-2023. February 2023. https://optometriceducation.org/wp-content/uploads/2023/01/Applicants-by-Gender.pdf
8. Association of Schools and Colleges of Optometry. Proportion of Female Full-Time Doctor of Optometry Students by Year, 2006-2023. May 2023. Accessed September 27, 2023. https://optometriceducation.org/wp-content/uploads/2023/05/Enrollment-Proportion-Female.pdf
9. Singh P, Lawton K, Istrate E. U.S. Dental School Applicants and Enrollees, 2022 Entering Class. American Dental Education Association; 2023. Accessed September 23, 2023. https://www.adea.org/data/students/Applicants-2022-Entering-Class/
10. Association of American Medical Colleges. Applicants to U.S. Medical Schools by Gender, 1980-1981 through 2022-2023. October 24, 2022. Accessed September 27, 2023. https://www.aamc.org/media/9586/download?attachment
11. Association of Schools and Colleges of Optometry. *OptomCAS Applicant Data Report – A National Snapshot 2009-2010*. Accessed September 27, 1927. https://www.optomcas.org/wp-content/uploads/2022/04/OptomCAS-Applicant-Data-Report-2020-2021.pdf

12. Association of Schools and Colleges of Optometry. *OptomCAS Applicant Data Report – A National Snapshot 2020-2021*. Accessed September 27, 2023. https://www.optomcas.org/wp-content/uploads/2022/04/OptomCAS-Applicant-Data-Report-2020-2021.pdf
13. Zadnik K, Reich LN. An Analysis of the Optometric Applicant Pool Relative to Matriculants. Optom Vis Sci. 2019;96(9):637-646. doi:10.1097/OPX.0000000000001424
14. National Center for Education Statistics. Digest of Education Statistics. Accessed September 26, 2023. https://nces.ed.gov/programs/digest/2022menu_tables.asp
15. Murphy B. Which undergrad majors are best for med school? Which undergrad majors are best for med school? May 27, 2021. Accessed July 25, 2024. https://www.ama-assn.org/medical-students/preparing-medical-school/which-undergrad-majors-are-best-med-school
16. Laurencin CT, Murray M. An American Crisis: The Lack of Black Men in Medicine. J Racial Ethn Health Disparities. 2017;4(3):317-321. doi:10.1007/s40615-017-0380-y
17. Black EyeCare Perspective. The 13% Promise. Accessed September 23, 2023. https://blackeyecareperspective.com/the-13-promise
18. Chu G, Kalaczinski L, Russo D, Leasher J, Elder K, Fink B. Diversity in our Colleges and Schools of Optometry. Optom Educ. 2017;43(1). https://journal.opted.org/article/diversity-in-our-colleges-and-schools-of-optometry/
19. Zhang X, Lin D, Pforsich H, Lin VW. Physician workforce in the United States of America: forecasting nationwide shortages. Hum Resour Health. 2020;18(1):8. doi:10.1186/s12960-020-0448-3
20. Boyle P. Medical school enrollments grow, but residency slots haven't kept pace. September 3, 2020. Accessed October 2, 2023. https://www.aamc.org/news/medical-school-enrollments-grow-residency-slots-haven-t-kept-pace#:~:text=To%20address%20concerns%20about%20the,%2C%20which%20was%202002%2D03.
21. Gibson DM. The geographic distribution of eye care providers in the United States: Implications for a national strategy to improve vision health. Prev Med. 2015;73:30-36. doi:10.1016/j.ypmed.2015.01.008
22. Rabinowitz HK, Diamond JJ, Markham FW, Santana AJ. The relationship between entering medical students' backgrounds and career plans and their rural practice outcomes three decades later. Acad Med. 2012;87(4):493-497. doi:10.1097/ACM.0b013e3182488c06
23. Feng PW, Ahluwalia A, Feng H, Adelman RA. National Trends in the United States Eye Care Workforce from 1995 to 2017. Am J Ophthalmol. 2020;218:128-135. doi:10.1016/j.ajo.2020.05.018
24. Grobler L, Marais BJ, Mabunda S. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. The Cochrane Collaboration, ed. Cochrane Database Syst Rev. 2015;(6). doi:10.1002/14651858.CD005314.pub3
25. Moreno G, Walker KO, Morales LS, Grumbach K. Do Physicians with Self-Reported Non-English Fluency Practice in Linguistically Disadvantaged Communities? J Gen Intern Med. 2011;26(5):512-517. doi:10.1007/s11606-010-1584-6
26. Verma P, Ford JA, Stuart A, Howe A, Everington S, Steel N. A systematic review of strategies to recruit and retain primary care doctors. BMC Health Serv Res. 2016;16:126. doi:10.1186/s12913-016-1370-1
27. Goodfellow A, Ulloa JG, Dowling PT, et al. Predictors of Primary Care Physician Practice Location in Underserved Urban or Rural Areas in the United States: A Systematic Literature Review. Acad Med J Assoc Am Med Coll. 2016;91(9):1313-1321. doi:10.1097/ACM.0000000000001203
28. Lapidus A, Shah S, Mekonnen M, et al. Medical student intentions to practice internal medicine in underserved areas associated with debt, identity and extracurricular participation. BMC Med Educ. 2023;23(1):420. doi:10.1186/s12909-023-04392-0
29. Quinn N, Keppol S, Bligdon S, Lyons S. Impact of Optometric Residency Training on Future Career Paths: A Survey of Perceptions of Optometry Students, Residents and Alumni. Optom

Educ. 2015;40(2):94-103.
30. Committee on Increasing the Number of Women in Science, Technology, Engineering, Mathematics, and Medicine (STEMM), Committee on Women in Science, Engineering, and Medicine, Policy and Global Affairs, National Academies of Sciences, Engineering, and Medicine. Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors. (Colwell R, Bear A, Helman A, eds.). National Academies Press; 2020:25585. doi:10.17226/25585
31. Cheryan S, Ziegler SA, Montoya AK, Jiang L. Why are some STEM fields more gender balanced than others? Psychol Bull. 2017;143(1):1-35. doi:10.1037/bul0000052
32. Google. Women Who Choose Computer Science— What Really Matters. May 26, 2014. Accessed July 25, 2024. https://static.googleusercontent.com/media/edu.google.com/en//pdfs/women-who-choose-what-really.pdf
33. California Department of Education, Data Reporting Office. Course Enrollment Listing 2018-19. Accessed August 17, 2024. https://dq.cde.ca.gov/dataquest/CourseReports/CourseResults.aspx?Filter=A&TheYear=2018-19&cTopic=Course&cChoice=CrseEnroll&cLevel=State&cdscode=00000000000000&Subject=N&AP=Y&IB=Y&CTE=N&lNotAll=True
34. New York State Education Department. NY State 2021-22 AP/IB Report. Accessed October 31, 2024. https://data.nysed.gov/APIB.php?state=yes&year=2022&createreport=1
35. Wyatt J, Feng J, Ewing M. AP® Computer Science Principles and the STEM and Computer Science Pipelines. December 2020. Accessed October 31, 2024. https://apcentral.collegeboard.org/media/pdf/ap-csp-and-stem-cs-pipelines.pdf
36. Jolly S, Griffith KA, DeCastro R, Stewart A, Ubel P, Jagsi R. Gender differences in time spent on parenting and domestic responsibilities by high-achieving young physician-researchers. Ann Intern Med. 2014;160(5):344-353. doi:10.7326/M13-0974
37. Heath DA, Spangler JS, Wingert TA, et al. 2017 National Optometry Workforce Survey. Optom Vis Sci. 2021;98(5):500-511. doi:10.1097/OPX.0000000000001688
38. Mertz EA, Wides CD, Kottek AM, Calvo JM, Gates PE. Underrepresented Minority Dentists: Quantifying Their Numbers And Characterizing The Communities They Serve. Health Aff Proj Hope. 2016;35(12):2190-2199. doi:10.1377/hlthaff.2016.1122
39. Supreme Court of the United States. Students For Fair Admissions, Inc. v. President and Fellows of Harvard College and Students For Fair Admissions, Inc. v. University of North Carolina, et al. June 29, 2023. Accessed September 28, 2023. https://www.supremecourt.gov/opinions/22pdf/20-1199_hgdj.pdf
40. Academic Senate University of California. Report of the UC Academic Council Standardized Testing Task Force (STTF); 2020. Accessed September 25, 2023. https://senate.universityofcalifornia.edu/_files/underreview/sttf-report.pdf
41. UC Office of the President. University of California Board of Regents unanimously approved changes to standardized testing requirement for undergraduates. May 21, 2020. Accessed September 28, 2023. https://www.universityofcalifornia.edu/press-room/university-california-board-regents-unanimously-approved-changes-standardized-testing
42. UC Office of the President. University of California admits record number of California residents and largest class of underrepresented freshmen in system history for fall 2023. August 8, 2023. Accessed September 24, 2023. https://www.universityofcalifornia.edu/press-room/university-california-admits-record-number-california-residents-and-largest-class
43. Davis D, Dorsey JK, Franks RD, Sackett PR, Searcy CA, Zhao X. Do racial and ethnic group differences in performance on the MCAT exam reflect test bias? Acad Med. 2013;88(5):593-602. doi:10.1097/ACM.0b013e318286803a

44. Elks ML, Herbert-Carter J, Smith M, Klement B, Knight BB, Anachebe NF. Shifting the Curve: Fostering Academic Success in a Diverse Student Body. Acad Med J Assoc Am Med Coll. 2018;93(1):66-70. doi:10.1097/ACM.0000000000001783
45. Conrad SS, Addams AN, Young GH. Holistic Review in Medical School Admissions and Selection: A Strategic, Mission-Driven Response to Shifting Societal Needs. *Acad Med*. 2016;91(11):1472-1474. doi:10.1097/ACM.0000000000001403
46. Addams AN, ed. Roadmap to Excellence: Key Concepts for Evaluating the Impact of Medical School Holistic Admissions. First edition. Association of American Medical Colleges; 2013.
47. Bates T, Mutha S, Coffman J. Practicing Holistic Review in Medical Education. July 2020. Accessed July 25, 2024. https://healthforce.ucsf.edu/sites/healthforce.ucsf.edu/files/publication-pdf/Practicing%20Holistic%20Review%20in%20Medical%20Education_102220.pdf
48. Samasource Impact Sourcing, Inc. About Our Founder. Accessed September 24, 2023. https://www.sama.com/our-story/#:~:text=She%20founded%20Sama%20in%202008,60%2C000%20people%20out%20of%20poverty
49. Association of Schools and Colleges of Optometry. ASCO Broadens Public Awareness of Optometry with New ‘Optometry Gives Me Life’ Campaign. March 12, 2019. Accessed September 1, 2023. https://optometriceducation.org/news/asco-broadens-public-awareness-of-optometry-with-new-optometry-gives-me-life-campaign/

Dr. Raymond Chu is the Associate Dean of Academic Affairs at the Southern California College of Optometry at Marshall B. Ketchum University. He is a Fellow of the American Academy of Optometry and a Diplomate in the Optometric Education Section.

Dr. Kristine Huang is an Associate Professor at the Southern California College of Optometry at Marshall B Ketchum University. She is a Fellow of the American Academy of Optometry and a member of the College of Optometrists in Vision Development and the Neuro-Optometric Rehabilitation Association.

Features

Editorial

Optometric Education – Different Lenses, Same Vision

Keshia S. Elder, OD, MS, MS, FAAO | *Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)*

Keshia Elder, OD, MS, MS, FAAO

Each year as spring emerges, I become contemplative. I eagerly look forward to upcoming capstone events such as commencement and the white coat ceremony, while also taking time to reflect on the past. While reviewing manuscripts for the first of two Winter/Spring 2025 issues of *Optometric Education*, I realized we are still grappling with many of the same overarching issues in optometric education that existed when I entered academia.

My journey to optometric education was indirect. Although I taught high school math prior to entering optometry school, when I joined my first optometry faculty in the fall of 2007, I still had many questions about teaching optometry students running through my mind. These questions included:

- How do you effectively deliver didactic and laboratory optometric instruction?
- How do you help students translate didactic instruction into clinical applications?
- What encompasses appropriate and effective clinical grading of optometry students?
- How can we ensure that we collectively (intern and attending) provide appropriate patient clinical care?
- Is my clinical instruction effective and appropriate?
- Are the students adequately qualified and properly prepared for the rigors of an optometric education?

In essence, I wondered if I as an individual and my institution as a whole were applying the correct pedagogy to the correct audience of students. These are the same questions and concerns that have plagued me throughout my years in academia. Many colleagues in optometric education also ask similar questions and spend their careers finding answers through the scholarship of teaching and learning

(SoTL). *Optometric Education* is the only peer-reviewed journal devoted to optometric education and through our journal, optometric educators can discover insight and data that can help inform their pedagogical approach.

There have been many advances in the field of optometry over the decades. These changes range from scope expansion to diagnostic and therapeutic technology. As optometry changes, our optometric institutions must proactively adjust curricula needs to meet the future demands of the profession. There have also been advances in methods of instructional delivery and expansion of educational technology (EdTech). Navigating these changes can be daunting. However, as optometric educators, we are driven to continuously provide the most effective educational training for our students.

Although changes in the field of optometry and optometric education necessitate that we adjust, I still have the same vision I have always had – to effectively apply the correct pedagogy to the correct audience of students to train outstanding optometrists. This vision is formed by my quest to discover the most accurate answers to my questions. It is my hope that this edition of *Optometric Education* will help you find some answers to some of the questions that guide your optometric education journey.

Drop Me a Line

What do you think? Let's continue to share our ideas, innovations, and best practices. I welcome your insights on this and any topic that is on your mind. Email address below.

Dr. Keshia Elder [elderk@umsl.edu], Editor of *Optometric Education*, is a Clinical Professor and Dean of the University of Missouri-St. Louis College of Optometry.

Sponsors

VSP Vision

OptometricEducation | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Get to Know Director of Doctor Relations Dr. Quy Nguyen

What inspired you to become an OD?

I was inspired when I shadowed a private practice optometrist in college. What stood out to me about the role was a versatile combination of being able to protect and enhance people's sight (we can argue this is probably the most important sense!) and having many career options to choose from while striking a good balance of work and life. In addition, optometry provides ODs the opportunity to connect with their patients every day and make a difference in their communities.

Tell us about your role as Director of Doctor Relations at VSP Vision.

I joined VSP in 2024 and am responsible for developing programs designed to support the needs of doctors throughout various stages of their careers. My team works closely with schools of optometry to support students and early-career ODs through scholarships, travel grants, job placement, career entry resources, and leadership development. In addition, my team manages our OD student loan repayment program that provides selected ODs with up to $200,000 in debt relief if they commit to working at a practice in an underserved community – I wish this program existed when I graduated! Before coming to VSP, I spent almost a decade at SUNY College of Optometry building pipelines for students entering the profession and supporting them on their career path. I'm excited to take my prior experiences to now develop VSP programs that enhance an optometrist's professional journey.

What does VSP Vision do to support doctors and patient flow to VSP network practices?

In addition to supporting optometry students and early-career ODs with student loan repayment and career development programs, VSP continues to deliver valuable programs and resources for network private practices. For example, VSP Premier Edge offers private practices several benefits, including training and education, recruiting and hiring OD talent, and marketing consultations. And for PECAA Max members, the VSP Vision Exam Rebate gives them the opportunity to receive up to $60,000 in rebates throughout 2025. We know patient care is the most important thing for network doctors. VSP promotes the importance of eye health and care from a VSP network doctor to more than 85 million Vision Care members each year. As I settle into my new role at VSP, I also hope to look at how we might address supporting doctors (and patients) in health care deserts where access is such a big issue.

What excites you about the future of optometry?

The many students whom I've had the blessing to serve are so compassionate, so tech savvy, and so well-rounded. I'm excited to see where they take the profession – they are our future!

What's the one thing you want doctors to remember about VSP?

I've been extremely fortunate to have had the opportunity to serve patients in a clinical setting, and then serve the future of optometry in an academic setting. Now, in an industry setting, I am learning about VSP and how the business must constantly evolve to meet the changing needs of doctors and patients. It's been eye-opening, and what I can tell you is that VSP will continue to support private practice ODs and the long-term success of the profession.

Dr. Quy Nguyen
Director of
Doctor Relations

For more information on VSP Vision, visit vspproviderhub.com or contact your local VSP representative.

ALCON Precision7

OptometricEducation | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

When daily disposables aren't an option, introduce your patients to PRECISION7®, the new **1-week** replacement contact lenses.

Fresh new lens every week featuring the ACTIV-FLO® System

16 hours of outstanding comfort and precise vision, even on day 7[1,3]

All at an affordable price

Scan here to learn more.

References: 1. In a 2-week prospective clinical study in the US; n=181; CLEAR CARE® Cleaning & Disinfecting Solution used for cleaning and disinfection; Alcon data on file, 2023. **2.** Zheng Y, Dou J, Wang Y, et al. Sustained release of a polymeric wetting agent from a silicone-hydrogel contact lens material. ACS Omega. 2022;7(33):29223-29230. doi: 10.1021/acsomega.2c03310. **3.** In a 28-day prospective clinical study;n=92; Alcon data on file, 2023.

Important information for PRECISION7® (serafilcon A) and PRECISION7® for Astigmatism (serafilcon A) contact lenses: For daily wear or extended wear up to 6 nights for near/far-sightedness. Risk of serious eye problems (i.e., corneal ulcer) is greater for extended wear. In rare cases, loss of vision may result. Side effects like discomfort, mild burning or stinging may occur.

See product instructions for complete wear, care, and safety information.

Alcon

ALCON Precision7

OptometricEducation | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)

Acuvue Eye Inspired

OptometricEducation | Optometric Education: Volume 50 Number 1 (Winter/Spring 2025)