PEER REVIEWED

The Benefits of Vision Screening as a Mandatory Component of a First-Year Optometry School Curriculum

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Abstract

Utilization of vision screenings as opportunities for early direct patient care in the first-year optometry school curriculum has direct benefits for students in the areas of technical skills, knowledge-base development, ability to distinguish normal from abnormal findings, improvement of communication skills and development of professionalism and humanism. This scholarly communication explores the benefits of early direct patient care in the healthcare professions. It also describes the integration of community vision screenings early in a first-year optometric curriculum and investigates the students' knowledge and attitudes before and after direct patient care experiences.

Key Words: *early direct patient care, vision-screening tests, first-year optometry curriculum, grading rubrics, community partnership*

Introduction

There is consensus among healthcare professionals that their education is enhanced by early "hands-on" experience with patients. Students rate these experiences as a valuable introduction to their professional roles in clinical practice.[1-5] This alternative model of health professional education includes didactic courses with simultaneous early exposure to direct patient care. It contrasts with the traditional lecture-based model of medical and optometric education in which the first-year curriculum includes only didactic courses and no direct patient care.[6] Optometric educators have expressed concern that first-year students are not prepared for patient care,[7] but current literature documents that a curriculum with clear goals for early student-patient encounters is feasible and can be successful.[8] Yet, in 2016, when we surveyed all of the schools and colleges of optometry in the United States, asking at what point in the program students experience their first direct patient encounters, less than one-third (29.4%, with 17 of 20 schools responding) reported students experiencing direct patient care in the first term of the first year.

Using a mixed research method of quantitative and qualitative surveys, we provide evidence that supports early patient care through vision screenings. The vision screening component integrated into students' first year at Western University of Health Sciences College of Optometry (WUCO) adds value to the curriculum and supports achievement of the college's educational goals of excellent clinical skills, preparation for full-scope care, experience with diverse populations and professional self-confidence.

Establishing a New Curriculum

WUCO opened in 2009 along with its newly built Eye Care Institute (ECI).[9] The ECI serves as the

academic-based clinical care facility for students at all levels in the Doctor of Optometry degree program. Having a minimal established patient population at the outset, the ECI needed external sources of patients. An easily accessible source, which fulfilled a community need and matched the skill set of first-year students in the fall semester, was school-age children, who are required to undergo vision screenings.

Vision screening course structure

Since the 2009 academic year, first-year optometry students at WUCO have provided direct patient care in the course Patient Care Services I: Vision Screenings (PCS-I). This course immediately follows the four-week Principles and Practice of Optometry I (PPO-I), a didactic and laboratory immersion-style course that covers the foundations of vision screenings and the vision screening test battery. Students are required to pass PPO-I in order to participate in PCS-I. In academic years 2009-2016, first-year students began vision screenings in the fifth week of the professional program. In 2017, the start of the vision screenings was moved to the eighth week of the program. The study results we report here are based on our evaluation of the 2016 vision screening rotation (OD class of 2020).

Training of students

Table 1. Click to enlarge

The test battery used for the vision screenings, shown in **Table 1**, is modified from the Colorado Vision Screening Battery.[10] It includes ocular motility, ocular tracking, accommodation and near point of convergence testing that relates to reading level and academic success.[11,12] Recent research shows that reading disabilities, visual attention, oculomotor readiness and reading comprehension are linked.[13] In PPO-I, WUCO students are introduced to the relationship between children's vision skills and successful learning and the importance of the optometrist's role in identifying and treating children with learning-related vision problems.

Selection of screening sites

The timing of the curriculum coincides with the need among local schools for vision screening services, which is at the beginning of the school year. WUCO students perform vision screenings at multiple elementary, middle and high schools within the Pomona Unified School District (PUSD). District administrators choose which schools use the screenings based on a status of "low performance," which is defined as 70% eligibility for low-income lunch and ranking in the lowest 30% on the standardized testing that is administered to all California school children.

Unintended benefits to the local school district

California law mandates vision screenings consisting of distance visual acuity, near visual acuity (since 2014) and color vision testing (males only) for school children in their first year of enrollment and/or in kindergarten, second, fifth and eighth grades. Prior to WUCO's involvement, school nurses working for PUSD conducted the vision screenings along with hearing screenings. The district appreciates the more comprehensive vision screening provided through WUCO. Before 2014, the nurse screenings utilized the Snellen distance visual acuity chart and primarily detected children with myopia while missing those with hyperopia. A screening battery consisting solely of distance vision testing is known to miss up to 40% of vision problems, especially those related to learning in the elementary grades, such as uncorrected hyperopia and binocular dysfunction.[14] A recent report by Kulp et al. demonstrated that even a moderate amount of uncorrected hyperopia in young children results in poor performance on tests of early literacy.[15]

Even with the state-mandated addition of near vision testing to the screening battery, vision problems may still go undetected. Recent research has also demonstrated that early detection of reduced near point of convergence in school-age children helps them to avoid some reading problems.[16] In July 2016, the American Academy of Optometry published a Policy Statement on Childhood Vision Screening, which reads "in order to facilitate early detection of children's vision problems and meet the vision needs of all children, the American Academy of Optometry recognizes the value of a continuum of eye care that includes both evidence-based vision screenings and access to comprehensive eye examinations by optometrists or ophthalmologists."[17]

All children who do not pass the WUCO vision screening are referred, and their parents receive, before the end of the calendar year, an official letter from a PUSD nurse recommending a comprehensive eye examination. Optometry students enrolled in a community service learning course assist PUSD nurses with follow-up of the referred children. They help with paperwork, contact parents by phone and speak directly to students at the school sites. They educate the children, their parents and teachers about the importance of vision in learning. They contact every student referred for a comprehensive vision examination in an effort to ensure they obtain the needed services and prescription glasses. In addition to delivering vision screening services and follow-up to the school district's children, WUCO now serves as a resource for the PUSD health services director, nurses and teachers. Since the inception of the screening program, 21,768 children have received vision screenings.

Student scheduling

The WUCO vision screenings, provided by a team of 8-14 first-year students, a supervising optometrist and two third-year student supervisors, take place on 15-22 days each year. Each first-year optometry student performs 6-7 full vision screenings per day. WUCO faculty members, who are California-licensed optometrists, supervise the optometry students. Working in pairs, students perform all vision screening tests on a single patient. At the end of each vision screening session, the faculty supervisor gathers the students to discuss the interesting cases of the day. Supervising optometrists and third-year students lead debriefing sessions that allow for discussion, reflection and feedback regarding the pediatric vision conditions and challenges the first-year students encountered. On average, each student experiences 35.6 direct patient care encounters by week 15 of the curriculum.

Course Assessment

Preceptor evaluation of student performance

Table 2. Click to enlarge

Table 3. Click to enlarge

Faculty supervision is associated with better patient care as well as faster acquisition of clinical skills by students.[18] To assess the performance of the optometry students on the day of the vision screening, the faculty supervisor uses a rubric to grade their behavior and skills **(Table 2)**. The assessment includes seven criteria: technical skills, knowledge base, accurate diagnosis and management, communication skills, attitude towards learning, professionalism and humanism. Each criterion is fundamental to becoming a good clinician.[19] By the end of the course, students who receive an evaluation of "almost all the time" or "all the time" in each of the seven graded areas pass the course. Throughout the years of this vision screening course, all students have received a passing grade, which supports the appropriateness of vision screening as direct care encounters early in the curriculum for first-year students.

Student self-assessment

To help us assess the value of this course, the 2016 first-year optometry students completed a self-assessment survey of their experience **(Table 3)**. The survey asked students to assign a letter grade to their experience. One hundred percent of the students completed the assessment of their vision screening experience, and 100% were evaluated by their clinical supervisors or preceptors. The course assessment showed that 90.5% of students assigned a grade of 'A' to their experience during PCS-I; 8.9% of students assigned a grade of 'B'; and 0.60% gave the course a grade of 'C' or lower. One-hundred percent of students indicated that performing numerous vision screenings early in their first year added value to their clinical education, as represented by these personal reports and reflections:

"I thought the vision screenings were a great way to dip our feet in the clinical pool! Not only did we get to help the community, but we had an awesome learning experience!"

"Vision screenings were very important to me because I had the opportunity to use and practice my skills on real patients."

"Vision screenings were so helpful. I gained a lot of confidence and improved my technical skills. I hope next year's students will continue to do this!"

"Vision screenings were great in introducing us to the community and building our skills as future optometrists."

"Learning by the textbook is one thing; learning through hands-on experience is another thing. Knowing that WUCO has direct patient care in the first year was one of the determining factors on why I chose this school."

"Knowing that these vision screenings may be a crucial stepping stone in a child's path to academic success, it's very rewarding to be a part of a team that provides this service to the community."

Overall, students rated the course as a successful learning experience in their first-year curriculum. This demonstrates that the curriculum design can support early entry of patient care.

Benefits to Students

Spiral curriculum

The benefits of early introduction to direct patient care reinforce the view that optometric education should focus on clinical training from the first year and develop within a spiral curriculum.[20] In a spiral curriculum, key concepts are presented repeatedly with deepening layers of complexity. The approach supplements the traditional layered curriculum in which basic sciences provide the necessary foundation for further learning.[20] For example, in our study's post-course survey, 83% of students reported being able to differentiate between normal and abnormal findings. Differentiating normal from abnormal findings is the foundation for clinical thinking and differential diagnosis. The vision screenings provide early experiential learning with the opportunity to revisit and emphasize concepts in subsequent patient care courses as well as didactic courses. Early introduction to direct patient care demonstrates applications and relevance of the basic sciences to the practice of optometry from the very beginning of the educational process. Empathy is explored through human interactions, and thus direct patient care aids in the development of empathy and professionalism.[21]

Professionalism

Role models for students include faculty as well as peers, with faculty being the most influential.[22] According to Baernstein et al., preclinical students at the University of Washington School of Medicine stated that role modeling was the primary mode of learning professionalism.[22] Professionalism is a

necessity in any healthcare profession as it helps to develop a strong bond between doctors and patients through respect.

Table 4. Click to enlarge

Table 5. Click to enlarge

The vision screening experience offers optometry students the opportunity to observe both positive and negative aspects of peer role models. Positive aspects include accurately diagnosing a certain condition or working in an efficient manner. Negative aspects include tardiness, showing disrespect to patients or faculty, or inaccurately diagnosing a condition. The positive aspects are attributes for which students should strive, and the negative aspects should be carefully noted and avoided. At the WUCO vision screenings, optometry students observe and learn from the supervising faculty how to interact in a professional manner with elementary school students and school nurses. The preceptor student grading form includes an assessment of students' interactions with patients, peers and other professionals in the areas of punctuality, preparedness and adherence to the dress code. Students must meet all criteria for professionalism all the time at each screening to pass the course. All students in our study received a passing grade in professionalism. Students who do not meet professional conduct standards do not receive a passing grade. Per the college's student handbook, they are referred to the Student Performance Committee, which makes decisions about remediation.

Pre- and post-vision-screening survey of students

Figure 1. Click to enlarge

Prior to the start of the vision screening rotation in 2016, a pre-survey was administered to the students (OD class of 2020). The survey **(Table 4)** attempted to solicit information about their perceptions and expectations going into the program. All first-year students were invited to participate via a link that was open for one week. The pre-survey consisted of five questions and asked students to rate aspects of their awareness, preparation, confidence and expectations related to clinical skills, interprofessionalism, cultural competence and community impact by means of a Wilcoxon signed-rank test. The pre-survey response rate was 96.6% (N = 86). The same group of students (N = 86), through the same process, was administered a post-survey at the conclusion of their vision screening rotation. They were asked to respond to an online survey on a five-point Likert scale about their experiences. The post-survey response rate was 85.4% (N = 76). Simple descriptive statistics were used for data analysis to provide summaries about the sample population and to determine whether distribution of measures changed for the period. **Figure 1** shows the students' perceptions before and after the PCS-1 course. Overall, there was a positive change in their perceptions before and after the vision screenings. This is evident in their choice of answers before and after their experiences.

A Wilcoxon signed-rank test indicated that students' experiences in the vision screening course elicited a statistically significant change in most of their perceptions, as in questions 2 through 5:

- Q2. (Z = -3.613, p = 0.000)
- Q3. (Z = -4.826, p = 0.000)
- Q4. (Z = -5.100, p = 0.000)
- Q5. (Z = -4.448, p = 0.000)

The median score rating was 4.00 both pre-and post-vision-screening experience for students' level of awareness of interprofessional interactions between optometrists and school nurses. The median score ratings for the other pre-and post-vision-screening experience questions are found in **Table 5**. This

survey supports the appropriateness of vision screening direct patient care encounters for all first-year optometry students, and thus is similar to previous research with medical students.[1,6]

The students' exposure to interactions between supervising optometrists and school nurses supports the evolving profession of optometry and the need for interprofessionalism to solve complex cases. It is also important to note the optometry students indicated a higher level of cultural competence at the end of their vision screening experiences.[23] Vision screenings as direct patient encounters early in the optometry curriculum contributed to development of cultural competence due to the nature of the school children selected for screenings.

Discussion

The WUCO vision screening course supports several optometric educational guidelines and goals. Specifically, vision screenings in areas of low social and economic status meet these requirements by expanding the breadth of education experienced by optometry students.[24] This can also help ameliorate the visual function and visual processing deficits that have been associated with neuro-integrative impairments commonly found in children with reading disabilities.[25] The vision screening course conforms to these guidelines. It is integrated into the local community and is part of a curriculum designed with specific learning objectives using the innovative outcomes-based education (OBE).[26] We assessed outcomes by using specific evaluation rubrics. Our results show that first-year optometry students greatly benefit from early direct patient care as it reinforces key clinical skills as well as enhances development of essential interpersonal skills such as professionalism and empathy. Faculty evaluations of students demonstrated that students acquired a wide range of the expected skills and attributes. The results of student evaluations of their vision screening experience demonstrated that they valued performing vision screening tests on patients, rather than screening simulations or testing classmates. As a whole, students were very enthusiastic about their early exposure to patient care. Their ability to clinically apply the concepts learned in didactic courses enriched their learning experience both in the classroom and in the community. Specifically, the vision-screening course was highly beneficial at meeting its student learning outcomes. Our data are consistent with prior reports, which have also shown that clinical training in the community helps to develop several important clinical attributes, including verbal and non-verbal communication skills and empathy towards patients.[27]

While performing screenings, the first-year optometry students communicate, interact and develop a connection with the elementary school children. They develop professionalism through interaction with school personnel such as nurses and teachers as well as with the different supervising faculty optometrists. Furthermore, the basic sciences provide students with a wide range of thinking and problem-solving skills, in particular those that relate to optometry and clinical learning.[28] After reviewing history questions with the children, optometry students learn to relate these symptoms to the findings obtained during the vision screening. For example, a child complains of losing her place when reading, and the optometry student finds low scores on pursuit accuracy testing. With this experience, the optometry students are able to listen, begin to interpret, communicate and manage the visual problems of the school children.

In 2017, as a result of ongoing curricular review at our optometry school, we moved the start of the vision screening program from the fifth week to the eighth week of the fall semester of the first year. We had two reasons for making this change. One reason was elementary school children tend to perform better at the screenings when they are more acclimated to the school. This is especially true for new enrollees, such as kindergarten students. PUSD school nurses and teachers informed us that as the children become more adjusted to their surroundings, teachers can observe their behaviors and performance in the classroom, regardless of grade. This input provides additional information to the optometrists as they make pass/refer decisions, particularly in cases of borderline test results. The second reason for the change was the additional opportunity for students to practice their newly learned skills on each other in

the preclinical setting. Students had reported this in their course evaluations, and supervising faculty observed that the students' screening test ability and speed improved as a result of the additional practice.

The vision screening experience provides optometry students an opportunity to interact with patients early in the professional education program. Transitioning from university-based to clerkship-based education is challenging, but after the vision screening experience, optometry students feel more prepared to provide direct patient care in their future professional career.[29] Future studies can evaluate the effects of first-year vision screenings on the clinical and professional performance of students in subsequent patient care courses.

Conclusion

The PCS-I course at WUCO provides educationally relevant learning experiences as it engages our optometry students in community-based vision screenings early in their education, in the fall term of the first year. A minority of optometric institutions offer a course early in the first-year curriculum that incorporates direct patient care. Our findings indicate it would be valuable for other optometric institutions to form partnerships with local school districts to implement a mandatory course involving school vision screenings early in the first-year curriculum.

Based on the great value WUCO students place on their experience with real patients early in the professional program, our study supports an alternative to the traditional lecture-based education model..

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References

1. Howe A, Dagley V, Hopayian K, Lillicrap M. Patient contact in the first year of basic medical training – feasible, educational, acceptable? Med Teach. 2007;29(2-3):237-45.
2. Válková L. First early patient contact for medical students in Prague. Fam Pract. 1997 Oct;14(5):394-6.
3. Vera-Diaz FA, Johnson C. Perceived enhanced clinical readiness for second-year optometry interns. Optometric Education. 2016 Summer;41(3).
4. Labreche T, Christian LW, Hrynchak P. Initial evaluation of an optometric outreach educational program. Optometric Education. 2016 Summer;41(3).
5. Helmich E, Bolhuis S, Laan R, Koopmans R. Early clinical experience: do students learn what we expect? Med Educ. 2011;45(7):731-40.
6. Christianson CE, McBride RB, Vari RC, Olson L, Wilson HD. From traditional to patient-centered learning: curriculum change as an intervention for changing institutional culture and promoting professionalism in undergraduate medical education. Acad Med. 2007;82(11):1079-88.
7. Penisten DK. The expanding scope of practice and the optometric curriculum. J Am Optom Assoc. 1992;63(11):779-80.
8. Ottenheijm RP, Zwietering PJ, Scherpbie AJ, Metsemakers JF. Early student-patient contacts in general practice: an approach based on educational principles. Med Teach. 2008;30(8):802-8.
9. Hoppe E. Focused on the future. Optom Vis Dev. 2009;40(1):14-15.
10. Bosse J, Condit RS, Fitzpatrick B, et al. Guidelines for school vision screening programs, Colorado Department of Public Health and Environment. 2nd edition, Sept. 1991.

11. Rouse M. Borsting E, Mitchell GL. Academic behaviours in children with convergence insufficiency with and without parent-reported ADHD. Optom Vis Sci. 2009 Oct;86:1169-77.
12. Scheiman M, Mitchell GL, Cotter SA, et al, CITT-ART Investigator Group. Convergence Insufficiency Treatment Trial – Attention and Reading Trial (CITT-ART): design and methods. Vis Dev Rehabil. 2015 Oct;1(3):214-228.
13. Scheiman M, Rouse M. Optometric management of learning-related vision problems, 2nd Edition. Mosby Elsevier, 2006.
14. Bodack MI, Chung I, Krumholtz I. An analysis of vision screening data from New York City public schools. Optometry. 2010;81(9):476-84.
15. Kulp MT, Ciner E, Maguire M, et al., VIP-HIP Study Group. Uncorrected hyperopia and preschool early literacy: results of the vision in preschoolers-hyperopia in preschoolers (VIP-HIP) study. Ophthalmology. 2016;123(4):681-9.
16. Dusek WA, Pierscionek BK, McClelland JF. An evaluation of clinical treatment of convergence insufficiency for children with reading difficulties. BMC Ophthalmol. 2011 Aug 11;11:21.
17. Ciner E, Cotter S, Kulp M, et al. American Academy of Optometry policy statement childhood vision screening. American Academy of Optometry. 2016 Aug:1-3.
18. Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: a systematic review. JAMA. 2009 Sept 23;302(12):1316-26.
19. Rizo CA, Jadad AR, Enkin M. What's a good doctor and how do you make one? Doctors should be good companions for people. BMJ. 2002 Sep 28;325(7366):711.
20. Super S. The spiral curriculum in optometric education. Optom Vis Sci. 1989 Oct;66(10):705-9.
21. Helmich E, Bolhuis S, Laan R, Koopmans R. Early clinical experience: do students learn what we expect? Med Educ. 2011;45(7):731-40.
22. Baernstein A, Oelschlager AE, Chang TA, Wenrich MD. Learning professionalism: perspectives of preclinical medical students. Acad Med. 2009;84(5):574-81.
23. Association of Schools and Colleges of Optometry. Guidelines for culturally competent eye and vision care. 2008. Available from: https://optometriceducation.org/files/Guidelines_CulturallyCompetentEyeAndVisionCare.pdf
24. Solan HA, Mozlin R. Biosocial consequences of poverty: associated visual problems. Optom Vis Sci. 1997 Apr;74(4):185-9.
25. Solan HA, Larson S, Shelley-Tremblay J, Ficarra A, Silverman M. Role of visual attention in cognitive control of oculomotor readiness in students with reading disabilities. J Learn Disabil. 2001 Mar-Apr;34(2):107-18.
26. Berman MS. Priorities for optometric education: outcomes of the curriculum conference. Optom Vis Sci. 1994 Feb;71(2):87-90.
27. Thompson BM, Lovie-Kitchin JE. Interpersonal skills training for optometry students: what should be taught? Optometric Education. 1988 Winter;13(3):84-8.
28. Woodruff CE. The evolution of optometric education in America. Optometry. 2001;72(12):779-86.
29. Surmon L, Bialocerkowski A, Hu W. Perceptions of preparedness for the first medical clerkship: a systematic review and synthesis. BMC Med Educ. 2016 March 12;16:89.

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