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FROM THE EXAMINATIONS DEPARTMENT

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Final Report
March 2012 Refraction Certificate Examination

Contents:

Introduction

The seventh Refraction Certificate examination in this format was held in the Vision Sciences Department, Aston University, Birmingham on 26 and 27 March 2012. 54 candidates presented themselves for the examination. The examination consisted of an 8 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

Eight OSCE stations are selected from a possible 16. Four stations are compulsory (they will appear in every examination). Four stations are selected from the remaining twelve.

Compulsory stations:

1. Cycloplegic Retinoscopy
2. Non Cycloplegic Retinoscopy
3. Subjective Refraction Sphere
4. Subjective Refraction Cylinder

Remaining stations

5. Binocular Balance
6. A second Cycloplegic Retinoscopy
7. Focimetry
8. Lens Neutralisation
9. Muscle Balance with Maddox Rod
10. Muscle Balance with Prism Cover Test
11. Near Addition
12. A second non Cycloplegic Retinoscopy
13. Refraction of a Model Eye
14. Trial Frame Fitting and Interpupillary Distance (IPD) Measurement
15. Visual Acuity and Refraction Estimation
16. Visual Acuity Testing of a Child

The stations used in the March 2012 examination were:

1. **Cycloplegic retinoscopy**
2. **Non-cycloplegic retinoscopy**
3. **Non-cycloplegic retinoscopy**
4. **Lens neutralisation**
5. **Subjective refraction-cylinder**
6. **Trial Frame and IPD measurement**
7. **Subjective refraction-sphere**
8. **Near addition**

Standard setting
Candidates must be able to accurately assess visual acuity, measure refractive error and recommend an appropriate spectacle correction to pass the Refraction Certificate. The pass mark is identified using the borderline candidate method. In addition the pass mark using the Hofstee method is calculated as a comparison, but not used to decide identify the successful candidates.

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.

Results (Table 1)

Maximum possible mark	100
Mean candidate mark	71
Median candidate mark	74
Standard deviation	13
Highest candidate mark	96
Lowest candidate mark	41
Range of marks	55
Reliability	0.6
Standard error of measurement (SEM)	8.6
BCM pass mark	65
Hofstee pass mark	72
Pass mark used (BCM + 1 SEM)	73
Pass rate	29/54 (54%)

Distribution of marks (Table 2)

Score	Distribution	Total
41-45	///	3
46-50	/	1
51-55	////	4
56-60	////	4
61-65	/////	5
66-70	/////	5
71-75	///// ////	9
76-80	///// //	7
81-85	///// ///// /	11
86-90	///	3
91-95	/	1
96-100	/	1
Total		54

Statistics for each station (Table 3)

	Station							
	1	2	3	4	5	6	7	8
	Cyclo Ret	**Non Cyclo**	**Non Cyclo Ret**	**Lens Neutralisation:**	**Sub Cyl:**	**Trial Frame & IPD:**	**Sub Sphere:**	**Near Add:**
Mean	11	10	10	6	11	4	13	7
Mean %	70	67	64	59	73	85	84	73
Median	11	11	10	6	12	5	13	8
Median %	73	70	67	60	80	100	87	80
sd	4	4	4	3	4	1	3	2
Min	1	1	1	0	3	1	5	1
Max	15	15	15	10	15	5	15	10
Total	15	15	15	10	15	5	15	10

Correlation between stations (Table 4)

		2	3	4	5	6	7	8
		Non Cyclo Ret	Non Cyclo Ret	Lens Neutralisation	Sub Cyl	Trial Frame & IPD	Sub Sphere	Near Add
1	Cyclo Ret	0.35	0.51	0.23	0.16	-0.03	0.14	0.10
2	Non Cyclo Ret		0.52	0.08	-0.03	-0.06	-0.05	0.09
3	Non Cyclo Ret			0.16	0.15	-0.04	0.02	0.17
4	Lens Neutralisation				0.14	-0.03	0.04	0.26
5	Sub Cyl					0.22	0.04	-0.11
6	Trial Frame & IPD						-0.05	-0.14
7	Sub Sphere							0.10

Comment

Unsurprisingly there is good correlation between the retinoscopy stations. Performance in the trial frame and IPD station had a negative correlation with all stations apart from the subjective refinement of the cylinder station, which is to be expected, as candidate performance in this station was very good. The two subjective refraction stations had poor correlation. Candidate performance was marginally lower in the cylinder station. The lens neutralisation station was the most difficult.

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 5)

Pass or fail on marks for each station

	Station	33% item discrimination	Item facility
1.	Cycloplegic retinoscopy	0.306	0.72
2.	Non-cycloplegic retinoscopy	0.278	0.7
3.	Non-cycloplegic retinoscopy	0.361	0.61
4.	Lens neutralisation	0.083	0.37
5.	Subjective refraction-cylinder	0.111	0.72
6.	Trial Frame and IPD measurement	0	0.93
7.	Subjective refraction-sphere	0.028	0.81
8.	Near addition	0.167	0.69

Standard setting and global judgments for each station (Table 6)

	Station (number of candidates)							
	1	2	3	4	5	6	7	8
	Cyclo Ret	Non Cyclo	Non Cyclo Ret	Lens Neutralisation:	Sub Cyl	Trial Frame & IPD	Sub Sphere:	Near Add
Pass	29	28	18	9	31	39	40	25
Borderline	16	15	18	19	13	10	11	17
Fail	9	11	18	26	10	5	3	12
% Pass	54	52	33	17	57	72	74	46
BCM mark*	9	7	9	8	10	3	12	7

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

Breakdown of results by training (Table 7)

	Failed	Passed	Total
In OST	11	20	31
Not in OST	13	10	23
Total	24	30	54

These differences are not statistically significant (p = 0.21)

Breakdown of results by deanery (Table 8)

Deanery	**Failed**	**Passed**	**Total**
East Midlands	0	2	2
East of England	1	3	4
East of Scotland	0	2	2
London	3	6	9
Mersey	1	0	1
North West	0	2	2
Northern	0	0	0
Northern Ireland	1	0	1
Oxford	0	0	0
Peninsula	1	0	1
South Yorks South Humber	0	0	0
Severn	2	0	2
Wales	0	1	1
West Scotland	0	0	0
Wessex	1	1	2
West Midlands	1	2	3
Yorkshire	0	1	1
Total	11	20	31

Breakdown of results by stage of training (Table 9)

Stage (includes FTSTA)	Failed	Passed	Total
ST1	0	2	2
ST2	3	14	17
ST3	6	3	9
ST4	1	0	1
Total*	10	19	29

* Stage of training unknown for 2 candidates

Breakdown of results by gender (Table 10)

	Failed	Passed	Total
Female	11	14	25
Male	13	16	29
Total	24	30	54

These differences are not statistically significant (p = 0.82)

Breakdown of results by country of qualification (Table 11)

	Failed	Passed	Total
UK	9	17	26
Outside UK	15	13	28
Total	24	30	54

These differences are not statistically significant (p = 0.26)

Breakdown of results by stated ethnicity (Table 12)

	Failed	Passed	Total
Asian/black	10	10	20
Other	7	8	15
White	3	8	11
Unknown	4	4	8
Total	24	30	54

These differences are not statistically significant for white/non white candidates (p = 0.30)

Breakdown of results by stated ethnicity for candidates in OST (Table 13)

	Failed	Passed	Total
White	3	7	10
Non-white	7	11	18
Total*	10	18	28

* Ethnicity unknown for 3 candidates

These differences are not statistically significant for white/non white candidates (p =0.70)

Breakdown of results by number of previous attempts (Table 14)

Attempts	Failed	Passed	Total
1 (First)	12	18	30
2	7	8	15
3	3	4	7
4	1	0	1
5	0	0	0
6	1	0	1
Any resit	24	30	54

Breakdown of results by OSCE team (Table 15)

	Failed	**Passed**	**Total**
Team 1	14	13	27
Team 2	10	17	27
	24	30	54

These differences are not statistically significant (p = 0.41)

Breakdown of results by day of examination (Table 16)

	Failed	**Passed**	**Total**
Monday	14	17	31
Tuesday	10	13	23
	24	30	54

These differences are not statistically significant (p = 1)

Comparison to previous examinations (Table 17)

	March 2010	July 2010	Nov 2011	April 2011	July 2011	Nov 2011	March 2012
Candidates	43	47	53	57	41	69	54
Pass mark	69%	75%	74%	71%	67%	65%	73%
Pass rate	47%	53%	42%	35%	66%	71%	54%
Pass rate in OST	58%	60%	44%	47%	72%	75%	66%
% Candidates in OST	67%	70%	68%	63%	71%	70%	57%
Reliability	0.58	0.6	0.6	0.6	0.42	0.6	0.6
SEM	9	8	7	6	6	8	8
Hofstee pass mark	68%	72%	71%	67%	71%	68%	72%

Performance of candidate by deanery for all examinations to date, where deanery is known (Table 18)

Deanery	**Total candidates**	**Total passes**	**Pass rate**
East of Scotland	5	5	100
North West	2	2	100
Oxford	1	1	100
Wales	5	5	100
East Midlands	13	10	77
Mersey	10	7	70
London	53	37	70
SE Scotland	6	4	67
Yorkshire (all localities)	25	13	65
East of England	15	9	60
Northern	10	6	60
West Midlands	22	12	55
Northern Ireland	4	2	50
Wessex	6	3	50
West Scotland	4	2	50
North West	17	7	41
Peninsula	11	4	36
Severn	4	1	25
TOTAL	213	130	61

Summary

The pass rate in the March examination is the lowest of the last 3 examinations. The reliability is still unacceptable at 0.6. This should improve when the examination changes to a 12 station OSCE. The Hofstee pass mark was very similar to the BCM + 1 SEM pass mark.

The retinoscopy stations have the highest discrimination value. This is encouraging as competence in these refraction skills is essential for paediatric ophthalmology. The lens neutralisation station remains the most difficult and is referred to in the candidate evaluation.

The change to an OSCE from the former long case examination appears to have been accepted by both candidates and examiners.

Michael Nelson BSc (Hons) FRCOphth MAEd
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June 2012

Appendix 1 Hofstee method for standard setting

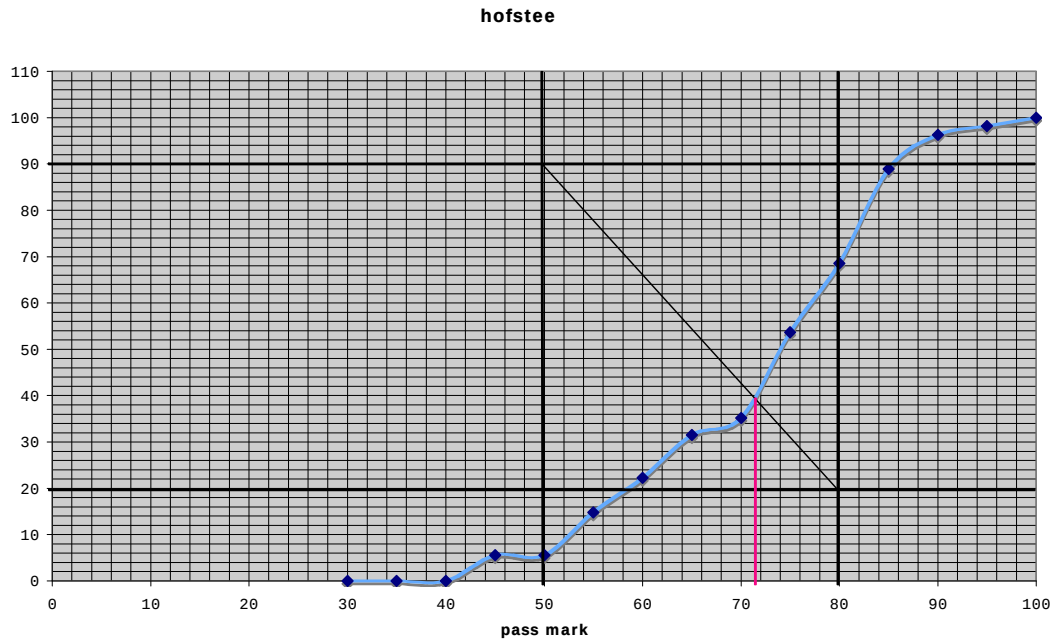
Hofstee method

In advance of the examination, members of the College's Examinations Committee were asked to nominate the values for the following:

5. The maximum credible pass mark for the examination (80%)
6. The maximum credible pass rate for the examination (75%)
7. The minimum credible pass mark for the examination (50%)
8. 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 72%, which is identical to the BCM + 1 SEM pass mark.



Appendix 2: Candidate evaluation

OSCE stations

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

Yes 93%
No 7%

Comments

- I was treated courteously in the first two rooms. And I was (ordered) to put lenses back with lack of courtesy in the fourth room after the near addition station.
- Generally was well treated, although one examiner was roughly commenting and said '' you need to tidy up your lenses, who do you expect is tiding up for you!''
- All very pleasant and helpful.
- Most treated me in a very courteous manner, however one examiner informed the exam co-coordinator that we were ready to start the subjective refinement of the sphere when it was clear that I was not ready to start. I subsequently ran out of time in this station.

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

Yes 100%
No 0

Comments

- Most of them were except for the near addition patient who was a 67-year-old lady who seemed irritated during the examination. She kept complaining how there was a reflection and how she couldn't see while I was trying to place her lenses in the trial frame! When I asked for the reading light, she wasn't satisfied at all. She was not cooperative which resulted in me testing one eye only!
- Retinoscope provided was too dull
- One patient chosen for the non-cycloplegic retinoscopy was rather challenging with very small pupil and cataract.
- Most of the patients were appropriate, however in the station on subjective refinement of the cylinder, the prescription given was very similar to the end prescription meaning not much refinement was needed.

The OSCE overall

Was the OSCE well organized?

Yes 93%
No 7%

Comments

- "Rooms" – cabins were a bit small
- There were a few times when the Snellen chart was not displayed properly and the examiner did not know how to fix it. Nobody else was available to fix it. I started my sphere refining station a minute late because we the Snellen chart was not up.

Were you given clear instructions about the OSCE?

Yes 93%
No 7%

Comments

- I was instructed in the instructions sent to me by mail to fog young patients in the subjective refraction stations, but the examiners objected to me doing so. There should have been clear instructions regarding fogging in these stations for the examiners, or otherwise it should be removed from the written instructions, which the college sends to us.
- My station "Refining the sphere": The axis was changed by almost 90deg, which I think is not realistic and can be tight in 5min.

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

Yes 70%
No 30%

Comments

- Most of the stations were fair except for the lens neutralization, which has become extinct! It was completely unfair to put a prism in the lenses and expect us to neutralize both left and right lenses in 5 minutes.
- It would be nice to have the same lens set in each station – the coloured lenses were red for negative power and black for positive – this was very confusing for me as the ones that I have trained on are the opposite (red for positive, black for negative). There was a set with silver lenses – this is a better option as there is no 'colour confusion' to contend with in a stressful situation.
- However, no stations on Maddox rod or Prism cover test was included – so did not seem to cover all bases.
- It does not assess knowledge, just being fast to communicate and perform.
- I consider myself competent in refraction, and I did practice considerably in preparation. I do not think the format of the examination reflect what is required in real practice of refraction. The 5 minute limit while is more than enough for some stations its hugely tight for others and the pressure from this results in mistakes such as writing down the results for one eye in the opposite eye box, which effectively makes you score zero for that station.

- Lens neutralization by loose lenses is an obsolete technique in view of focimeters. 5 minutes is inadequate to do both lenses.
- I feel that eight 5-minute stations asking you to assess various aspects of refraction would not be as accurate as an actual complete refraction of a patient, as may be done in clinical practice. Also, with only 8 stations I feel that one error (especially given the time pressure) could have a great bearing on the overall outcome.
- I do not believe that the exam accurately reflects my skills and knowledge; I believe that the five minutes given in each station are not adequate time to properly perform refraction. Under normal circumstances you would have more time, which allows you to ensure your findings. Even if you can perform refraction in less than 5 minutes you would still have more time to double check your findings. Doing refraction in 5 minutes puts you under unnecessary stress, which makes you lose your confidence and reduce as well the accuracy of the results.

Exam Preparation

Who helped you to develop competence in refraction?

Optometrist	14
Consultant ophthalmologist	4
Fellow trainee	6
Self-taught	8
Other (please list	3

- Refraction course Cardiff
- London Refraction Course – run by fellow Ophthalmology trainees was very useful
- RCOphth eye site course

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

<50: 5
<100: 5
>100: 3

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

- Practice, practice, practice as much retinoscopy as possible in people of all ages and pupil sizes.
- Cover all possible stations – theory and acquire practical experience
- Complete all 12 e-learning for healthcare modules in the Refraction section from Eye-site with web access links to the website via the RCOphth – www.e-lfh.org.uk
- Occlude in the subjective refraction stations; do not fog as examiners object to what you are doing, especially if you are using a quick sweep of a retinoscope to check.
- You really don't need to take any equipment to the exam other than a ruler for IPD measurement; everything is there.
- The exam is very stressful and time-tight; do not attempt to do anything but quick productive steps.
- Although you need to work hard and learn how to do refraction, yet do not be disappointed if you failed the exam since the pressure of strict timing is immense.
- Go to refraction course
- Practice is the key, refract many patients
- Supervised refraction by a consultant/optometrist is vital
- Check on line videos for refraction
- Practice hand lens neutralization and be able to do it within 5 mins
- The main thing is to practice a lot.
- Eye site online course on college website is really good. Practice retinoscopy on different subjects. Time is one of the important factors to be considered while practicing.

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

- No more lens neutralization please!
- Exam was fair but still feel – having to read the questions to two stations in advance can be sometimes confusing when under pressure and time constraints.
- Hand neutralization: I don't see the benefit of doing both sides in 5 minutes. It is good to know about it, but this skill is almost never used in practice. Even Optometrists do not use this.
- Having to neutralize 2 lenses in 5 minutes is too much time pressure. Other than that requirements for the time were reasonable
- In my recent exam one of the stations for refraction, while examining patient's left eye, the trial lens case was kept on patient's right hand side away from my reach. I was informed that it couldn't be moved nearer or to left side of patient. It was inconvenient to hold retinoscope with left hand and if I needed to change the lenses, I had to stand up, walk and get the new lenses, come back and perform retinoscopy.
- I would suggest that the College considers performing the refraction exam using the Phoropter as an option.