

Examination Report

December 2014 Refraction Certificate Examination



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1 Introduction

The fourteenth Refraction Certificate examination in the format was held on. 63 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 seventh sitting of the refraction certificate with 12 OSCE stations. The reliability of the examination has improved (Cronbach alpha 0.6) but is still less than desirable and does not meet the expectations of the GMC.

The Hofstee method of standard setting was used to identify the pass mark for this examination, which was 71%.

The pass rate has increased from the last sitting and was at the average level (68%). The pass rate in OST was significantly higher than outside OST. A small number of candidates performed very badly.

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

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Education Adviser

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)

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 80% (minimum fail rate 20%)
3. The minimum credible pass mark for the examination 65%
4. The minimum credible pass rate for the examination 10% (maximum fail rate 90%)

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.

4. Results (table 1)

Number of candidates	63	
Maximum possible mark	180	
Mean candidate mark	132/180	73%
Median candidate mark	136/180	75.5%
Standard deviation	19.3	10.7%
Highest candidate mark	167/180	93%
Lowest candidate mark	93/180	52%
Reliability	0.6	
Standard error of measurement (SEM)	11.6	6.5%
Hofstee pass mark	127/180	71%
Pass rate	43/63	68%
Pass rate in OST	33/43	77%

Distribution of marks (table 2)

Score	Distribution	Total
91-95	//	2
96-100	////	4
101-105	/	1
106-110	////	4
111-115	/////	5
116-120	//	2
121-125	//	2
126-130	////	4
131-135	/////	5
136-140	///// / / / / /	11
141-145	///// / / / /	9

146-150	////	5
151-155	////	5
156-160		0
161-165	//	2
166-170	//	2
Total		

/ Candidate failed / candidate passed

Statistics for each station (table 3)

		Mean	Median	Standard deviation	Minimum	Maximum
1	CR1	12.5	14	3.1	3	15
2	CR2	12.8	14	3.2	3	15
3	SRC	9.9	10	4.2	2	15
4	CR3	12.3	14	3.8	1	15
5	CR4	11.8	14	3.6	0	15
6	LN	9.7	11	3.9	0	15
7	NCR1	9.8	11	4.2	1	15
8	NCR2	10.3	11	4.2	2	15
9	VA	13.3	13	1.4	10	15
10	SRS	10.3	11	3.1	2	15
11	BB	8.4	9	4.1	0	14
12	NA	10.7	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%	14
Subjective	3	25%	10
Other	3	25%	12

Correlation between stations (table 4)

	CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB
CR1											
CR2	0.76										
SRC	0.12	-0.04									
CR3	0.12	0.21	-0.26								
CR4	0.06	0.21	-0.27	0.63							
LN	0.08	0.12	0.11	0.11	0.12						
NCR1	0.11	0.28	-0.148	0.22	0.14	0.12					
NCR2	0.06	0.29	-0.10	0.13	0.05	0.11	0.77				
VA	0.07	0.12	0.24	-0.03	-0.01	0.09	0.02	0.13			
SRS	-0.02	0.12	0.05	0.05	-0.07	0.23	0.14	0.21	0.18		
BB	0.07	0.16	0.10	0.10	-0.05	0.36	0.03	0.23	0.23	0.69	
NA	0.22	0.32	0.04	0.04	-0.09	0.08	0.23	0.27	0.21	0.26	0.20

Median correlation between the cycloplegic refraction stations = 0.21

Correlation between non-cycloplegic refraction stations = 0.77

Best correlation between NCR2 and NCR 1 and CR2 and CR1

Poorest correlation between CR3 and SRC

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

CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB	NA
0.46	0.65	0.07	0.45	0.33	0.48	0.59	0.62	0.31	0.47	0.53	0.49

5. Breakdown of results

Breakdown of results by training (table 8)

	Failed	Passed	Total
In OST	10	33	43
Not in OST	10	10	20
Total	20	43	63

These differences are statistically significant (0.045 Fishers exact)

Breakdown of results by deanery (table 9)

Deanery	Failed	Passed	Total
East Midlands	1	2	3
East of England	0	3	3
East of Scotland	0	0	0
KSS	0	1	1
London	2	5	7
Mersey	0	3	3
North Scotland	0	0	0
North West	0	2	2
Northern	0	1	1
Northern Ireland	0	0	0
Oxford	0	1	1
Peninsula	2	1	3
Severn	1	1	2
South East Scotland	0	2	2
Wales	1	2	3
Wessex	1	2	3
West Midlands	1	2	3
West Scotland	1	4	5
Yorkshire	0	1	1
Total	10	33	43

Breakdown of results by stage of training (table 10)

Stage (includes FTSTA)	Failed	Passed	Total
ST1	0	10	10
ST2	4	8	12
ST3	4	11	15
ST4	0	1	1
Total*	8	30	38

*Level at examination unknown for 5 candidates

Breakdown of results by gender (table 11)

	Failed	Passed	Total
Female	9	16	25
Male	11	27	38
Total	20	43	63

These differences are not statistically significant ($p = 0.59$ Fishers exact)

Breakdown of results by country of qualification (table 12)

	Failed	Passed	Total
UK	7	25	32
Outside UK	11	17	28
Total	18	42	60

Unknown for 3 candidates

These differences are not statistically significant ($p = 0.167$ Fishers exact)

Breakdown of results by first language (table 13)

	Failed	Passed	Total
English	7	27	34
Not English	9	11	20
Total*	16	38	54

*Unknown for 9 candidates

These differences are not statistically significant ($p = 0.072$)

Breakdown of results by stated ethnicity (table 14)

	Failed	Passed	Total
Non-white	14	24	38
White	3	14	17
Total*	17	38	55

*Unknown for 8 candidates

These differences are not statistically significant ($p = 0.212$ Fishers exact)

Breakdown of results by number of previous attempts (table 15)

Attempts	Failed	Passed	Total
1 (First)	16	35	51
2	2	6	8
3	2	2	4
Any resit	4	8	12
Total	20	43	63

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%
Dec 14	63	71%	68%	77%	68%	0.6	12 (6.5%)	71%

Performance of candidate by deanery for all examinations to date, where deanery is known (table 17)

Deanery	Total passes	Total candidates	Pass rate %
KSS	9	10	90
East of Scotland	7	8	88
Oxford	6	7	86
North Scotland	5	6	83
Mersey	22	28	79
South Scotland	11	14	79
London	86	118	73
Northern	13	18	72
East of England	22	32	69
North West	18	26	69
Yorkshire	29	42	69
West Midlands	30	44	68
East Midlands	18	27	67
Northern Ireland	8	12	67
Wessex	12	18	67
West Scotland	13	21	62
Severn	11	18	61
Wales	14	23	61
Peninsula	8	25	32
Total	342	497	69

Appendix 1 Hofstee method for standard setting

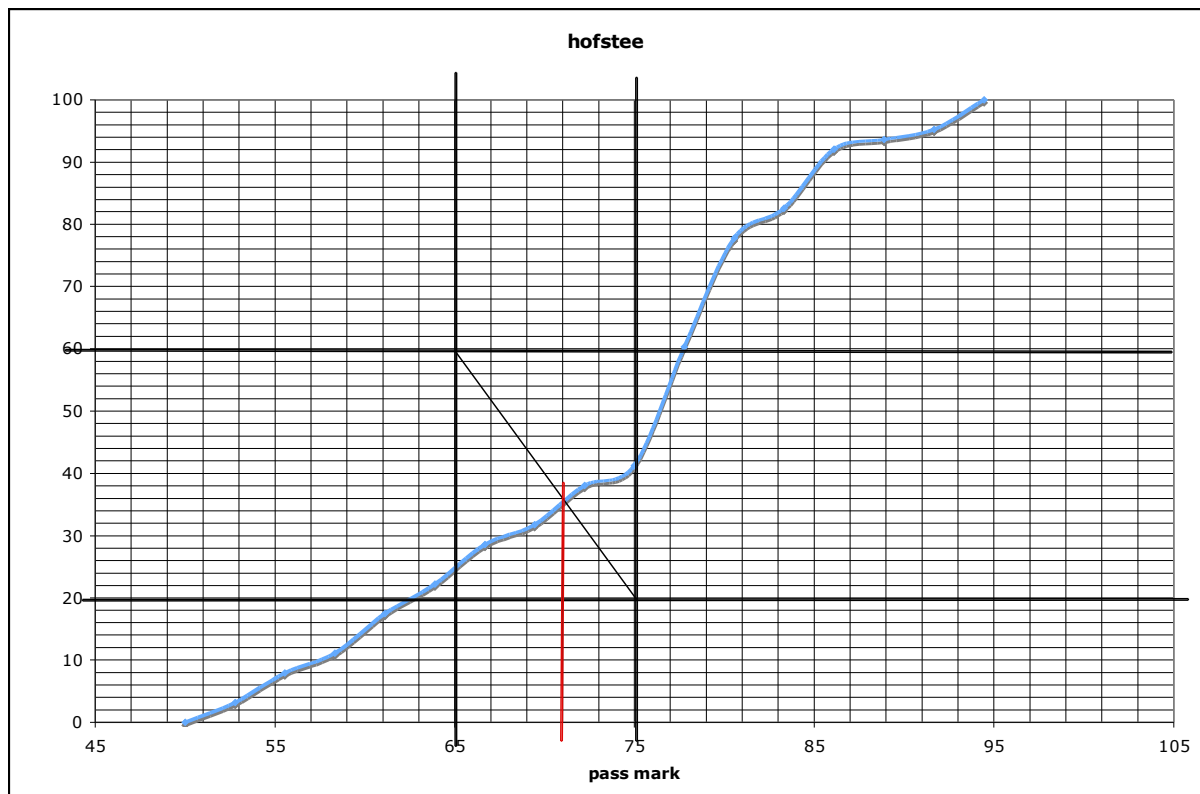
Hofstee method

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 135/180 (75%)
2. The maximum credible pass rate for the examination (80%)
3. The minimum credible pass mark for the examination 117/180 (65%)
4. The minimum credible pass rate for the examination (40%)

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 127/180 (71%).



OSCE stations

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

Yes 14/15

No 0/15 (One candidate did not select an answer)

Comments

- I had my exam on Wednesday at 13:50. The consultants were very nice and supportive in stations 1-3. However, I did not have a good experience with the examiner in station 4 (refine sphere, binocular balance and reading add), which was unluckily my first station. All I can remember about him is his unkind comments as well as rushing me into things. I hope this is taken into consideration when organizing the next refraction test.
- Nice examiners!
- Slightly more intimidating with the invigilator assessing the examiner in 2 of my 4 stations
- Unfortunately in the very first station (subjective refraction: sphere and binocular balance), the examiner interrupted a few times during the examination between changing of lenses/VA check, just to confirm which lenses were in the frames and VA at random points. This was quite disconcerting, as it interrupted the flow of change of lenses. I had to repeat certain steps again therefore taking more time than was potentially necessary. This also was complicated with a problem with the computer screen briefly (see below), although the examiner did try to help resolve this.
- All staff very polite and courteous
- All examiners were very good
- I felt examiners understand the pressure we are in.
- All the examiners were very courteous and most had a friendly manner. One of the examiners did appear somewhat aloof, and talked over the head of the patient, which seemed inappropriate. A second examiner did proceed to wander in front of the Snellen chart during my examination of the patient which was unhelpful.

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

Yes 13/15

No 3/15 (one candidate selected both answers)

Comments

- The patient appointed for sphere correction and binocular balance was not paying attention and was giving a vague feedback during the different assessment steps
- All patients were appropriately selected and maximally co-operative.
- Ret in room with lens neutralization – difficult view ? cataracts
- I did my exam on 16th Dec am session, a lady patient in station 4 (binocular balance and sphere refinement) was fairly uncooperative and when asked to read the chart

she was reluctant to do this well. This is not an appropriate patient for time short or pressure dependent situation like this exam.

- Although one patient on the reading add station was quite elderly and had clearly forgotten his instructions, having to be prompted by the examiner several times.
- Patients were appropriate, although some did not seem to have been briefed beforehand as to what to expect during the process, therefore valuable time was spent explaining and reiterating the process rather than doing refraction/refining sphere/refining cyl etc
- One patient for the cycloplegic refraction was awaiting cataract surgery and had slightly unusual reflexes, but I understood this could be part of the examination.
- I felt only one patient not very cooperative, but may be it was meant to be.
- My patient for sphere refinement and binocular balance was in compliant. I saw her keeping her eye closed when I asked her to read the chart and she was inconsistent with her answers in the 1st and 2nd task - which was also picked up by the examiner himself. He made some remark to her referring to the examination day before. I think if there had been an issue with her already then, this patient should not have been invited for the second day.
- Most of the patients in my circuit were appropriate and able to answer the necessary subjective questions quickly and consistently. The lady who was the patient for the Cylinder refinement, however, was very inconsistent with her answers and was not appropriate for the station.

The OSCE overall

Was the OSCE well organized?

Yes 14/15

No 0/15 (one candidate did not select an option)

Comments

- Unfortunately again in my very first station (subjective refraction: sphere and binocular balance), my computer screen froze for a while on the duochrome display, so I could not progress through to the LogMar letters. Also I lost time trying to find the near reading chart when the station had already started, just to find it hidden underneath on the pull out tabletop. The examiner did try their best to help with the computer and also finding of the chart.
- The OSCE was well organised and ran smoothly (albeit slightly late).
- The OSCE was well organized. The timer bell would possibly be better if audible to all the rooms at once rather than the invigilator coming to each room individually to inform the candidate and examiner of the time remaining.

Were you given clear instructions about the OSCE?

Yes 13/15

No 1/15 (one candidate did not select an option)

Comments

- Only in station 4 – binocular balance /sphere refinement the examiner did not tell me the about the 5 mins change from testing sphere refinement to change to binocular balance. Therefore I only had 2 mins to do binocular balance. I think this is unfair and unacceptable especial when the instruction on the examination sheet are clear. It is difficult for the candidate to keep time in pressured situations.
- Staff were clear and thorough in their instructions.
- The information published on the College website prior to the examination was fairly clear, although the example mark sheets contain lots of errors which have since been corrected. The information to candidates at each station should all be displayed outside the room. This would allow the candidates to read the information whilst waiting (since reading the information is not time limited anyway). I often missed the instruction sheets inside the room, since I had read the mark sheets and station title outside and then walked in and was introduced to the examiner and patient. None of the examiners highlighted the location of the information sheets. The more detailed station information should also be published on the College website as this would not unfairly benefit any candidates, but would enable candidates to move between stations more quickly and easily. Several of the examiners did not understand the rules of the examination which is disconcerting as a candidate and should not be allowed to happen. I experienced an examiner telling me to wait between the first and second 5 minute stations (when you are allowed to progress from one eye to the fellow eye), and another candidate was told to continue between the second and third 5 minutes which is incorrect. All the examiners should be completely familiarized with the regulations and instructions.

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

Yes 9/15

No 4/15 (two candidates did not select an option)

Comments

- I did not agree about the amount of time we were given for station 4. There were lots of jobs to do in such a short period of time in that station. The time given in the rest of the stations was quite fair.
- 1- The un-cooperative patient made it difficult to achieve good performance in 2 stations which I was well prepared for.
2- The opposite color code for the refraction lenses was confusing (we were already told that) but what made it even more difficult is not having the sign (+) or (-) on each lens, which is usually standard in all the sets that I have been using before
3- Having the 2 Cross cylinders in the Cylinder correction station with 2 different color codes was confusing. You had to re-setup your mind every time you change between the 0.5D and the 1.0D Cross Cylinder, which normally doesn't happen in normal practice.
- Occasionally patient responses are variable which could lead to confusion due to time constraint, otherwise fairly well constructed assessment.
- Does not assess all knowledge reg. refraction
- Subjective tests are difficult in 5 mins slots.

- A couple of the stations were quite disorganised especially the reading add station. Spectacles for focimetry were regarded by most candidates as bizarre as the optical centre was on the border of the reading add making assessment of prism nigh on impossible.
- It would have been much better if not for the problems encountered in the very first station. Unfortunately I did not feel comfortable mentioning all the above straight away after the circuit, as everyone had already gathered in the foyer to leave.
- In my second cycloplegic retinoscopy station (combined with focimeter) the examiner advised me that I was running out of time, and to stop my retinoscopy and write down my answers. I did so, and once I had finished writing the coordinator came in to give a warning that there was 1 minute left. I am certain the examiner was trying to be helpful, but this did mean I rather rushed the end of the retinoscopy and was left with a spare minute where it was too late to go back and carry on with my ret (since my answers were already written down). Generally though I thought the OSCE was fair, and the examiners (including this one!) were very pleasant.
- It is hard to comment on your own level of knowledge. I prepared 3 months for this exam on a nearly daily basis. Senior opticians and consultants who observed me several times during this period said they have no concern at all about me passing this exams.
- The new format OSCE does benefit from being less susceptible to unreliable patients or biased examiners. However, it does not allow a candidate to demonstrate that they can do a thorough and complete refraction. My first impression of the Cylinder refraction was simply "Well I wouldn't start from here". Also the retinoscopy stations often had surplus time, but I was unable to complete the binocular balance and near vision stations to my satisfaction. If I had been able to have the same amount of total time and had been asked to complete a full refraction I think I would have demonstrated my knowledge much better. The examination tests that candidates can perform each step individually, but does not demonstrate that they can competently refract a patient.

Exam Preparation

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

Optometrist	12/15
Consultant ophthalmologist	4/15
Fellow trainee	7/15
Self-taught	8/15
Other (please list)	Hospital optometrist, Course

Question 2

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

- I didn't keep a record
- 50
- 5 complete refractions
- 50
- 90+
- 100
- 200+
- 100+
- 50+
- ~40 (although more cycloplegic retinoscopies without subjective modification)
- I did parts of refraction while practicing rather than complete ones. May amount to 30 in total.
- Nearly 60 patients
- 150
- 20

Question 3

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

- Practice
- Bring your own Cross Cylinders, time is shorter than what you think, start to write your finding once the 1 minute bill rings.
- Practice retinoscopy as much as you can. There is no alternative to practice. You can literally finish a five minute retinoscopy in 2 minutes if you have the skill.
- Be wary of time
- Practice – no substitute for this in prep
- Practice - I refracted everyone in my ophthalmology department and checked their prescription with the focimeter.
- Practice as much as possible, ensure that refraction is slick and instructions clear. Take own retinoscope and equipment, watch for lenses being placed in the wrong slots in the stations!
- Check the computer screen scrolls through with no issues prior to starting stations.

- Ensure you do lots of cycloplegic retinoscopies, and focus on the centre of the reflex. Pre-operative cataract patients are good as you generally have an up-to-date refraction to compare your result to.
- Take own retinoscope. Get a lens rack. Its helpful with dilated retinoscopy!
- Concentrate on time. I felt I had to be bit more quicker.
- I found this webpage very helpful: <http://www.eyedocs.co.uk/ophthalmology-learning/articles/optics-and-refraction>
- I would highly recommend arranging practice in a friendly high-street optician's practice. The patients tend to allow a more normal refraction to be carried out from beginning to end. Hospital optometry departments usually have a high weighting of unusual patients (keratoconus etc) who are less likely to be used in the examination, and also often will have small numbers of young patients who accommodate. I would advise practicing the 5 minute stations carefully, as the time pressure in these is usually the greatest. I would also advise taking a stopwatch into the examination, which you can quickly reset and start at the beginning of each station to aid your time keeping. The call of one-minute is too late if you think you've lots of time left. Having the time elapsed on your watch lets you plan your station much more accurately! Decide whether you're going to use positive or negative cyls almost before you start practicing. You only need to learn one technique and deciding early will save you getting confused later!

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

- Examination is held exactly as described. The college guidelines should suffice.
- One of my retinoscopy stations I had the answer well within time on a scrap piece of paper. The 1 minute warning came which rushed me to finish causing an error in transcribing my final answer. I feel that this was not a fair reflection of my performance on the station. Perhaps time should be given for the retinoscopy, then as much time as required to fill in the answer sheet so that errors due to time pressure are reduced as much as possible.
- Use standard /LogMar charts or equivalent instead of computer based programmes. Ensure that all equipment in each room is readily seen by candidate on desk and rearranged accordingly prior to starting of a new circuit for that session.
- I felt couple of stations need more time like subjective refraction and focimetry.
- I noticed by pure chance that one of the cylinder lenses that I needed to mount was out of axis within its frame, which is not really acceptable. For the focimetry part I asked if I could familiarize myself with the focimetre, as the particular type was new to me. The examiner said no, I have to that once the 5 min started. As a result, I even did not know how to switch the machine on when the examination time was started. I think it says in the RCOphth handbook that there is a familiarisation time for all stations.
- I am not convinced that the Borderline Candidate method is a good way to set the pass mark for this examination. This method can be influenced too much by your fellow candidates on the day and also by the examiners. The examination should be very reliable, and part of this includes ensuring a candidate who passes on one sitting would pass it at any other sitting, and a failing candidate should continue to fail. The Borderline Candidate method means that it depends heavily on who else is sitting the examination making it a less reliable "high-stakes" examination.