Examination Report

July 2014 Refraction Certificate Examination

The ROYAL COLLEGE of OPHTHALMOLOGISTS

Contents:

1 Introduction

The fourteenth Refraction Certificate examination in the OSCE format was held on 14 and 15 July 2014 at the Glasgow Caledonian University. 34 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 sixth sitting of the refraction certificate with 12 OSCE stations. The reliability of the examination (Cronbach alpha 0.4) is still less than desirable and does not meet the expectations of the GMC. However this examination had the fewest candidates for several years. It is also notable that a recent sitting of the examination in Malaysia had a very high reliability.

The Hofstee pass mark is relatively stable and was the same as the BCM pass mark for this examination. This method of setting the pass mark will be used after August 2014.

The pass rate in OST was lower than in previous sittings. A small number of candidates performed very badly.

Candidates performed variably in all of the cycloplegic retinoscopy stations.

Stations CR1, SRC, NCR1 and BB were the most highly discriminating between poor and well performing candidates in the examination overall. The near add, VA, lens neutralisation and CR3 were the poorest discriminating stations.

There were no significant differences in performance based upon OST, gender, ethnicity, first language or country of qualification.

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September 2014

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 was identified using two different methods:

Borderline candidate method (BCM)
Examiners marked the station they were supervising according to the marking guidance provided. In addition they were asked to rate the candidates overall performance as a pass, a fail or borderline. The median mark allocated to the borderline candidates then becomes the pass mark for that station. The sum of the borderline marks for each station is the examination pass mark.

Hofstee method (see appendix 1 for details)
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
2. The maximum credible pass rate for the examination
3. The minimum credible pass mark for the examination
4. The minimum credible pass rate for the examination

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 used to compare the difficulty of successive examinations.

4. Results Table 1

Number of candidates	34
Maximum possible mark	180
Mean candidate mark	133/180 (74%)
Median candidate mark	134.5/180 (73%)
Standard deviation	14.0 (7.7%)
Highest candidate mark	154/180 (86%)
Lowest candidate mark	93/180 (52%)
Reliability	0.41
Standard error of measurement (SEM)	11 (6%)
BCM pass mark	122/180 (68%)
Hofstee pass mark	133/180 (74%)
Pass mark used (BCM + 1 SEM)	133/180 (74%)
Pass rate	21/34 (62%)
Pass rate in OST	12/22 (55%)
Pass rate if Hofstee mark had been used	21/34 (62%)

Distribution of marks **Table 2**

Score	Distribution	Total
91-95	/	1
96-100		0
101-105		0
106-110	/	1
111-115	/	1
116-120	///	3
121-125	///// /	6
126-130	/	1
131-135	/////	5
136-140	/////	5
141-145	//	2
146-150	///// //	6
151-155	///	3
156-160		0
Total		34

/ Candidate failed / candidate passed

Statistics for each station **Table 3**

		Mean	Median	Standard deviation	Minimum	Maximum
1	CR1	10.8	12	3.5	4	15
2	CR2	9.6	10	3.3	3	15
3	SRC	9.8	11	4.5	1	15
4	CR3	13.0	14	2.3	8	15
5	CR4	11.5	11	2.5	7	15
6	LN	11.0	11	3.0	3	15
7	NCR1	11.4	13.5	4.0	2	15
8	NCR2	11.5	13	3.9	3	15
9	VA	12.8	13	1.9	6	15
10	SRS	11.2	12	2.2	4	14
11	BB	8.7	9.5	3.7	0	15
12	NA	11.6	12.5	3.1	4	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%	12.5 (83%)
Subjective	3	25%	11 (73%)
Other	3	25%	12.5 (83%)

Correlation between stations Table 4

	CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB
CR1											
CR2	0.53										
SRC	0.04	-0.19									
CR3	-0.20	-0.03	-0.10								
CR4	0.23	0.27	0.01	0.48							
LN	0.03	0.01	0.43	-0.01	-0.21						
NCR1	0.16	0.13	0.13	-0.01	-0.04	0.05					
NCR2	0.21	-0.03	-0.10	0.02	-0.01	-0.30	0.73				
VA	-0.06	-0.01	0.47	0.13	-0.10	0.34	0.04	-0.07			
SRS	-0.03	-0.12	0.32	-0.15	-0.23	0.19	-0.17	-0.01	-0.02		
BB	0.18	-0.08	0.53	-0.25	-0.11	0.27	-0.02	-0.14	-0.06	0.42	
NA	-0.30	-0.18	0.18	-0.25	-0.11	-0.04	-0.28	-0.22	0.05	0.43	0.29

Median correlation between the cycloplegic refraction stations = 0.25
Correlation between non-cycloplegic refraction stations = 0.73
Best correlation between CR1 and CR2 (0.53) and NCR1 and NCR2 (0.72)
Poorest correlation between NA and CR1 (-0.30)

Correlation between each station and the total score Table 5

CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB	NA
0.47	0.29	0.65	0.03	0.21	0.39	0.51	0.34	0.31	0.52	0.53	0.10

Item discrimination and facility

33% item discrimination has a value between -1.00 and +1.00. If the candidates who score well in the examination overall score well in the station, the item discrimination index will be close to +1.00. If the candidates who score poorly in the examination overall score well in the station, the item discrimination index will be close to -1.00. Ideally the station item discrimination value should be greater than 0.400. The facility of each station estimates how easy the candidates found the task to complete.

Utility of each question Table 6

Pass or fail on marks for each station

	Station	33% item discrimination	Item facility (%)
1.	Cycloplegic Retinoscopy (CR1)	0.455	68
2.	Cycloplegic Retinoscopy (CR2)	0.273	59
3.	Subjective Refraction Cylinder (SRC)	0.545	65
4.	Cycloplegic Retinoscopy (CR3)	0.091	68
5.	Cycloplegic Retinoscopy (CR4)	0.364	65
6.	Lens Neutralisation (LN)	0.091	71
7.	Non Cycloplegic Retinoscopy (NCR1)	0.455	76
8.	Non Cycloplegic Retinoscopy (NCR2)	0.182	65
9.	Visual acuity and IPD measurement (VA)	0.00	71
10.	Subjective Refraction Sphere (SRS)	0.182	85
11.	Binocular balance (BB)	0.545	76
12.	Near Addition (NA)	0.000	72

Standard setting and global judgments for each station Table 7

		Pass	Borderline	Fail	% Pass	BCM mark*	%
1	CR1	18	12	4	53	9.5	63
2	CR2	14	11	9	41	9	60
3	SRC	18	9	7	53	9	60
4	CR3	21	13	0	62	13	87
5	CR4	9	24	1	26	11	73
6	LN	16	13	5	47	10	67
7	NCR1	19	11	4	56	9	60
8	NCR2	22	7	5	65	12	80
9	VA	23	9	2	68	13	87
10	SRS	17	16	1	50	10	67
11	BB	16	11	7	47	7	47
12	NA	19	14	1	56	9.5	63

*BCM mark = median mark for borderline candidates for each station.

5. Breakdown of results

Breakdown of results by training Table 8

	Failed	Passed	Total
In OST	10	12	22
Not in OST	3	9	12
Total	13	21	34

These differences are not statistically significant (p = 0.21)

Breakdown of results by deanery Table 9

Deanery	**Failed**	**Passed**	**Total**
East Midlands	2	0	2
East of England	1	0	1
East of Scotland	0	1	1
KSS	0	2	2
London	1	0	1
Mersey	0	0	0
North Scotland	0	0	0
North West	1	0	1
Northern	0	0	0
Northern Ireland	0	2	2
Oxford	0	0	0
Peninsula	2	0	2
Severn	0	1	1
South East Scotland	0	2	2
Wales	1	0	1
Wessex	0	0	0
West Midlands	0	0	0
West Scotland	2	3	5
Yorkshire	0	1	1
Total	10	12	22

Breakdown of results by stage of training Table 10

Stage (includes FTSTA)	**Failed**	**Passed**	**Total**
ST1	2	3	5
ST2	5	4	9
ST3	2	4	6
ST4	0	0	0
Total*	9	11	20

**Level at examination unknown for 2 candidates*

Breakdown of results by gender Table 11

	Failed	Passed	Total
Female	5	14	19
Male	8	7	15
Total	13	21	34

These differences are not statistically significant (p = 0.16)

Breakdown of results by country of qualification Table 12

	Failed	Passed	Total
UK	6	13	19
Outside UK	7	8	15
Total	13	21	34

These differences are not statistically significant (p = 0.48)

Breakdown of results by first language Table 13

	Failed	Passed	Total
English	5	15	20
Not English	6	5	11
Total*	11	20	31

*Unknown for 3 candidates

These differences are not statistically significant (p = 0.13)

Breakdown of results by stated ethnicity Table 14

	Failed	**Passed**	**Total**
Non-white	8	14	22
White	2	5	7
Total*	10	19	29

*Unknown for 5 candidates

These differences are not statistically significant (p = 1.0)

Breakdown of results by number of previous attempts Table 15

Attempts	Failed	Passed	Total
1 (First)	9	19	28
2	4	1	5
3	0	1	1
4	0	0	0
5	0	0	0
6	0	0	0
Any resit	4	1	5
Total	13	21	34

6 Comparison to previous examinations Table 16

Date	Candidates	Pass mark	Pass rate	Pass rate in OST	% Candidates in OST	Reliability	SEM	Hofstee pass mark
Mar 10	43	69%	47%	58%	67%	0.6	9 (9%)	68%
July 10	47	75%	53%	60%	70%	0.6	8 (8%)	72%
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%

Performance of candidate by deanery for all examinations to date, where deanery is known
Table 17

Deanery	**Total passes**	**Total candidates**	**Pass rate %**
KSS	8	9	89
East of Scotland	7	8	88
North Scotland	5	6	83
Oxford	5	6	83
Mersey	19	25	76
South Scotland	9	12	75
London	81	111	73
Northern	12	17	71
West Midlands	28	41	68
Yorkshire	28	41	68
East Midlands	16	24	67
North West	16	24	67
Northern Ireland	8	12	67
Wessex	10	15	67
East of England	19	29	66
Severn	10	16	63
Wales	12	20	60
West Scotland	9	16	56
Peninsula	7	22	32
Total	309	454	**68**

Appendix 1 Hofstee method for standard setting

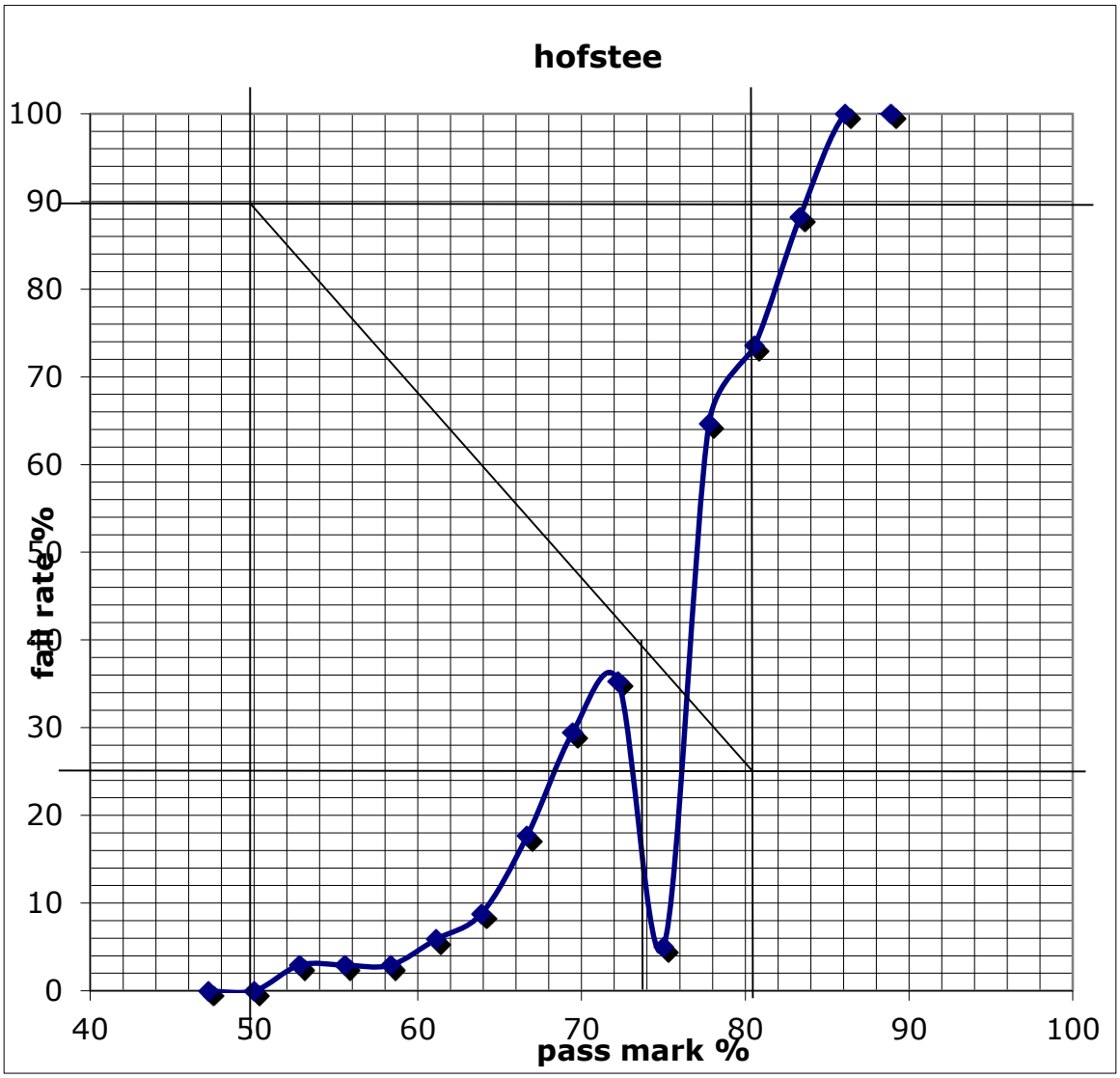
Hofstee method

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 144/180 (80%)
2. The maximum credible pass rate for the examination (75%)
3. The minimum credible pass mark for the examination 90/180 (50%)
4. The minimum credible pass rate for the examination (10%)

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 pas mark for this examination was 133/180 (74%), which is the same as the BCM + 1 SEM pass mark.



Appendix 2: July 2014 - Refraction Certificate Candidate Feedback

OSCE stations

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

Yes 10/10
No 0/10

Comments

- All the examiners very friendly and professional.
- Very polite and put me in ease.

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

Yes 9/10
No 2/10 (One candidate answered yes and no!)

Comments

- Most of the patients were appropriate, but I had a lady in my checking Visual acuity station that did not respond very well to the visual acuity charts when asked. She was not sure which line to read despite telling her to read the line above the red line. That took up some time.
- Some patient didn't give clear answers making timekeeping an issue.
- Except Subjective refinement for the sphere and binocular balance patient who was unreliable. All other patients were very good.
- On the whole yes, although the patient in the Best Vision sphere was not anwering appropriately, and seemed confused.
- Several of my patients were elderly and took a significant amount of time in reading the visual acuity chart. One my patients actually read out the near acuity as N8 and N6 as opposed to reading the text as I had directed her to. This was very off putting and she also continuously commented on her vision throughout my examination. I felt that young patients may have been more appropriate for a time pressured OSCE. Overall I did not feel that the patients chosen were appropriate.
- Ret patients were good at following directions. Subjective modification patients were very poor at answering consistently.

The OSCE overall

Was the OSCE well organised?

Yes 10/10
No 0/10

Comments

- Good and efficient rotation of stations

- I was impressed with the well organised structure.
- Rooms could have had more surfaces to write on; rubber (on end of pencil) not the best… Visual acuity was checked with American notation – was this necessary or helpful?!

Were you given clear instructions about the OSCE?

Yes 10/10
No 0/10

Comments

- All examiners were very helpful at the Glasgow OSCE with the exception of the subjective refinement of sphere/ binocular balance/ near add room. I admit I'm not sure how much of the timekeeping responsibility lies with the examiner (if any), but one of the other candidates on my circuit completely missed out binocular balance without – apparently - any time warning from this examiner. Although I did not miss out an entire station I feel I could definitely have benefited from more/ better instruction in that one room.
- Yes, apart from the first room. The first room that I started with, included 3 stations as (1) sphere adjustment (2) binuclear (3) near add. I was not aware that the examiner would not inform me after 5 min and also would let me carry on adjusting the sphere. As a result, I did not get a chance to do anything with binuclear station. This (joining the sphere and binuclear together without any warning) was not mentioned in the instruction booklet, provided by Royal College.

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

Yes 8/10
No 2/10

Comments

- For most stations yes, but once again, the visual acuity and near chart reading station had a too little time, which does not allow me to express what I know
- Overall the OSCE at Glasgow was excellent. One thing that did throw me was all the visual acuity charts being the European decimal or American format (which is fine but it did mean visions were no longer automatic as I was more used to the Snellen and LogMAR). Additionally instead of being given a chart you had to operate the letters with a remote control, which was different and also took time. Most of the examiners were so friendly and helpful at the exam this wasn't a big problem, however in the subjective refinement of sphere and binocular balance station with an unreliable patient, strange remote control and a chart I wasn't used to, it was definitely a challenge! I eventually asked the examiner of that station if she could kindly operate the remote control for me (ie press the buttons) – she pulled a face and did it grudgingly.
- The time allocated for change, preparation and actual examination does not account for using new equipment that one is unfamiliar with and communicating and directing elderly patients. These factors all add unnecessary pressure in the OSCE which contributes to an unfair assessment.

- Yes, apart from the first room (the first 2 stations). Over all, it was a fair exam and thank you very much for doing so.
- Yes for ret; I felt that my performance in subjective stations was hampered by patients' inconsistent/vague responses, which resulted in time delay and confusion.

Exam Preparation

Who helped you to develop competence in refraction? (Please tick the answer as appropriate)

☐	Optometrist	7/10
☐	Consultant ophthalmologist	4/10
☐	Fellow trainee	7/10
☐	Self-taught	3/10
☐	Other (please list) Course	1/10

Question 2
Approximately how many complete refractions (retinoscopy + subjective modification) did you carry out in your preparation for the examination?

- 30
- 35
- 80-90
- Difficult to say
- 50
- Over 80
- 7th person, did not put down anything down
- I have done about 400 refractions for my post graduate training in refraction module in Sri Lanka.That was in 2010.
- 50
- 60

Question 3
Please provide any other advice that you would like to share with future candidates.

- Time can be quite limited for some stations, especially if the patients have difficulty following instructions. Hence you should try to rush through each station in case you encounter such unexpected difficulties.
- Learn the European decimal and American visual acuity charts as well as the usual Snellen Chart and LogMAR so its all automatic and you do not need to refer to a conversion chart – which was provided but in the exam situation of 5 mintues per station you really do not have the time!
- Preparation is key
- Provide snellen vision charts because it is very easier for the exam setup.
- Prepare for American notation….?!

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

- Projector remotes were not standardized. For some stations, examiners operated the remotes but had difficulty, which took up some of the allotted time. For other stations, candidates had to become familiar with different types of remotes in a short period of time.
- I personally feel that the examination be better conducted if the stations followed on from each other as opposed to being mixed up – eg Cyl not following sphere refinement.
  1) Cyclo ret (2 eyes) x 2
  2) Non cyclo ret (2 eyes) x 1
  3) Best sphere, Cyl refinement and Binocular balance (2 eyes) x1
  4) Near add (2 eyes) x1
  5) Focimeter station x1

  This follows the order in which you would actually refract a patient in clinical practice. I'm not sure what the need is to practice lens neutralization by hand as this is not used in clinic practice by optometrists.
- Vision charts are not satisfactory.The computer driven vision charts are not good for a exam setup because it takes time to get the chart one by one and the patient also gets confused.Other thing is that there is no any uniformity of the vision charts in different OSCE stations.One I got for cylinder refinement was too complicated and I was expected to convert the reading to snellen's by looking at another complicated conversion table.If snellens charts are given for the exam setup it would be better in a very limited time period. Trial lenses given were not upto the standard some were with out handles even and in trial frames very difficult to hold the lenses.Not the Occulus ones?