Examination Report

April 2017 Refraction Certificate Examination

Contents:

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1.   Introduction

The 25th Refraction Certificate examination in the format was held on 11 April 2017 in Birmingham. Sixty two candidates presented themselves for the examination. The examination consisted of a 12 station OSCE covering a range of skills required to assess visual acuity, refractive error and the prescription of spectacles.

Examination blueprint

The Refraction Certificate (RCert) is designed to assess the following learning outcomes from the Royal College of Ophthalmologists curriculum for ophthalmic specialist training (OST):

CA2   Vision
CA7   Motility
PM1   Management plan
PM14   Spectacles
PS2   Refraction
PS21   Hand hygiene
C1   Rapport
C2   Communication
C12   Records
BCS6   Optics
BCS14 Instrument technology
AER16 Time management

Examination Structure

The examination consists of 12 OSCE stations. Each station contributes a possible 15 marks to the overall total. The stations used for the examination were:

1. Cycloplegic Retinoscopy (CR1)
2. Cycloplegic Retinoscopy (CR2)
3. Subjective Refraction Cylinder (SRC)
4. Cycloplegic Retinoscopy (CR3)
5. Cycloplegic Retinoscopy (CR4)
6. Lens Neutralisation (LN)
7. Non Cycloplegic Retinoscopy (NCR1)
8. Non Cycloplegic Retinoscopy (NCR2)
9. Visual acuity and IPD measurement (VA)
10. Subjective Refraction Sphere (SRS)
11. Binocular balance (BB)
12. Near Addition (NA)

2.   Summary

This is the 17th sitting of the refraction certificate with 12 OSCE stations. The reliability of the examination is acceptable (Cronbach alpha 0.7) and meets the expectations of the GMC.

The Hofstee method of standard setting was used to identify the pass mark for this examination, which was 73%.
The pass rate was reasonable at 67% with a slightly higher pass rate in OST at 69%.

Relatively high mean scores were observed across all 12 stations, the lowest mean was for subjective refraction of the sphere. Cycloplegic refraction 3 was the station in which this cohort of candidates achieved the highest scores. It appears that the stronger candidates are losing marks in the VA station as there is a low correlation with overall score and the VA station.

Candidates in training appear to be better prepared for the exam than their non-trainee counterparts.
Those in ST3 are required to pass this exam to progress in their training and 6 of the 17 ST3 candidates failed. There is a good pass rate for ST1 and ST2.

3.   Standard setting

Candidates must be able to accurately assess visual acuity, measure refractive error and recommend an appropriate spectacle correction to pass the RCert. The pass mark is identified using the Hofstee method:

Hofstee method (see appendix 1 for details)
After the examination, examiners were asked to review the parameters for the standard setting based upon their judgment of the difficulty of the stations. The following values were used to set the pass mark:

The cumulative fail rate as a function of the pass mark and the co-ordinates derived from the four values above were plotted on a graph. The point where a line joining the two co-ordinates intersects the cumulative function curve is used to identify the pass mark.

1. The maximum credible pass mark for the examination 75%
2. The maximum credible pass rate for the examination 70%
3. The minimum credible pass mark for the examination 60%
4. The minimum credible pass rate for the examination 30%

4.   Results (table 1)

Number of candidates	63	
Maximum possible mark	180	
Mean candidate mark	134	74%
Median candidate mark	136	76%
Standard deviation	19.7	11%
Highest candidate mark	165	92%
Lowest candidate mark	43	24%
Reliability	0.7	
Standard error of measurement (SEM)	11	6%
Hofstee pass mark	131/180	73%
Pass rate	42	67%
Pass rate in OST	27/39	69%

Distribution of marks (table 2)

Score	Distribution	Total
<51	/	1
51-60		0
61-70		0
71-80		0
81-90		0
91-100	/	1
101-110	/////	5
111-120	///// /	6
121-130	///// ///	8
131-140	///// ///// ///// ///// /	21
141-150	///// /////	10
151-160	///// ////	9
161-170	//	2
171-180		0
Total		63

/ Candidate failed / candidate passed

Statistics for each station (table 3)

		Mean		Median	Standard deviation	Minimum	Maximum
1	CR1		12.1	13	3.6	1	15
2	CR2		11.6	13	4.1	0	15
3	SRC		11	13	4.3	1	15
4	CR3		12.4	14	2.9	4	15
5	CR4		10.3	11	3.9	0	15
6	LN		11.5	13	3.1	2	15
7	NCR1		11.2	11	3.5	0	15
8	NCR2		10.6	11	3.9	0	15
9	VA		11.2	11	2.9	4	15

10	SRS		9.8	10	3.6	1	15
11	BB		10.6	11	3.6	0	15
12	NA		11.4	12	3.2	2	15

The relative weights for each skill in refraction (based upon the number of stations is:

Clinical skill	Number of stations	Contribution to total marks	Median mark
Retinoscopy	6	50%	12
Subjective	3	25%	11
Other	3	25%	12

Correlation between stations (table 4)

	CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB
CR1											
CR2	0.4										
SRC	0.2	0									
CR3	0.1	0.1	0.1								
CR4	0.1	0.1	0	0.6							
LN	0	0	0.2	0.1	0.1						
NCR1	0.1	0.1	0.3	0.5	0.4	0					
NCR2	0	0	0	0.5	0.5	0	0.6				
VA	0.2	0.2	0	0	0	0	0.2	0			
SRS	0.2	0.2	0.1	0.2	0.3	0.2	0	0	0		
BB	0.1	0	0.1	0	0.1	0.1	0	0	0.7	0.7	
NA	0	0	0.1	0.2	0.2	0.1	0.1	0	0	0.1	0.1

Median correlation between the cycloplegic refraction stations = 0.1
- There was good correlation between CR3 and CR4 and NCR1 and NCR2
- The highest correlation was between VA and BB and SRS and BB
- There was moderate correlation between CR1 and CR2

Correlation between non-cycloplegic refraction stations = 0.6
Otherwise there was poor correlation between most stations

Correlation between each station and the total score (table 5)

CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB	NA
0.4	0.4	0.4	0.6	0.6	0.4	0.6	0.5	0.3	0.5	0.4	0.3

Notes:
In the CR3 station, the minimum mark was 4 so all candidates achieved almost 30% of the available marks. There was a high correlation with the other refraction stations CR4 (0.6) and NCR1 & 2 (both 0.5) but a low correlation with CR1 and CR2. Could it be that the patients selected for CR1 and CR2 presented a greater challenge?

It is reassuring to see the minimum mark of 4 achieved in the VA station as this is a fundamental skill used in daily practice and not as technically demanding to learn as refraction and other stations are. The VA station had a low correlation with the overall mark for the exam indicating that the weaker candidates were picking up marks here but the stronger candidates were not.

5. Breakdown of results

Breakdown of results by training (table 6)

	Failed	Passed	Total
In OST	12	27	39
Not in OST	9	15	24
Total	21	42	63

These differences are statistically significant (0.19 Fishers exact)

Breakdown of results by deanery (table 7)

Deanery	Failed	Passed	Total
East Midlands	2	1	3
East of England	0	3	3
East of Scotland	0	0	0
KSS	0	1	1
London	1	4	5
Mersey	2	2	4
North Scotland	0	0	0
North West	0	2	2
Northern	1	0	1
Northern Ireland	0	1	1
Oxford	1	1	2
Peninsula	1	1	2
Severn	0	1	1
South East Scotland	0	0	0
Wales	1	1	2
Wessex	2	0	2
West Midlands	0	4	4
West Scotland	0	1	1
Yorkshire	1	4	5
Total	12	27	39

Breakdown of results by stage of training (table 8)

Stage (includes FTSTA)	Failed	Passed	Total
ST1	1	2	3
ST2	5	14	19
ST3	6	11	17
ST4	0	0	0
Total	12	27	39

Breakdown of results by number of previous attempts (table 9)

Attempts	Failed	Passed	Total
1 (First)	17	23	40
2	3	13	16
3	1	4	5
4	0	2	2
Any resit	4	19	23
Total	21	42	63

6. Comparison to previous examinations (table 10)

Date	Candidates	Pass mark	Pass rate	Pass rate in OST	% Candidates in OST	Reliability	SEM	Hofstee pass mark
Nov 10	53	74%	42%	44%	68%	0.6	7 (7%)	71%
Apr 11	57	71%	35%	47%	63%	0.6	6 (6%)	67%
July 11	41	67%	66%	72%	71%	0.4	6 (6%)	71%
Nov 11	69	65%	71%	75%	70%	0.6	8 (8%)	68%
Mar 12	54	73%	54%	66%	57%	0.6	8 (8%)	72%
July 12	44	71%	59%	67%	64%	0.5	9 (9%)	71%
Dec 12*	71	69%	75%	77%	55%	0.6	11(6%)	72%
Apr 13	64	74%	61%	64%	64%	0.8	11(6%)	74%
July 13	42	72%	74%	90%	48%	0.7	10(6%)	74%
Dec 13	75	72%	67%	76%	65%	0.7	10(6%)	71%
Apr 14	56	73%	84%	89%	66%	0.6	9.5(5%)	75%
July 14	34	74%	62%	55%	65%	0.4	11 (6%)	74%
Dec 14*	63	71%	68%	77%	68%	0.6	12 (7%)	71%
Apr 15*	57	77%	65%	73%	65%	0.4	11 (7%)	77%
June 15*	33	69%	58%	n/a^	0%	0.73	10 (6%)	69%
July 15*	31	66%	58%	55%	65%	0.65	9.4(5%)	66%
Jan 16*	70	70%	60%	60%	81%	0.8	10 (6%)	70%
Mar 16*	57	==77%==	81%	83%	70%	0.9	7.7 (4%)	==77%==
Jun 16*	23	70%	57%	n/a^	0%	0.7	11 (6%)	70%
July 16*	64	70%	64%	67%	67%	0.6	12 (7%)	70%
Jan 17*	62	72%	63%	64%	90%	0.6	10 (6%)	72%
Apr 17*	63	73%	67%	69%	62%	0.7	11 (6%)	73%

* Hofstee pass mark used for these examinations

^ Examination held in Kuching

Performance of candidate by deanery for all examinations to date, where deanery is known (table 11)

Deanery	Total passes	Total candidates	Pass rate %
KSS	19	21	90
East of Scotland	9	10	90
North Scotland	8	9	89
South East Scotland	14	17	82
Oxford	11	14	79
North West	28	38	74
London	122	167	73
Northern	16	22	73
Mersey	29	40	73
Yorkshire	43	61	70
West Midlands	47	67	70
Wessex	20	29	69
East of England	32	47	68
Northern Ireland	10	15	67
West Scotland	19	29	66
East Midlands	22	34	65
Severn	14	22	64
Wales	17	34	50
Peninsula	12	35	34
Total	492	711	69

Appendix 1   Hofstee method for standard setting

Hofstee method

In advance of the examination, members of the College's Examinations Committee were asked to nominate the values for the following:
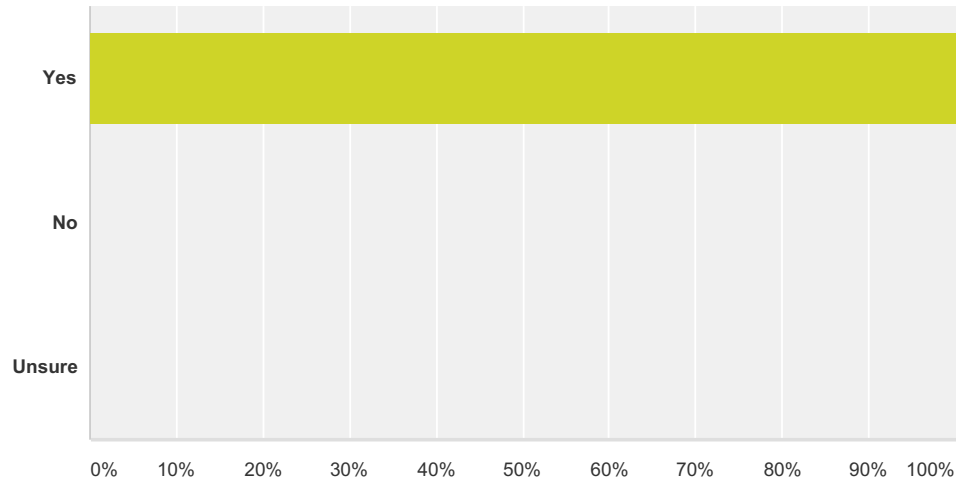1. The maximum credible pass mark for the examination 75%
2. The maximum credible pass rate for the examination 70%
3. The minimum credible pass mark for the examination 60%
4. The minimum credible pass rate for the examination 30%

The cumulative fail rate as a function of the pass mark and the co-ordinates derived from the four values above were plotted on a graph. The point where a line joining the two co-ordinates intersects the cumulative function curve is used to identify the pass mark.

The Hofstee pass mark for this examination was 131/180 (73%).

Q1 Were you treated in a courteous manner by the examiners in this examination?

Answered: 29   Skipped: 0

Answer Choices	Responses	
Yes	**100.00%**	29
No	**0.00%**	0
Unsure	**0.00%**	0
Total		**29**

#	Comments	Date
1	Examiners were very nice and polite, and treated me courteously.	4/23/2017 7:52 PM
2	Generally examiners were very nice. Although the examiner on the refining sphere station was quite off putting as he kept on coming very close to me and looking over my shoulder which added unnecessary pressure while doing the station.	4/20/2017 12:31 PM
3	Examiners were informative and showed respect	4/19/2017 5:37 PM
4	Examiners were excellent . They were courteous and tried to make you feel comfortable	4/18/2017 4:41 PM

Q2 Were the patients you were asked to examine appropriate for the examination?

Answered: 29   Skipped: 0
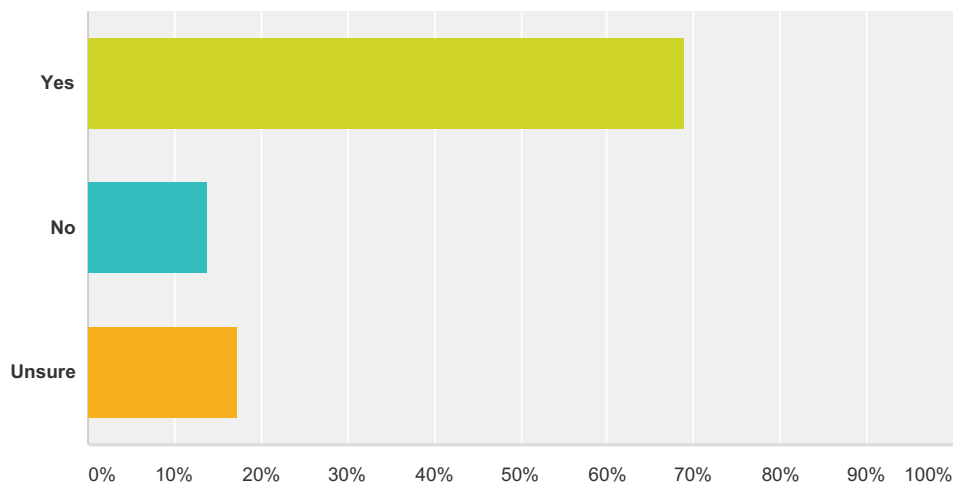
Answer Choices	Responses	
Yes	**68.97%**	20
No	**13.79%**	4
Unsure	**17.24%**	5
Total		29

#	Comments	Date
1	I had a retinoscopy patient who was either shutting his eyes/falling asleep or about to (but never quite managing to) sneeze, such that the entire station was impossible to do. It was the last session of the day, and it was obvious that he was very tired. When the examiner said "See you tomorrow", the patient said "We'll see". It is entirely understandable that repeat examinations in one day are difficult for some patients and the day can be very exhausting for them. However in an examination in which time is paramount, not taking this into account in the examination process is a flaw. We were asked to give feedback by an external assessor after the examiner and this was mentioned by myself and another candidate, but the assessor suggested that this is just part and parcel of this kind of practical exam. I would beg to disagree and venture that this compromises the validity of the exam, and when such events occur in other college exams (e.g. MRCP PACES) then they are addressed systematically.	4/23/2017 7:52 PM
2	In general good, one patient in the cycloplegic station did not dilate well (despite being recently dilated) and thus the retinoscopy reflex was poor	4/22/2017 8:42 PM
3	I felt that one young patient was not consistent with her responses which caused some confusion. However, this could be only how I perceived it and not the fault of the patient.	4/21/2017 8:20 PM
4	While the majority of patients were very suitable and actually better than I hoped for. The patient chosen for the trial frame fitting station had a very tightly fit hijab on. It was impossible to get the frame around her ears yourself, the examiner had to ask the patient to do it and even then the patient herself struggled because her hijab was so tight. Some forward thinking should have easily foreseen this becoming an issue, and was taking up unnecessary valuable time during a very time pressured station and almost certainly affected the measurement of back vertex distance.	4/20/2017 12:31 PM
5	Overall yes. However, couple of patients were just started to get furious! One of them refused to let me put her frame on. In my last station, the examiner was mentioning to the patient that I will be the last candidate so just be patient.	4/19/2017 4:48 PM
6	The patient in the refining the cylinder station kept changing her answers. it became fairly nonsensical. Another candidate said the same thing in the immediate debrief.	4/19/2017 10:36 AM
7	My patient for refining cylinder was vague in his answers - on refining the axis, he said both lenses were "the same" leading me to believe the correct axis was reached, when in fact I later found it was not. Secondly my patient for binocular balance was unreliable and changed her mind when performing the duochrome leading me to waste time attempting to reach the correct prescription.	4/18/2017 5:01 PM

2 / 10

8	Binocular balance patient spent too long deciding if she could see 'red or green' better that it left no time to examine the other eye. This was my first station and I hope that for the other candidates she was more decisive. The patient in subjective cylinder station was wearing a hijab which made it difficult to fit the trial frame in a time pressured setting.	4/18/2017 2:35 PM
9	One of the patients for cycloplegic retinoscopy- one of his pupils was less dilated and appeared to be accommodating.	4/18/2017 12:45 PM
10	Some were tired and their eyes were closing during the retinoscopy therefore affecting the light reflex or their focusing point which could alter the final outcome.	4/18/2017 12:08 PM

Q3 **Was the OSCE well organised overall?**

Answered: 29   Skipped: 0
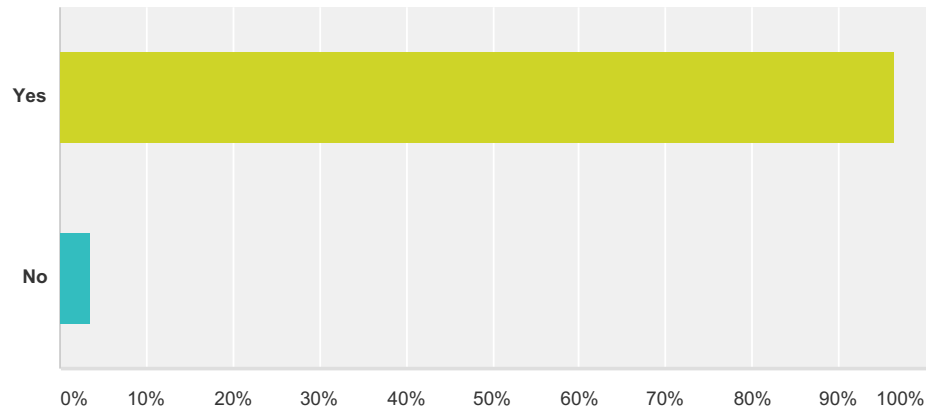
Answer Choices	Responses	
Yes	**96.55%**	28
No	**3.45%**	1
Total		**29**

#	Comments	Date
1	The introductory period and time-keeping between stations was very good. The very start of the exam was a bit of a muddle as the patient information sheet was hidden behind me but apart from that no issues.	4/23/2017 7:52 PM
2	Yes ran very well. Examiners were well prepared.	4/20/2017 12:31 PM
3	But the use of the elctronic Vision charts caused trouble. Once when the chart locked on to pictures only and we did not know how to change it back to letters - thankfully this was before a station during prep time. And once when the computer software crashed, shut itself down and needed reloading. This was during a 5 minute station and slightly alarming.	4/19/2017 10:36 AM
4	Long waiting gaps between stations. Some stations felt rushed and required more time.	4/18/2017 12:08 PM

Q4 Were you given clear instructions about the OSCE?

Answered: 29   Skipped: 0
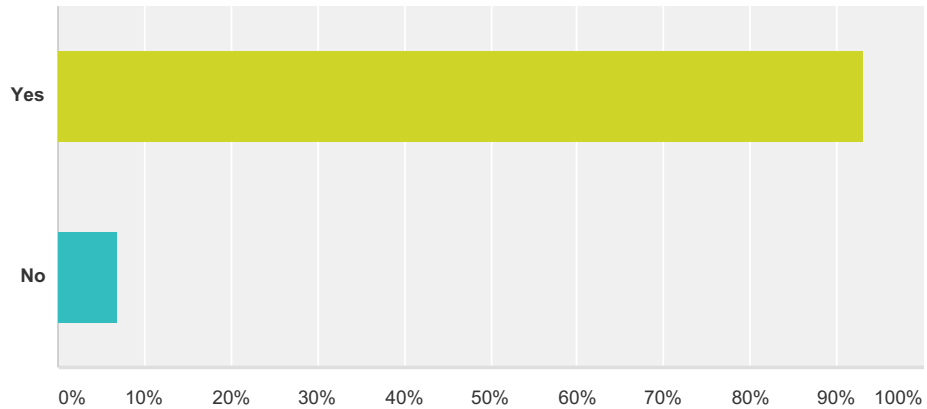
Answer Choices	Responses	
Yes	**93.10%**	27
No	**6.90%**	2
Total		**29**

#	Comments	Date
1	Although there have been instructions regarding fitting of the trial frame prior to the start of the station, in Station B I was not allowed to do this prior to begining my retinoscopy. This meant I lost time fitting the trial frame when I should have been performing my retinoscopy on a non cyclo patient.	5/1/2017 10:29 AM
2	The written instructions, and those available online, were very clear and there were no surprises.	4/23/2017 7:52 PM
3	However, being within the process was different. I read the examination information pack several times and I practiced with timing before the exam. However, exam rooms were not so familiar for me and this caused too much mind disturbance and foolish mistakes.	4/19/2017 4:48 PM
4	Instructions were clear. But I feel that if royal college can make a short video that how the osce will be conducted .This would be really helpful	4/18/2017 4:41 PM

Q5 Did you feel that the OSCE was a fair assessment of your knowledge?

Answered: 28   Skipped: 1
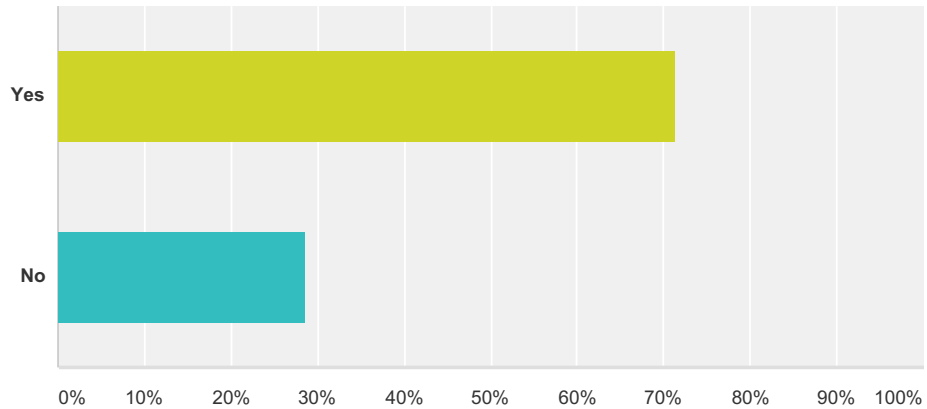
Answer Choices	Responses	
Yes	**71.43%**	20
No	**28.57%**	8
Total		**28**

#	Comments	Date
1	A double station was compromised by an exhausted patient shutting his eyes and trying to sneeze.	4/23/2017 7:52 PM
2	This exam does not depend on knowledge only but on familiarity with the instruments like how fast you can change the charts and to recognize the lenses.	4/21/2017 8:20 PM
3	Not a good representation of actual refraction ability due to time pressure.	4/20/2017 12:31 PM
4	Time was really tight especially I was not working in my usual settings	4/19/2017 4:48 PM
5	enough.	4/19/2017 10:36 AM
6	The exam was race against time rather than anything else. Patients need more time to make decsions and in real world each step of good refraction may take upt0o 20 minutes	4/18/2017 5:20 PM
7	The time pressure is a limiting factor	4/18/2017 5:16 PM
8	Again, a couple of unreliable patients meant valuable time was wasted as I tried to arrive at correct prescription	4/18/2017 5:01 PM
9	Although the above points mentioned can affect the final outcome. Trainees do seem to under perform in exams. Putting time pressure does not help.	4/18/2017 12:08 PM
10	Would be better in 2-4 full refractions	4/18/2017 12:00 PM

Q6 Who helped you to develop competence in refraction? (Please select the answer as appropriate)
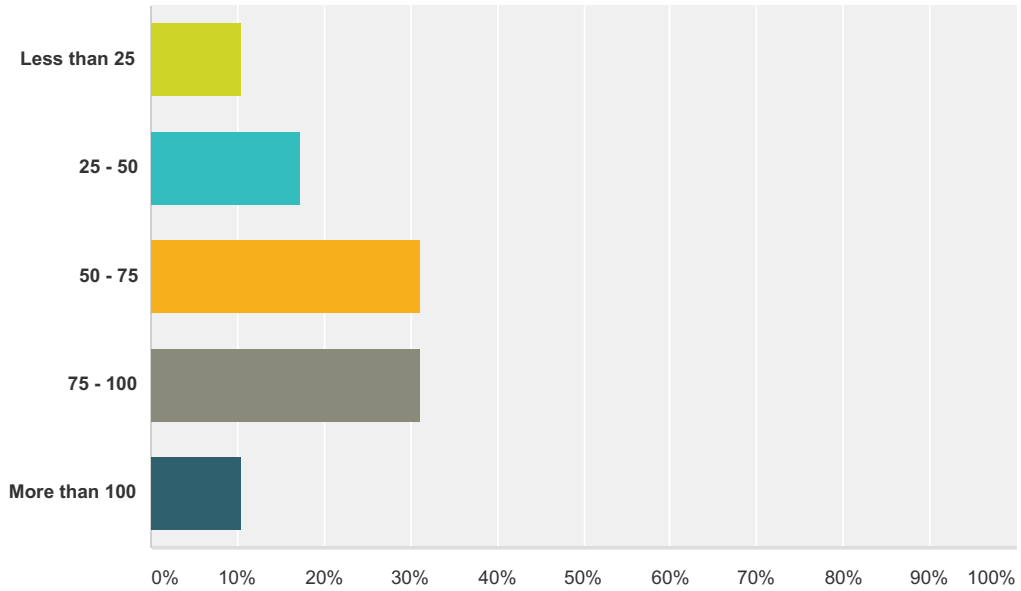
Answered: 28   Skipped: 1
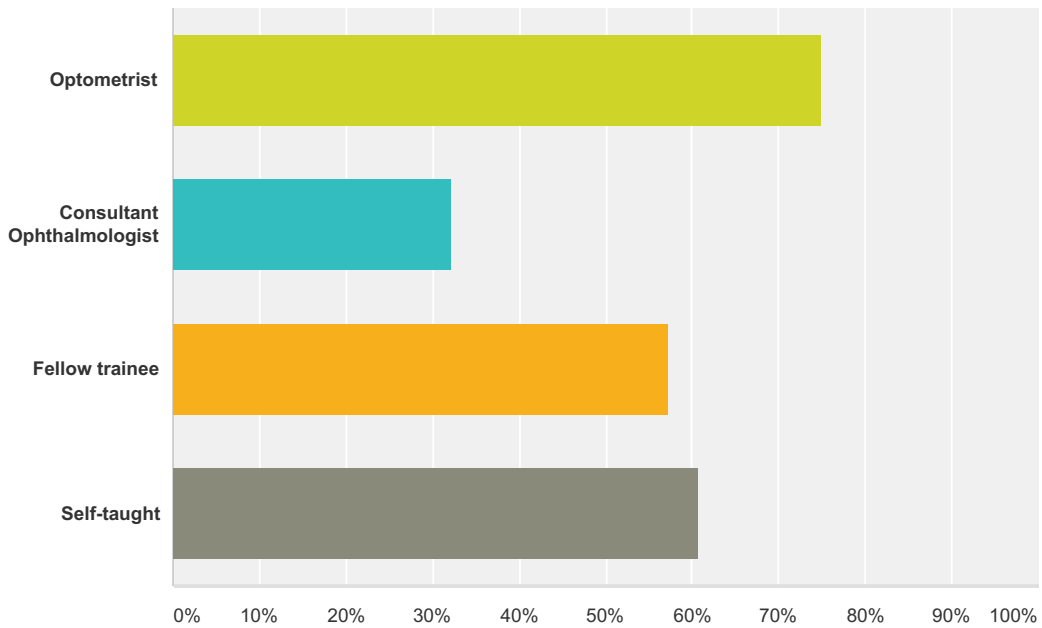
Answer Choices	Responses	
Optometrist	**75.00%**	21
Consultant Ophthalmologist	**32.14%**	9
Fellow trainee	**57.14%**	16
Self-taught	**60.71%**	17
Total Respondents: 28		

#	Other (please specify)	Date
1	Practise with colleagues	4/23/2017 7:52 PM
2	I'm practicing since 2006 so it was a part of my past residency in Egypt. All i needed was some refreshment.	4/19/2017 4:48 PM
3	Refraction course conducted by trainees	4/18/2017 7:43 PM

Q7 Approximately how many complete refractions (retinoscopy + subjective modification) did you carry out in your preparation for the examination?

Answered: 29   Skipped: 0

Answer Choices	Responses	
Less than 25	**10.34%**	3
25 - 50	**17.24%**	5
50 - 75	**31.03%**	9
75 - 100	**31.03%**	9
More than 100	**10.34%**	3
Total		**29**

Q8 Please provide any other advice that you would like to share with future candidates.

Answered: 17   Skipped: 12

#	Responses	Date
1	Some of the trail frames were not placed in the right slots and needs to be check prior to using.	5/1/2017 8:17 PM
2	Practice is key.	5/1/2017 10:29 AM
3	Practise writing down answers within timed practise as this can take more time than you expect.	4/23/2017 7:52 PM
4	Speed in subjective refraction stations is very important because they have the shortest time relative to what is required to be done and written down.	4/21/2017 8:20 PM
5	Practice time management	4/21/2017 10:54 AM
6	This exam is not like refracting in real life. Need to practice exam technique.	4/20/2017 12:31 PM
7	Its important not to define lenses by their colors in the exam; red doesn't necessarily means concave and black doesn't necesarily mean convex and that applies to the Jackson cross cylinder used as well. Also it's better to practise on both types cycloplegic and non cycloplegic retinoscopy ,it can get tricky sometimes.	4/19/2017 5:37 PM
8	The eyedocs tips and hints and FRCOphth guidelines were very useful. Practice on a range of different patients: myopes, hypermetropes, different ages. Start timing yourself early on and ensure you are finishing very comfortably within time as in the exam I found it takes you a bit more time due to nerves/different charts etc. Practice practice practice until it becomes a routine. I found 3-4 months of daily practice is sufficient to feel prepared for the exam.	4/19/2017 12:57 AM
9	Practice, practice, practice not only retinoscopy but subjective refraction too and follow the suggested format.	4/18/2017 7:43 PM
10	Start to prepare early, attend courses and do as many as u possibly can	4/18/2017 5:35 PM
11	Please provide a 5 minutes warning or at least a stop watch.	4/18/2017 5:20 PM
12	Stop watch is essential As during Osce you are not aware of time .	4/18/2017 4:41 PM
13	Time is a big issue!	4/18/2017 2:35 PM
14	Practicing on all kinds of patients is key to this exam as well as practicing in timed conditions as this is a very time pressured exam.	4/18/2017 1:39 PM
15	Timing is very quick on the near add station.	4/18/2017 12:45 PM
16	Practise doing retinoscopy with the left hand for left eyes, as I found that uncomfortable and used only the right hand to ret. carry your own flippers.	4/18/2017 12:24 PM
17	Make sure you go through the answer sheet as the exams tests specific things.	4/18/2017 12:08 PM

Q9 Please write any other comments you have about the Refraction Certificate Exam below.

Answered: 14   Skipped: 15

#	Responses	Date
1	Some of the trail frames were not placed in the right slots and needs to be check prior to using.	5/1/2017 8:17 PM
2	As I mentioned above, valuable time could be lost for some candidates if different information is given by different examiners. Also, I felt that there was something wrong with the foci meter in station A, which gave the graticules an oily appearance, despite trying to focus the eyepiece.	5/1/2017 10:29 AM
3	Advised someone meets and directs candidates to a waiting area away from patients and candidates who have already completed their exam.	4/26/2017 6:36 PM
4	In the non-cycloplgeic retinoscopy station, the patient was very tall and I was unable to lower his chair or raise my chair any further -- consequently it was difficult to be on axis when performing retinoscopy.	4/24/2017 4:24 PM
5	There was an external assessor at the examination station who kindly asked to meet with the candidates after the exam for our feedback. The external assessor was very polite. However the feedback we offered was not accepted (i.e. any criticism from the candidates was gently but effectively repelled), so I don't understand the objective of this exercise.	4/23/2017 7:52 PM
6	Probably consider adding a few more minutes to the subjective refraction stations including refining cyl, sphere and binocular balance. Instruct patients to try to cooperate more by answering the candidates questions quickly and loudly. Request the examiners to change the charts for the candidates specially in refining the cyl station in which the letter chart did not have an O letter and we needed to change to the round target several times because checking vision was relevant, which left no time to answer the station correctly.	4/21/2017 8:20 PM
7	Again exam settings! This is not so familiar for me as we use projectors in my country so computerised screens were not that familiar and needed more time to use them. May be an orientation day prior to exam will be beneficial.	4/19/2017 4:48 PM
8	Lenses used in exam were difficult to use as the dioptre were engraved on the side of the lens but not coloured which make it very hard to see in the dark. The cylinder axis was also very faint on the lens. I would like to mention that the results come out after the deadline for the second attempt. Which mean candidate has to wait a long time to do it again if he failed.	4/19/2017 2:44 PM
9	I found the mounter of the focimeter that was brought in the exam was a bit difficult to use and wasn't holding the spectacles steady. Also, in spite of adjusting the eyepiece to view the protractor clearly, I found that it was difficult to get clear lines to record an accurate value so I didn't feel comfortable with my answer at the end despite a lot of practice for this station and feeling confident with my technique. Otherwise I thought the examiners were nice and introduced the stations well and the patients were good and compliant.	4/19/2017 12:57 AM
10	well organised, but for some stations there was too little time	4/18/2017 8:37 PM
11	Well organised and well structured.	4/18/2017 7:43 PM
12	Please organise training sessions and mock exams so candidates will know in advance what will happen. My first station was like a pilot station for me to know exactly what is the situation. I learnt to tune myself for the rest of exam and finish quickly.	4/18/2017 5:20 PM
13	I hope that the unreliability of patients was taken into account by the examiners, as this truly impacts on the end result (given the real time pressures in the exam).	4/18/2017 5:01 PM
14	I found the Subjective cylinder Refining station particularly daunting as my patient just would not improve on the vision chart.	4/18/2017 12:24 PM