The Royal College of Ophthalmologists
17 Cornwall Terrace, London. NW1 4QW.
Telephone: 020-7935 0702, Extension 210
Facsimile: 020-7487 4674
Email: Emily.Beet@rcophth.ac.uk
Website: WWW.RCOPHTH.AC.UK

FROM THE EXAMINATIONS DEPARTMENT

PATRON HRH THE DUKE OF YORK, KCVO, ADC

Final Report
December 2012 Refraction Certificate Examination

Contents:

1. Introduction

The ninth Refraction Certificate examination in the OSCE format was held in London on 17th and 18th December 2012. 71 one candidates presented themselves for the examination. The examination consisted of an updated, 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. The stations for the December 2012 examination were:

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

2. 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 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.

3. Results (Table 1)

Number of candidates	71
Maximum possible mark	180
Mean candidate mark	133 (74%)
Median candidate mark	133 (74%)
Standard deviation	17.8 (9.9%)
Highest candidate mark	164 (91%)
Lowest candidate mark	92 (51%)
Range of marks	72
Reliability	0.6
Standard error of measurement (SEM)	11
BCM pass mark	113 (63%)
Hofstee pass mark	130 (72%)
Pass mark used (BCM + 1 SEM)	124 (69%)
Pass rate	53/71 (75%)
Pass rate in OST	30/39 (77%)

Distribution of marks (Table 2)

Score	Distribution	Total
91-95	*I*	1
96-100	*IIII*	4
101-105	*I*	1
106-110	*II*	2
111-115	*IIIII*	5
116-120	*I*	1
121-125	*IIII I III*	8
126-130	*IIIII IIII*	9
131-135	*IIIII IIII*	9
136-140	*IIIII*	5
141-145	*IIIII III*	8
146-150	*III*	3
151-155	*IIII*	4
156-160	*IIIII IIIII*	10
161-165	*I*	1
166-170		0
Total		71

Statistics for each station (Table 3)

		Mean	*Mean %*	Median	*Median %*	Standard deviation	Maximum	Minimum
1	CR1	11.7	*78.0*	13.0	*86.7*	3.2	15	4
2	CR2	12.0	*80.0*	14.0	*93.3*	3.4	15	2
3	SRC	10.1	*67.3*	12.0	*80.0*	4.4	15	0
4	CR3	11.5	*76.7*	13.0	*86.7*	3.5	15	1
5	CR4	11.9	*79.3*	14.0	*93.3*	3.6	15	1
6	LN	9.6	*64.0*	10.0	*66.7*	3.9	15	2
7	NCR1	11.3	*75.3*	11.0	*73.3*	3.4	15	3
8	NCR2	10.6	*70.7*	11.0	*73.3*	4.1	15	0
9	VA	13.0	*86.7*	14.0	*93.3*	2.0	15	4
10	SRS	9.9	*66.0*	10.0	*66.7*	3.0	14	2
11	BB	9.5	*63.3*	10.0	*66.7*	3.6	14	1
12	NA	11.8	*78.7*	13.0	*86.7*	2.5	15	4

Correlation between stations (Table 4)

	CR	SRC	CR	CR	LN	NCR	NCR	VA	SRS	BB	NA
CR1	0.53	0.19	0.25	0.16	0.01	0.21	-0.04	-0.08	0.14	0.25	0.22
CR2		0.17	0.29	0.20	0.00	0.07	-0.02	-0.18	0.00	0.07	-0.01
SRC			0.25	0.26	-0.03	0.13	0.13	-0.17	0.03	0.08	0.23
CR3				0.44	0.11	0.13	0.13	-0.17	0.03	0.05	0.14
CR4					0.12	0.02	-0.09	-0.11	-0.04	0.07	0.13
LN						-0.03	0.14	0.00	-0.02	-0.11	0.07
NCR1							0.61	-0.14	0.16	0.18	-0.01
NCR2								0.08	0.10	0.15	0.16
VA									0.13	0.19	0.33
SRS										0.78	0.31
BB											0.42

Median correlation between the cycloplegic refraction stations = 0.25
Correlation between non-cycloplegic refraction stations = 0.61
Best correlation between subjective refraction (sphere) and binocular balance
Worst correlation between visual acuity and almost all of the other stations

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 (CR)	0.47	0.78
2.	Cycloplegic Retinoscopy (CR)	0.26	0.80
3.	Subjective Refraction Cylinder (SRC)	0.21	0.67
4.	Cycloplegic Retinoscopy (CR)	0.43	0.76
5.	Cycloplegic Retinoscopy (CR)	0.26	0.79
6.	Lens Neutralisation (LN)	0.17	0.64
7.	Non Cycloplegic Retinoscopy (NCR)	0.30	0.75
8.	Non Cycloplegic Retinoscopy (NCR)	0.38	0.70
9.	Visual acuity and IPD measurement (VA)	-0.04	0.86
10	Subjective Refraction Sphere (SRS)	0.38	0.66
11	Binocular balance (BB)	0.51	0.63
12	Near Addition (NA)	0.21	0.78

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

		Pass	Borderline	Fail	% Pass	BCM mark*	%
1	CR	38	23	10	54	10	67
2	CR	43	18	10	61	9	60
3	SRC	35	15	21	49	8	53
4	CR	38	22	11	54	9	60
5	CR	40	16	15	56	10.5	70
6	LN	30	18	23	42	10	67
7	NCR	37	20	14	52	9	60
8	NCR	32	22	17	45	9	60
9	VA	61	9	1	86	11	73
10	SRS	37	19	15	52	9	60
11	BB	38	10	23	54	9	60
12	NA	53	12	6	75	9.5	63

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

4. Breakdown of results

Breakdown of results by training (Table 7)

	Failed	Passed	Total
In OST	9	30	39
Not in OST	9	23	32
Total	18	53	71

These differences are not statistically significant (p = 0.63)

Breakdown of results by deanery (Table 8)

Deanery	**Failed**	**Passed**	**Total**
East Midlands	0	0	0
East of England	1	1	2
East of Scotland	0	0	0
London & KSS	2	12	14
Mersey	0	2	2
North Scotland	0	2	2
North West	0	1	1
Northern	1	2	3
Northern Ireland	1	0	1
Oxford	0	1	1
Peninsula	1	1	2
Severn	0	0	0
South Scotland	0	1	1
Wales	2	0	2
Wessex	1	1	2
West Scotland	0	0	0
West Midlands	0	5	5
Yorkshire	0	1	1
Total	9	30	39

Breakdown of results by stage of training (Table 9)

Stage (includes FTSTA)	**Failed**	**Passed**	**Total**
ST1	1	1	2
ST2	2	10	12
ST3	6	17	23
ST4	0	0	0
Total*	9	28	37

**Level at examination unknown for 2 candidates*

Breakdown of results by gender (Table 10)

	Failed	Passed	Total
Female	8	27	35
Male	10	26	36
Total	18	53	71

These differences are not statistically significant (p = 0.63)

Breakdown of results by country of qualification (Table 11)

	Failed	Passed	Total
UK	8	28	36
Outside UK	10	25	35
Total	18	53	71

These differences are not statistically significant (p = 0.54)

Breakdown of results by stated ethnicity (Table 12)

	Failed	**Passed**	**Total**
Non-white	12	36	48
White	5	15	20
Unknown	1	2	3
Total	18	53	71

These differences are not statistically significant for white/non white candidates (p = 1.0)

Breakdown of results by number of previous attempts (Table 13)

Attempts	Failed	Passed	Total
1 (First)	13	41	54
2	3	4	7
3	0	6	6
4	0	1	1
5	2	1	3
Any resit	5	12	17
Total	18	53	71

Comparison to previous examinations (Table 14)

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%

Performance of candidate by deanery for all examinations to date, where deanery is known (Table 15)

Deanery	**Total candidates**	**Total passes**	**Pass rate**
East of Scotland	5	5	100
North Scotland	3	3	100
Oxford	2	2	100
East Midlands	13	10	77
London & KSS	76	56	74
Mersey	14	10	71
South Scotland	7	5	71
Wales	11	7	64
Northern	13	8	62
East of England	18	11	61
West Midlands	28	17	61
North West	19	11	58
Northern Ireland	7	4	57
Yorkshire	28	16	57
Wessex	9	5	56
West Scotland	6	3	50
Severn	7	3	43
Peninsula	15	5	33
TOTAL	281	181	64

Summary

This was the first exam with 12 OSCE stations. The examination attracted the largest number of candidates to date (71), and had the highest pass rate. The pass mark was the lowest of the last three sittings. The pass rate in OST was highest to date (77%)

There was a very wide range of candidate performance. Candidates had most difficulty with the lens neutralisation, binocular balance and subjective refraction (sphere) stations. The measurement of VA and IPD was the easiest station.

There was a reasonable degree of correlation between the cycloplegic refraction stations, and excellent correlation between non-cycloplegic retinoscopy stations. The VA & IPD station had a very poor degree of correlation with all the other stations. There was also an excellent degree of correlation between the binocular balance and subjective refraction (sphere) stations, which are carried out on same patient.

The stations that had the best correlation with a candidate's overall performance were the binocular balance and near add stations. The stations that had the worst correlation with a candidate's overall performance were the lens neutralisation and visual acuity and IPD stations.

The stations that were best able to discriminate between the poor and good candidates were cycloplegic refraction 1, cycloplegic refraction 4, and binocular balance. The worst discriminators were VA & IPD and lens neutralisation stations.

86% of candidates in the VA & IPD station were graded as pass by examiners
42% of candidates in the lens neutralisation station were graded as pass by examiners

Michael Nelson BSc (Hons) FRCOphth MAEd
Education Advisor

March 2013

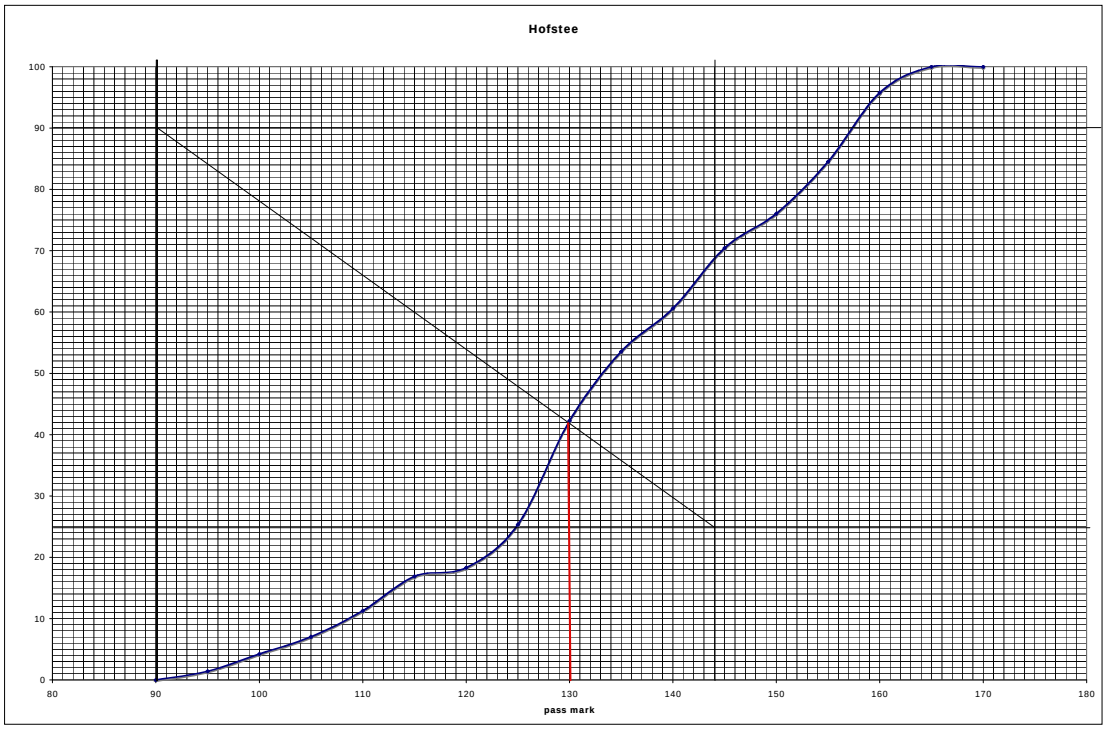
Hofstee method

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 144/180 (80%)
6. The maximum credible pass rate for the examination (75%)
7. The minimum credible pass mark for the examination 90/180 (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 130/180 (72%), which is higher than the BCM + 1 SEM pass mark (but similar to previous examinations)



Appendix 2: Candidate evaluation

OSCE stations

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

Yes 11/11
No 0/11

Comments

- All the examiners are very polite and friendly.
- All the examiners were very polite, clear and explained each station and equipment in detail.
- The examiners and staff were absolutely perfect. They helped us understand each station and provided the means to achieve the best we could.
- All were very helpful and calming in what is a stressful day.
- I thought the examiners were excellent. They created a friendly and positive atmosphere, and responded like human beings. Often in OSCEs, examiners can make the exam unnecessarily difficult by presenting a poker face at each turn. The examiners were very encouraging, and were supportive/helpful with finding kit and helping with lighting/ fixation targets.

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

Yes 9/11
No 2/11

Comments

- They are very cooperative.
- The majority of the patients for retinoscopy stations were young. The near add station also had an appropriately aged patient.
- One young patient was very indecisive with her answers. This would be fine in a normal clinical situation but under a timed situation it was impossible to examine her properly. I therefore did not complete the examination and write my answers down in the available time.
- Overall, yes, but a bit harsh to put in 2 quite tricky patients (one a myope of -10D!) and another myope with an odd red reflex…Quite challenging given 10 minute retinoscope time for both eyes.
- I must say no to this answer however if there were a middle answer I would probably choose that. Reason being was that all patients were young, all patients were myopic, and the patient I had to do the cylinder adjustment was a high myope. Myopes are the hardest to refract and I believe there should have been a mixture of cases to allow for hypermetropes to be examined as well. Young patients as well tend to accommodate more; therefore that makes matters even worse. This is why in an everyday practice, young patients (or children) are dilated, and not examined in a set time limit.
- Perhaps the patient does need to be instructed by the exam team to keep looking in the distance during the non cyclo ret in order to control accommodation. My one kept on looking down frequently at my lens choice despite me telling her to keep looking in the distance.
- All youthful, all myopic. Perhaps some variety?

The OSCE overall

Was the OSCE well organized?

Yes 11/11
No 0/11

Comments

- Actually all examiners and patients are good. Only the different and unfamiliar instruments and Snellen charts gives candidates headache. For those trainees practice outside UK, that is the most challenging and scary part.
- There was plenty of time before each station for the candidates to look at the mark sheet and also 5 min given in the room during which the examiners explained the station and equipment.
- Well run but at times there were delays as retinoscopes and pencils went missing.
- Very good organization, starting and finishing on time.
- Considering first day of the new exam in a new venue it seemed well organized. One particular point to do with the equipment - no ‘O’ on the refinement of cyl and on the same station lenses were fixed on the right side of the patient and asked to refine left eye. Very difficult running back and forth from lens set with the clock very much against you.
- Late getting started due to lack of kit, but once started, very efficient. Sheila and other co-coordinators were excellent in ensuring each candidate knew where they were going.

Were you given clear instructions about the OSCE?

Yes 11/11
No 0/11

Comments

- Instructions on the College website was clear. Mark sheets were helpful to have beforehand. The examiners gave clear instructions before each station started.
- Examiners were very helpful relaxing us as well as giving us all the info we required to perform in this context of the exams.
- Excellent idea to put all answer sheets online. This made it stress free reading through on the day, as we just had to double-check they were in fact what was online.

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

Yes 7/11
No 4/11

Comments

- Although the exam ran smoothly, I felt the time given for each station is very tight and stressful. It’s very hard to gage under exam pressure how long time has past. Although it was helpful to have the “1 minute left” warning.

- During my practice in refraction I have been examining patients thoroughly, performing a whole refraction. I feel the OSCE makes it more difficult to demonstrate competence when only performing sections of the examination. I think it would be better to do complete refractions on patients as you can respond to patient's needs as they arise during the examination.
- As discussed following the exams, the way the exams are setup in stations does not correspond to the actual clinical practice in any way. Even though the GMC sets rules of how trainees need to be scored and sufficiently tested, I fail to understand why examiners would not be able to adequately test each procedure in a normal clinical setting, judging each step individually and thus coming up with a passing mark. An example would be: Each trainee would have to examine 3 patients, given an unaided VA, and the trainee would have to start from retinoscopy, then subjective refraction (including sphere adjustment, cylinder refinement, sphere readjustment, binocular balance). Then the final outcome would be written and the trainee would be allowed to check the glasses prescription of the patient examined. Out of the 3 patients, 2 or one could be dilated, and thus retinoscopy could be performed in both settings. Downside of course would be the fact that the dilated patients would not be able to 'see' as clearly to check the final visual acuity, but pinhole could be used for this occasion. I don't see how the examiners would not be able to adequately, judge and score trainees, enough to keep the GMC happy. I found it hard to focus when I have practiced to do refractions in a clinical setting, knowing that I start off from point A to finish to point B, and I am asked in stations just to do bits here and there. It is much more difficult to practice with optometrists and fellow colleagues in stations when preparing for the exam, and even though we may be capable to refract patients quite easily, I am not sure if the exams can depict that if one station has failed us.
- Performing under time pressure in a new environment for international students can compromise performance of good candidates and erroneously lead to a poor result. I feel the same pattern without a strict time limit would lead to a more fair assessment than the current hurried pattern.
- Time was limited for some OSCEs
- The exam is distant from the actual practice of refraction. Just doing the individual steps in a disjointed (and unrealistic) way feels unnatural, and hard to get any kind of rhythm going. I'm comfortable with my refraction abilities, but not with my ability to demonstrate them during a game of musical chairs. I doubt the examiners would appreciate having been assessed in this way.

Exam Preparation

Who helped you to develop competence in refraction?

- Optometrist 8
  (3 different Optoms, with 6 sessions at high street optom)
  (Went to my local specsavers which had a very helpful optometrist, also optom students)
- Consultant ophthalmologist 3
- Fellow trainee 6 **(other trainees who had done the exam)**
- Self-taught 5 **(watching some videos online first)**
- Other (please list) Course, Eastbourne Course.

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

- 80
- About 60
- Approx 100
- 40-50
- >200!
- About 15 refractions, about 20 retinoscopies
- Ret 100+, Subjective ~50
- More than 1000
- 45
- 50-100
- ~50-80 rets, ~30 complete refractions

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

- Bring your own equipments to avoid unnecessary difficulty during examination.
- Start practicing in clinics even if one or two per day. Gets you used to seeing different types of reflex even if you don't know what the actual refractive error is. Get someone to watch you ret so that they can comment on your position, height, technique, etc, as you can't obverse yourself. Helpful to practice with another candidate as it motivates you and also practice on each other too.
- Practice seeing the retinoscope reflex on dilated children first. Ask optometrist if you can watch them doing the routine. Ask optometrist to watch and make comments on your technique.
- No matter how many refractions you have done, or how competent you are, the real test is the time pressure and ability to write down the correct result and transpose etc.
- I would recommend to candidates to try and practice the stations more rather than do full refractions on patients, as this will allow a better chance to adapt to pass the exams. I don't know if this will make them more capable to refract with higher confidence, but at least it may help them pass the exams.
- Practice in the same format before your exam, especially for international students who may not be familiar with the exam pattern.
- I would advise them to complete this feedback form.
- Get plenty of practice on a variety of patients, and at the beginning and near the end, make sure you ask a strict optom to provide feedback on your technique.

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

- Perhaps longer duration for manual focimetry? Otherwise the division between objective and subjective refraction is a bit stilted and artificial.
- The equipment and Snellen chart are very different from my practice. 5 Minutes orientation may not be enough to predict the difficulties that the candidates may face during examination. For example, in subjective cylinder station, the red/green line on the provided Jackson cross cylinder was too faint after the room turned dim. I couldn't see the colour line on the Jackson cross cylinder properly after the room became too dim. I had no choice except to ask the examiner to help me to turn on and off the light continuously to check the axis and power. I never thought this might happen during 5 minutes orientation. When the examiner informed me the time was over 4 minutes, I

still can't finish the station. If I know this would happen, I will bring my own Jackson cross cylinder. I think this is the reason why those candidates bring their own cylinder lens for examination. The provided Snellen chart didn't have letter "O" so I had to use "H", which is also symmetrically. But I am not familiar to use it. I suggest letting the candidates to orientate/practice themselves at the examination place (may be 1-2 rooms only) with the provided instruments a few days before the examination. This can be very helpful for those trainees from outside UK. Thank you.

- I would like to add that doing binocular balance in a patient that I haven't refracted from the start, takes more time than 5 minutes for 2 different techniques. This becomes more crucial if I am dealing with a young myopic patient. When dealing with this setting, and patient is either not understanding the instructions or is far off due to accommodation, I would have liked to have more time to refine the glasses, double check the final acuity with any reductions on the sphere etc. When I do refractions in practice, it never takes more than 1 minute per eye to do a binocular balance on a patient. But in the setting where I am just given a refraction, which I haven't tested myself, that becomes more difficult. Hence the trouble that a lot of candidates had on that day of the examinations.
- It is somewhat unclear to me why this exam exists at all, as none of the other clinical skills we develop are formally tested in this way. It feels like a waste of money without any real justification (profit?). If it is such a struggle to satisfy the GMC of the objectivity of the exam (which I gather has resulted in this bizarre and frenetic format), why not just scrap it and allow local trainers to assess our competence as they do for cataract surgery? I have wasted £500 many times in my life, but never in such an irritating and tedious fashion.