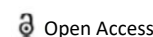




RESEARCH ARTICLE



Medical Student Competence in Ophthalmology Assessed Using the Objective Standardized Clinical Examination

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ABSTRACT

Background: Medical school education in ophthalmology is lacking and requires more attention. In this study, we assessed medical student competency in ophthalmology using an ophthalmology station in an Objective Standardized Clinical Examination (OSCE).

Materials and Methods: 100 pre-clerkship medical students and 98 clerkship medical students were included in this study. The OSCE station consisted of a common ocular complaint-blurry vision with decreased visual acuity-and students were asked to take an appropriate history, provide 2-3 differential diagnoses to explain the symptoms, and perform a basic ophthalmic examination.

Results: Generally, clerks performed better than pre-clerks in the history taking ($p < 0.01$) and the ophthalmic examination ($p < 0.05$) sections, with few specific exceptions. For the history-taking section, more pre-clerkship students asked about patient age and past medical history ($p < 0.00001$) and for the ophthalmic examination, more pre-clerkship students performed the anterior segment examination ($p < 0.01$). Interestingly, more pre-clerkship students were also able to provide two to three differential diagnoses ($p < 0.05$), specifically, diabetic retinopathy ($p < 0.00001$) and hypertensive retinopathy ($p < 0.00001$).

Conclusion(s): The performance of both groups was generally satisfactory; however, many students in both groups had scores that were unsatisfactory. Notably, pre-clerks also outperformed clerks in certain areas which emphasize the importance of revisiting ophthalmology content through clerkship. Awareness of such knowledge can allow medical educators to incorporate focused programs into the curriculum.

ARTICLE HISTORY

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KEYWORDS

Medical education; ophthalmology; OSCE

Introduction

Education in ophthalmology in medical schools is lacking [1]. There is a growing body of evidence suggesting that medical students and primary care physicians are not at the expected level of competency in ophthalmology [2,3]. The Association of University Professors in Ophthalmology policy statement outlines the minimal level of competence expected of primary care physicians in dealing with ophthalmic complaints [4]. It states that all students should be able to measure and record visual acuity, manage red eye, manage a patient with eye trauma, detect abnormal movements of the eye, assess pupillary responses, perform direct ophthalmoscopy with an explanation of findings and be able to initially manage a patient with an ocular complaint and/or refer the patient appropriately [4]. It remains unclear wheth-

er current medical students would meet these criteria.

The Objective Standardized Clinical Examination (OSCE) is widely used in medical student and resident education. It provides an innovative way to assess a student's clinical skills including communication skills, examination skills, in addition to factual memorization [5]. The purpose of this study was to use the OSCE, a standard component of medical student assessment, to objectively evaluate medical students' competency in ophthalmology at a single medical school. Furthermore, we hoped to identify specific areas of weakness, potentially necessitating curricular reform.

Materials and Methods

Participants

Medical students from two classes at a single medical

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school were included in the study. This project adhered to the Declaration of Helsinki, and abided to all regional, national, and international laws of the institution the project were conducted in. The first group of students consisted of 100 pre-clerkship students (Group A) and the second group comprised of 98 clerkship students (Group B). During the regular OSCE administration for each class, the students had to complete one OSCE station involving the following prompt: "A patient presents to you with blurry vision and markedly decreased visual acuity." This station was used to assess the competency in ophthalmology and was broken down into 3 parts. Part 1 consisted of history taking, part 2 consisted of coming up with differential diagnoses, and part 3 consisted of the ophthalmic exam. Each student in both groups received the same prompt and examiners were given a scoring rubric. The students had access to a blank sheet of paper and a pencil as well as several clinical skills testing tools including a stethoscope, reflex hammer, cotton balls, toothpicks, tuning forks, direct ophthalmoscope, penlight, and a Rosenbaum pocket visual acuity screener. There was no slit lamp available to the students.

The OSCE checklist and scoring rubric used to evaluate the students. The OSCE prompt outlining instructions to the student is also shown.

OSCE prompt

A patient presents to you with blurry vision and markedly decreased visual acuity. Examine the patient:

- Take a brief history
- Generate 2 or 3 main differential diagnoses.
- Perform an ophthalmic examination relevant to the history.

Instructions to the examiner

Please score all 3 parts of the student’s overall performance on this station by checking the scales provided for each part.

Part 1

In assessing performance the following questions and characteristics of visual loss should be elicited from the patient by the student (Table 1):

Table 1. Place a mark on the appropriate area along the scale using the legend below:

S. NO	Source	Marking legend
1	Unsatisfactory	1= student covered 1 or none of these areas
2		2= student covered 1 or weakly 2 of these areas
3		3= student covered 2 of these areas

4		4= student covered 3 of these areas
5		5= student covered 3 or weakly 4 of these areas
6		6= student covered 4 of these areas
7	Excellent	7= student covered all of these areas

- Nature of visual loss- transient or persistent?
- Is visual loss monocular or binocular?
- Temporal features: Is the onset abrupt or sudden? Occurring over hours, days, weeks?
- Patient age and pertinent medical history (i.e hypertension, diabetes, arthritis, etc.)
- Prior visual acuity- normal or not.

Part 2

Possible differential diagnoses: Features of diabetic retinopathy, Features of hypertensive retinopathy, Retinal detachment, Retinal vascular occlusion (amaurosis fugax, arterial occlusion, retinal vein occlusion), Optic neuritis, Transient ischemic attacks, Stroke (occlusion of cerebral arteries), Glaucoma, Trauma.

Place a mark on the appropriate circle:

- Student able to derive 2 or 3 differential diagnoses,
- Student NOT able to derive at least 2 differential diagnoses.

Part 3

For the ophthalmic examination, the following examinations and techniques should be performed competently (Table 2):

Table 2. Place a mark on the appropriate area along the scale using the legend below:

S. NO	Source	Marking legend
1	Unsatisfactory	1= student covered 1 or none of these areas
2		2= student covered 1 or weakly 2 of these areas
3		3= student covered 2 of these areas
4		4= student covered 3 of these areas
5		5= student covered 3 or weakly 4 of these areas
6		6= student covered 4 of these areas
7	Excellent	7= student covered all of these area

- Examination of visual acuity using the “Rosenbaum pocket vision screener” are visual acuity should be assessed in each eye with the other eye covered, student should comment on visual acuity - ie. 20/20 or 20/50 left eye, etc.
- Pupillary responses
- light reaction and swinging flashlight test for afferent pupillary defect
- student should notice a dilated pupil and comment on it
- Anterior segment exam using a pen light or ophthalmoscope
- Visual field testing
- Fundoscopy with description of findings

Analysis

Each student’s performance was graded using a 7-point scale for part 1 and part 3 of the OSCE station. Means and standard deviations were used to summarize these data. Part 2 was graded using a binary classification and proportions were used to summarize these data. Unpaired t-tests were conducted to compare overall clerk and pre-clerk performance in part 1 and part 3. Chi-squared tests were conducted to compare performance between groups for overall performance in part 2, and specific sub-questions within parts 1 and 3.

Results

Table 3 outlines the section-by-section score breakdown for each group. Overall, the pre-clerks performed worse than the clerks in part 1, the history-taking section (5.03 vs. 5.68, t=3.52, p<0.001). There was no significant difference between groups for asking about whether the visual loss was monocular or binocular (53.0% vs. 63.2%, chi-squared: 2.14, p=0.14) and asking about temporal features of the vision loss (83.0% vs. 87.8%, chi-squared=0.90, p=0.34). Pre-clerks asked about whether the visual loss was transient or persistent significantly less than the

clerks (68.0% vs. 85.7%, chi-squared: 8.71, p<0.01). Pre-clerks also asked about prior visual acuity significantly less than the clerks (57.0% vs. 80.6%, chi-squared=12.83, p<0.001). However, the pre-clerks did significantly better at ensuring to ask about patient age and pertinent medical history such as hypertension, diabetes, and arthritis (96.0% vs. 71.4%, chi-squared: 22.0543, p<0.00001).

Overall, the pre-clerks were more often able to identify 2-3 relevant differential diagnoses than the clerks (92.0% vs. 80.6%, chi-squared=5.45, p<0.05). There was no significant difference between groups for identifying retinal detachment (17.0% vs. 22.4%, chi-squared=0.93, p=0.34), retinal vein occlusion (7.0% vs. 13.3%, chi-squared=2.07, p=0.15), optic neuritis (11.0% vs. 19.4%, chi-squared=2.71, p=0.10), transient ischemic attack (5.0% vs. 6.1%, chi-squared=0.12, p=0.73), stroke (10.0% vs. 17.3%, chi-squared=2.27, p=0.13), or trauma (39.0% vs. 29.6%, chi-squared=1.94, p=0.16) as possible differential diagnoses. Pre-clerks identified diabetic retinopathy (96.0% vs. 70.4%, chi-squared=23.34, p<0.00001) and hypertensive retinopathy (60.0% vs 14.3%, chi-squared=44.19, p<0.00001) as possible differential diagnoses significantly more often than clerks. Clerks identified glaucoma as a possible diagnosis more often than pre-clerks (9.0% vs. 23.5%, chi-squared=7.65, p<0.01).

Overall, pre-clerks performed worse than clerks in the ophthalmic examination section (4.33 vs. 4.70, t=2.22, p<0.05). There was no significant difference between pre-clerks and clerks for measuring visual acuity (84.0% vs 80.6%, chi-squared=0.39, p=0.53) or performing fundoscopy (92.0% vs. 89.8%, chi-squared=0.29, p=0.59). Pre-clerks less consistently checked pupillary responses (65.0% vs. 80.6%, chi-squared=6.08, p<0.05) and performed visual field testing (51.0% vs. 68.0%, chi-squared=6.98, p<0.01). Pre-clerks more consistently performed an anterior segment exam (22.0% vs. 7.14%, chi-squared=8.74, p<0.01) (Tables 3 and 4).

Table 3. Results for each section showing values corresponding to the percentage of students in each group those were able to achieve a mark for each task or question. See the materials and methods section for a detailed explanation of each numerical value corresponding to a particular section. For example, 1 in Part 1 (History section) corresponds to Nature of Visual Loss.

	Part 1					Part 2									Part 3				
Group	1	2	3	4	5	1	2	3	4	5	6	7	8	9	1	2	3	4	5
A	68	53	83	96	57	96	60	17	7	11	5	10	9	39	84	65	22	51	92
B	86	63	88	71	81	70	14	22	13	19	6	17	23	30	81	81	7	69	90

Table 4. Results for the final scores by individual section for each group. The standard deviation of the mean is also shown. Also, for part 2 the final result is shown as the percentage of students that were able to identify 2-3 differential diagnoses.

Group	Part 1-Average Score	Part 1-Standard Deviation	Part 2-% who identified 2-3 diagnoses	Part 3-Average Score	Part 3-Standard Deviation
A	5.03	1.45	92	4.33	1.27
B	5.68	1.13	81	4.70	1.07

Discussion

This study found that there is room for improvement in medical student ophthalmology education. Clerks generally performed better than pre-clerks except for some specific sub-questions and the ability to identify 2-3 relevant differential diagnoses. The literature suggests that there is a lack of ophthalmology teaching at the medical school level and a downward trend with regards to didactic ophthalmology teaching and clinical ophthalmology experience [1,6-8]. As a result, many non-ophthalmologist physicians may be inadequately trained to deal with the initial management or appropriate referral of basic ophthalmic complaints [1,9]. Possibly, an increased emphasis on ophthalmology as a fringe specialty within medicine, that is unrelated to most other specialties, has led to a decrease in ophthalmology education. Interestingly, our study suggested that pre-clerks did perform better in generating differential diagnoses which may suggest that clerkship exposure to ophthalmology is too limited, and students may lose the knowledge they once had due to a lack of exposure. According to the Association of University Professors in Ophthalmology 2004 Survey on Medical Student Teaching, formal ophthalmology rotations in medical school have declined significantly, from 68% in 2000 to 30% in 2004 [1].

Clerks performed significantly better than pre-clerks in history taking and performing an ophthalmic examination, although pre-clerks were more often able to identify 2-3 relevant differential diagnoses. Interestingly, pre-clerks outperformed clerks in specific parts of asking about patient age and pertinent medical history, and more often identified diabetic retinopathy and hypertensive retinopathy as possible differential diagnosis. These findings could suggest that pre-clerks were more effective at incorporating general history taking questions such as the past medical history and identifying possibly relevant systemic conditions such as diabetes and hypertension. This may be expected as clerks may have been more focused on specific ocular pathologies. Nonetheless, identifying relevant systemic conditions and asking general history questions such as patient age and pertinent medical history are crucial skills and should be emphasized within clerkship. In the ophthalmic examination section,

both groups were able to identify measuring visual acuity and funduscopy as important components of the ophthalmic examination; however a low proportion of students in both groups performed an anterior segment examination. Likely, this is because clinical skills sessions pertaining to ophthalmology typically only focus on visual acuity and funduscopy without discussing the anterior segment. By extension, students need to understand exterior ocular anatomy to successfully conduct an anterior segment examination. This is often not the case, although there are several high-quality, easily accessible, resources for medical students [10-12]. Possibly, raising awareness and placing emphasis on using such resources could ameliorate medical student ophthalmology knowledge and performance.

In our study, the performance of students in each class was satisfactory, but there was clear room for improvement. Although the means suggest that students are in the satisfactory range, the standard deviation demonstrates a large spread of scores, indicating that several students are performing unsatisfactorily (Table 4). Future work should investigate whether the spread of scores for other subject areas is similar to what was observed in this study. Students with prior interest in ophthalmology are most likely to seek further knowledge in the field and conversely, it may be possible that those without interest in the field may be able to avoid ophthalmology content as it is generally not a large component of medical school education [8,13-15].

Conclusion

The results of our study indicate that there is a need for improvement in ophthalmology teaching, although it appears that many students are performing at the expected level for ophthalmic content and clinical skills. Notably, there is some evidence from our study which suggests that clerks perform worse than pre-clerks in certain aspects which reinforces the importance of revisiting concepts, even basic ones, previously covered in the medical school curriculum. Even a single-week ophthalmology rotation has been shown to improve ophthalmic knowledge in clerks. Possibly, further emphasis on a case-based flipped classroom model may be a suitable option for ophthalmology education in medical school. In addition,

incorporation of ophthalmic concepts during tutorials, clinical skills sessions, and didactic lectures will remain important. Consistently including ophthalmology focused stations in OSCEs may also encourage students to keep up to date with ocular anatomy, physiology, and examination techniques. Lastly, awareness of the areas of ophthalmology where medical student show weakness can help medical educators to incorporate focused programs into the curriculum to address these issues.

Conflicts of Interest

The authors have no conflicts of interest to report.

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