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FROM THE EXAMINATIONS DEPARTMENT

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Final Report
March 2010 Refraction Certificate Examination

Contents:

Introduction
The first Refraction Certificate examination in the new format was held in Birmingham on 29 and 30 March 2010. 43 candidates presented themselves for the examination. The examination consisted of an eight 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 2010 examination were:

1. **Cycloplegic Retinoscopy**
2. **Lens neutralisation**
3. **Non Cycloplegic Retinoscopy**
4. **Near addition**
5. **Subjective Refraction Cylinder**
6. **Muscle balance (Maddox rod)**
7. **Subjective Refraction Sphere**
8. **Visual acuity in a child**

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
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.

Results

Maximum possible mark	100
Mean candidate mark	68.6
Median candidate mark	67
Standard deviation	11.4
Highest candidate mark	86
Lowest candidate mark	46
Range of marks	40
Reliability	0.58
Standard error of measurement (SEM)	9
BCM pass mark	60
Hofstee pass mark	68
Pass mark used (BCM + 1 SEM)	69
Pass rate	20/43 (47%)

Distribution of marks

<46		0
46-50	\\	2
51-55	\\\\\	5
56-60	\\\\\	5
61-65	\\\\\ \\\\	9
66-70	\\\	3
71-75	\\\\\	5
76-80	\\\	3
81-85	\\\\\ \\\\	9
86-90	\\	2
>90		0

The marks show a bimodal distribution (61-65 and 81-85).

Statistics for each station

	Station							
	1	2	3	4	5	6	7	8
Max mark	15	10	15	10	15	15	15	5
Mean	11.5	6.0	10.2	6.0	9.0	10.6	11.1	4.2
Mean%	76.6	59.8	68.2	59.5	60.2	70.7	74.1	84.7
Median	12.0	7.0	11.0	7.0	10.0	11.0	12.0	5.0
Med%	80.0	70.0	73.3	70.0	66.7	73.3	80.0	100.0
SD	3.1	2.7	3.4	2.9	3.0	3.4	4.1	1.2
Max	15.0	10.0	15.0	10.0	13.0	15.0	15.0	5.0
Min	3.0	0.0	0.0	0.0	3.0	2.0	2.0	0.0
Range	12.0	10.0	15.0	10.0	10.0	13.0	13.0	5.0

Correlation between stations

		1	2	3	4	5	6	7
		Ret	Lens	Ret	Add	Sub	Maddox	Sub
2	Lens	0.06						
3	Ret	0.29	0.05					
4	Add	-0.05	0.38	0.20				
5	Subj	-0.04	0.34	0.22	0.33			
6	Mad	-0.23	0.27	0.01	0.29	0.13		
7	Subj	-0.08	0.22	-0.18	0.20	0.08	0.01	
8	VA	-0.25	0.43	0.17	0.20	0.33	0.26	0.21

Best correlation between lens neutralisation and VA in child (0.43)
Poorest correlation between cycloplegic refraction and VA in child (-0.25)
Modest correlation between retinoscopy stations 0.29
Poor correlation between subjective modification stations 0.08
Reasonable correlation between:

- Lens neutralisation and near add (0.38)
- Lens neutralisation and subjective cylinder (0.34)
- Near add and subjective cylinder (0.33)
- VA in child and subjective sphere (0.33)

Poor correlation between cycloplegic retinoscopy and all stations apart from non-cycloplegic retinoscopy

Breakdown of Results

Breakdown of results by training

	Failed	Passed	Total
In OST	12 (41%)	17 (59%)	29 (67%)
Not in OST	11 (79%)	3 (21%)	14 (33%)
Total	23 (53%)	20 (47%)	43

These differences are statistically significant (p = 0.022)

Breakdown of results by gender

	Failed	Passed	Total
Female	13 (62%)	8 (38%)	21 (%)
Male	10 (45%)	12 (56%)	22 (%)
Total	23 (53%)	20 (47%)	43

These differences are not statistically significant (p = 0.28)

Breakdown of results by country of qualification

	Failed	Passed	Total
UK	9 (38%)	15 (62%)	24 (56%)
Outside UK	14 (74%)	5 (26%)	19 (44%)
Total	23 (53%)	20 (47%)	43

These differences are statistically significant (p = 0.018)

Breakdown of results by number of previous attempts

Attempts	Failed	Passed	Total
1 (First)	16 (62%)	10 (38%)	26 (60%)
2	5 (45%)	6 (55%)	11
3	1 (25%)	3 (75%)	4
4	1 (50%)	1 (50%)	2
Any resit	7 (41%)	10 (59%)	17 (40%)

Feedback

Feedback was sought from candidates by the Senior Examiner at the end of each rotation and from examiners at the end of the examination.

Candidate feedback

The exam was generally well received. Some of the candidates had sat the previous format and some were new to the process. Of the former group - the overwhelming feeling was that this was better. One candidate expressed the opinion that despite failing the former format, it was better. However even that candidate could see the logic of proceeding to the current format.

Individual comments:

- Well run - Enough time to familiarise with the room.
- Better this way but time pressure
- Not enough time for fitting trial frame - difficult to move from one set to another
- 10 minutes per OSCE would be better (rather than 5 minutes) - maybe 8 minutes
- Difficulty checking lenses: difficulty checking prism (full aperture lenses)
- Notes on the website - are slightly off
- Lens neutralisation difficult - would be better in one eye
- Would appreciate publishing mark scheme
- Useful to use a trial frame for lens neutralisation
- A minute's notice would have been very much helpful for each OSCE
- Use of a bell?
- Difficulty in that there was no distance spot for the Maddox rod
- Concerns about the multitude of tasks for lens neutralisation (without focimeter) including the reading add
- Use of a prism bar or loose prisms (not the lens prisms) for the Maddox and lens neutralisation
- Hand lens neutralisation - bit tough to do all parts including bifocal add
- Timing again mentioned
- One candidate suggested not pairing up OSCE stations
- Published mark sheets would be helpful
- A warning of one minute to go - write down in 30 second
- Clear advice that the examiner will change Snellen charts. Also advice to ignore the fact the chart is at third of a meter - which on subjective will alter the power by 1/3
- Need to practice for the time
- Question about the PCT - primary position only and near - type of prisms
- A suggestion was made that there was a big clock in each room
- A desk lamp for darkened room would be helpful.

Examiner feedback

Pretty good: feel this should be like a driving test - and if they meet quality - as long as you would be happy for them to be refracting in the clinic - it's a promise that this candidate would do a refraction clinic and be accurate. If that was suggested there should be no problem with 100% pass.

There was a discussion about the possibility of what constituted a "must fail" situation (or a red flag). There was general agreement that an accurate cycloplegic refraction was imperative and that if this was poorly performed this might constitute a must fail. There was some debate about the other compulsory stations, and of these, it was felt that non-cyclo ret had the weakest case, but that subjective sphere and cyl should be performed well. As to the error that could be tolerated - it was felt that a limit of approximately 1.50D would be about right.

Eye movement and biometry might form part of the exam.

General impression was not to publish the marking guide.

It is difficult to be specific about the marks for cyl power when axis is very incorrect. Lens neutralisation of both lenses for power, cyl, add and prism is difficult in time allowed - might be better to ask them to do just one lens.

Summary

Given that this was the first sitting of the new format RCert examination, the feedback and utility are very encouraging. Several suggestions have emerged from the candidate and examiner feedback.

The pass rate was acceptable for a new examination, which does not appear to have disadvantaged candidates who had experience of the previous examination style.

Candidates who are in OST and those who qualified in the UK were more likely to pass the examination.

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