

# Review of Primary FRCA Examination 2016-2017

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## Introduction

This document reports on the Primary FRCA conducted through the year 2016-2017. It is intended that the document will be of interest and value to examiners, staff and officers of the Royal College of Anaesthetists, the General Medical Council, trainees, trainers and members of the public.

The exam consists of two separate components – a multiple choice written component (undertaken 3 times a year) and an oral component (also undertaken 3 times a year). Overall pass rate was lower this year in the MCQ examination and slightly higher in the oral examination.

Both components saw continuing high numbers of candidates. The nature of the oral examination means that this provides significant strain on the examining body, however there is some mitigation with the increasing size of the examining board (due to increased examiner recruitment over the last few years) as well as improvements in the examination process to try to ensure more efficient use of examiner time. Core groups have continued to be scheduled where possible during the examining week minimising the need to attend the college outside that time for most examiners.

Mark Blunt continued as Chair, with Tina McLeod and Mark Forrest as Deputy Chairs. Tina has now stepped down as Deputy and Chris Leng has been elected to the post starting in November 2017.

## The Examination

The Primary exam consists of two parts:

- A written paper
- An oral day consisting of SOE & OSCE

The primary exam tests the knowledge and application of basic sciences to anaesthetic practice along with an introduction to the clinical aspects of the profession. The science topics covered fall into the realms of physiology, pharmacology and physics.

### The Primary Written Exam:

The primary written exam consists of 2 sections:

- a) 60 MTF (multiple true/false) questions based upon physiology, pharmacology and physics/clinical measurement. These are considered an efficient way of testing the broad range of basic science knowledge embedded in the Basic Level Training Curriculum. All are carefully selected from a large database of previously well performing questions, reinforced with new peer reviewed questions year on year. No negative marking is applied, but a correction for guesswork is made prior to the pass mark being set.
- b) 30 SBA (single best answers). These are designed to examine the application of the knowledge tested in the MCQ section. In each SBA, 4 marks may be awarded for each question. This reflects the ability to reject the 4 incorrect answers.

The MCQ Core Group convenes shortly after each written paper when each question stem is reviewed along with any candidate feedback on specific questions. The latest three sittings have continued the historical trend of MTF questions appearing robust, performing well and/or being positive discriminators. The SBA sections continue to include a number of new questions that have been through a rigorous quality assurance process by the MCQ Core Group. The SBAs consistently perform well, with the best answer almost always chosen by the highest

percentage of candidates. In the few questions where this appears not the case, the Core Group once again ensure that the question is sound before allowing it to remain part of that examination.

A maximum total score of 300 is possible for the 60 MTF questions and a further 120 marks for the 30 SBA questions. There is no negative marking. Historically, the pass marks of the MTF and SBA sections of the paper are always derived separately using the independent Angoff scores of an extended group of current and previous MCQ Core Group members. Their remit is to score the likelihood that the 'minimally competent' candidate will arrive at the correct answer to each question set. It is noteworthy that the averaged Angoff scores used within the MCQ Examination have remained remarkably consistent over the years.

The Angoff derived mark for the MTF and SBA sections are summated and a reduction applied to allow for one standard error of measurement (SEM). The SEM is derived using the standard deviation of the performance of the candidates and the KR-20 (see below). In the MCQ Exam, the applied SEM consistently reduces the overall pass mark in the candidates' favour by a further 9-10 marks. Furthermore, where statistical analysis derives marks that are not whole numbers, these are rounded down to again favour the candidates.

The KR-20 is derived as a measure of internal reliability of the Examination and reflects the number of test items, the candidate performance on every test item and the variance thereof. The combined KR-20 of the last three papers has been between 0.86-0.91 reflecting a reassuringly high reliability of testing. (In the last three exams, the KR-20 for the MTF section was between 0.84-0.9 and the SBA section between 0.44-0.56 reflecting the lower number of questions).

As in the previous year, attendee numbers continue to be higher (1135) than in the years prior to 2015. However, the pass rates of the three recent examinations were in keeping with those of previous examination years. (58.9%, 54.6.1% and 53.1%). The mean pass rate in the last 4 years being 56.2% (SD 7.9%). Across the years, no obvious pattern emerges in the pass rate by month of sitting.

Historically, candidates have expressed concern that the SBA section may be detrimental to their chance of passing. It is true that candidates generally score a higher mark in the MTF section than in the SBA section, but this does not translate into a higher nominal pass rate once Angoff standard setting is applied to both sections. Since its inception, the section nominal pass rate in SBA has been no lower than that in the MTF section and in the last four years has been significantly higher, improving the overall pass rate.

The March 2017 Examination saw the introduction of more detailed feedback for all candidates on their performance on individual questions. This was mapped to areas of the Basic Level Anaesthetic Training curriculum to inform their future learning. This will not only enable unsuccessful candidates to see where marks were lost, but also help successful candidates to identify weaker areas ahead of their subsequent OSCE/SOE examination.

<b>Examination Year</b>	Attendees	Overall	MTF Nominal	SBA Nominal	Angoff Mean	Exam KR-20	yearly No of candidates
Sitting	Per Exam	Pass Rate	Pass Rate	Pass Rate	score/420	Reliability	
<b>2013-2014</b>							
Sep-13	193	48.7%	37.3%	59.6%	301	0.87	765
Nov-13	196	54.6%	38.8%	73.5%	309	0.91	
Mar-14	376	60.6%	42.6%	81.9%	304	0.92	
<b>2014-2015</b>							
Sep-14	350	64.9%	50.9%	84.0%	297	0.91	941
Nov-14	263	75.3%	44.1%	97.0%	309	0.9	
Mar-15	328	52.7%	44.5%	60.4%	313	0.92	
<b>2015-2016</b>							
Sep-15	387	46.0%	42.9%	56.9%	298	0.915	1141
Nov-15	336	55.1%	47.6%	68.8%	** 296	0.88	
Mar-16	418	49.8%	45.0%	60.5%	*** 309	0.92	
<b>2016-2017</b>							
<b>Sep-16</b>	<b>435</b>	<b>58.9%</b>	<b>32.2%</b>	<b>82.3%</b>	<b>** 308</b>	<b>0.86</b>	
<b>Nov-16</b>	<b>308</b>	<b>54.6%</b>	<b>30.2%</b>	<b>84.1%</b>	<b>*** 302</b>	<b>0.88</b>	
<b>Mar-17</b>	<b>392</b>	<b>53.1%</b>	<b>37.8%</b>	<b>69.9%</b>	<b>301</b>	<b>0.91</b>	1135
<b>Overall</b>							
<b>Mean</b>		56.2%	39.3%	70.4%			
<b>Median</b>		54.6%	40.3%	69.4%			
<b>SD</b>		7.96%	7.07%	11.08%			

\*Adjusted  
\*\* out of 418  
\*\*\*out of 415

**Table 1: Candidate attendance, outcome overall and for MTF and SBA components for last 4 years of primary examination along with Angoff score and reliability (KR-20)**

## Oral examination (SOE/OSCE)

The oral examination consists of two components sat at the Royal College of Anaesthetists on the same day. The Structured Oral Examination (SOE) comprises two 30 minute oral examinations and the Objective Structured Clinical Examination (OSCE) one 107 minute examination as described in more detail below.

On their first attempt candidates must take the SOE & OSCE at the same sitting. If a candidate is unsuccessful in one part they may retake this as a sole item in subsequent exams (i.e. to take the SOE alone they must have previously passed the OSCE & vice versa).

The oral exam is held 3 times per year and is now timed to allow candidates to enter soon after their MCQ success should they wish to do so. Changes to timings have been designed to allow candidates more attempts before they apply for registrar jobs.

## Structured Oral Examination (SOE)

The SOE section of the oral examination gives the opportunity for examiners to explore a candidate's understanding as well as their knowledge of clinical and basic science concepts. To be eligible a candidate must have passed the MCQ exam.

The SOE section consists of 2 parts.

- SOE 1 – 2 sections testing pharmacology (15 mins); physiology (15 mins).
- SOE 2 – 2 sections testing clinical (15 mins); physics, safety & measurement (15 mins)

Each examination lasts a total of 30 minutes. In each section candidates are exposed to 3 questions of 5 minutes each, and their answers are evaluated independently by 2 examiners. Thus a total of 4 examiners are involved in independent scoring for each candidate.

The scores awarded are criterion based, with no additional score possible for outstanding performance in each question. This inevitably leads to right skewing of the spread of total scores for the candidate cohorts.

The processes involved in the SOE section are now well established. One of the potential criticisms of this type of exam is the influence of examiner bias and question variability on a candidate's performance. Previous Rasch modelling has confirmed that the differences in candidate scores is only minimally effected by these components supporting this approach as a robust and reliable examination method for high stakes examination such as this. Further evaluation is ongoing aimed at understanding the influence of candidate diversity on scores.

Each of the 4 sections of the SOE exam have their own working party. These are chaired by a senior examiner.

- Pharmacology – Sian Jagger
- Physiology – Ian Shaw
- Clinical – Fiona Cameron
- Physics, safety & measurement – Chris Leng

The working parties are tasked with reviewing current questions and topics, introducing new questions and setting exams. With increasing examiner numbers we are now able to hold many (though not all) of these during exam week. As examiners are finding it increasingly difficult to get time away from their trust, this is providing a more consistent attendance at meetings. In order to maintain the standard of question papers, we continue to use the difficulty index ( $p$ ) [proportion of successful outcome in a question] and the discrimination index ( $D$ ) [association between candidate's success on individual questions and their success in the SOE overall]. This data also provides support to section leads in focusing review efforts on questions that are performing poorly (either high or low difficulty or poor discrimination).

In addition to the 4 videos on the website specifically looking at the SOE questioning, we have added one on the overall process of the exam. This is designed to assist those new to the college to familiarise themselves with order of the day and the facilities to try to reduce the stress associated with attending for the oral day.

## Objective Structured Clinical Examination (OSCE)

The OSCE consists of 18 consecutive stations of 5 minutes duration each with a 1 minute break between stations. The marks from 16 of these contribute to the final mark for the candidate whilst the other two are used as test stations for new questions.

A candidate may score up to 20 marks at each station, and the sum of their marks at every station produces their final score. This is compared against a target score created by use of Limen referencing on each of the individual stations.

Each day the results are analysed to ensure consistency of the process. In particular, candidates who score 1 mark under the pass mark have their performance reviewed.

Currently, the exam is paper based. The long term aim is to move across to an electronic platform but the need for absolute reliability and to avoid significant delays has precluded this at present. This will continue to be reviewed by the exam board.

- a) Communication/history/interaction stations: the new assessment system continues to be rolled out into the history and communication stations. This better rewards those candidates who approach the question in an organised and professional manner rather than exhibiting a random scattergun approach. This approach to assessment has strong support of our Lay committee members. Following assessment of these questions, they are now 'live' and therefore part of the scored examination.

b) Computer interactive stations: these stations remove the requirement for the presence of a dedicated examiner in the booth by designing a standalone kiosk capable of presenting a repeating 5-minute computer-based OSCE question to an entire round of candidates. Initially introduced to replace paper-based X-ray stations this approach has now being rolled out to anatomy and resuscitation stations. Despite the technical challenges encountered this has been a successful introduction and the working parties are now tasked with expanding the question bank to incorporate more booths.

The increase of computer-interactive stations should reduce the examining body requirement. This will potentially allow examiners to focus on the stations where examiner interaction provides additional benefit both in terms of the examination process and the scope of assessment.

### SOE/OSCE Results 2016-2017

		PASS	Partial pass (SOE)	Partial pass (OSCE)	FAIL	n
NOV 2016	Sat both - First Attempt	62.4%	9.1%	16.7%	11.8%	263
	Sat both - resitting	45.2%	16.1%	12.9%	25.8%	31
	Sat SOE only	66.7%			33.3%	45
	Sat OSCE only	96%			4%	25
JAN 2017	Sat both - First Attempt	43.0%	24.4%	9.3%	23.3%	193
	Sat both - resitting	45.7%	25.7%	14.3%	14.3%	35
	Sat SOE only	71.7%			28.3%	60
	Sat OSCE only	67.7%			33.3%	33
MAY 2017	Sat both - First Attempt	63.5%	8.3%	13.3%	14.9%	181
	Sat both - resitting	34.6%	9.6%	28.8%	26.9%	52
	Sat SOE only	65%			35%	40
	Sat OSCE only	87.9%			12.1%	66

Table 2: Percentage pass, partial pass and fail for each of the 3 sittings of the oral examination with total number of candidates attending (excludes candidates who withdrew or failed to attend)

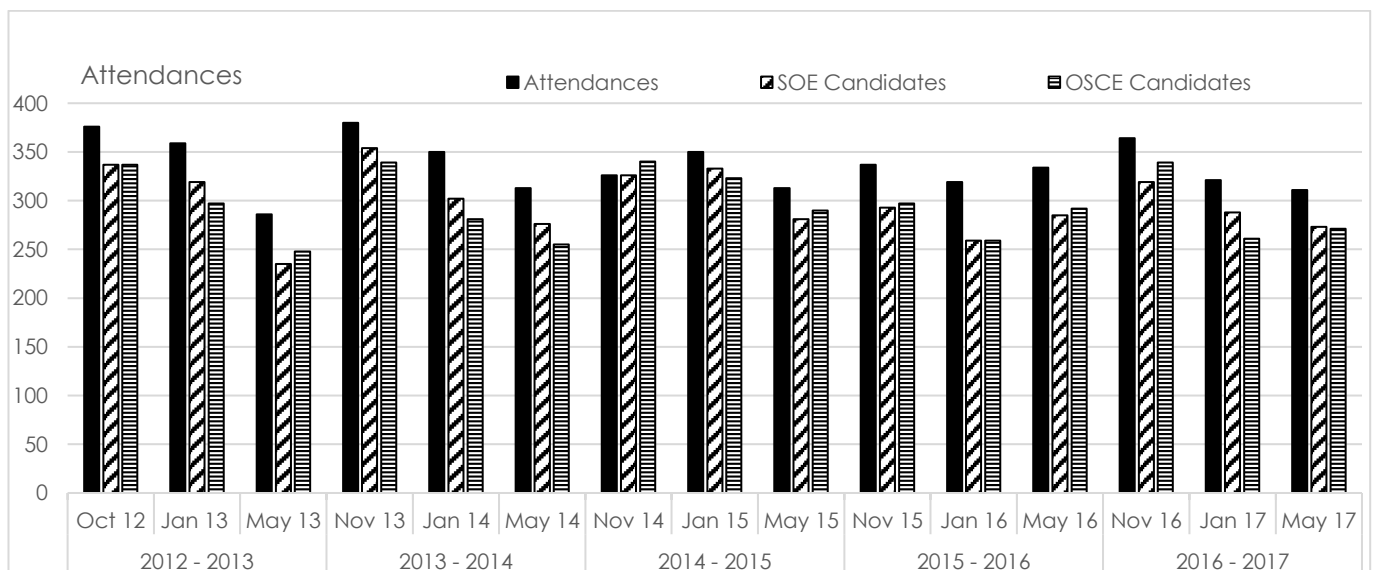
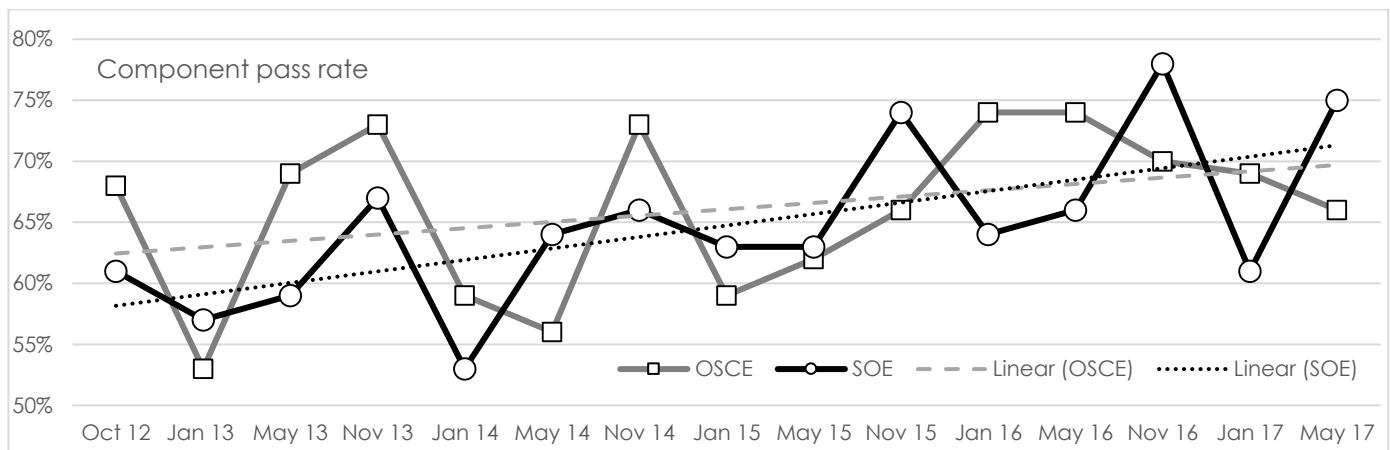


Figure 1: Attendance at SOE & OSCE over last 5 years



**Figure 2: Pass rate for SOE & OSCE components for examination over the last 5 years showing linear trend lines for both components.**

Overall 1006 candidates attended the oral examination in 2016-2017 (compared with 990 in 2015-2016). 598 passed the exam (either passing both components, or the one component they had left to pass).

This data confirms the view expressed in the 2015-2016 report that the performance of those sitting the exam for the first time in November and May have a similar expectation of success (62.4% and 63.5% passing fully at that attempt, with 88.2% and 85.1% passing at least one component). In January, the performance of those attempting the exam for the first time was significantly worse than November or May (only 43% passing fully and only 76.7% passing one or more components – this was also markedly worse than January 2017 (48.9% and 81.4% respectively)). It is notable that the performance in SOE was relatively poor in that sitting.

As with last year those who were sitting the OSCE alone had a higher success rate (84.0% v 68.9%) however again this was not the case for the SOE (68.3% v 68.2%). It is however notable that the overall pass rate for the SOE has increased consistently for the last 6 years at a rate of almost 1% per exam sitting (see Figure 2). Whilst there has been an increase in the mean pass rate for the OSCE this has been smaller (approx. 0.5% per sitting) and there has been a slight fall off over the last year.

## Quality Assurance

It is vital to ensure the exam process is of high quality and remains fit for purpose. We are keen to ensure that the principal variable affecting the outcome for a candidate is their performance alone rather than inconsistency in the impact of the examiner, process or environment on the result. We have therefore continued our standard assurance processes around new examiner monitoring, continual assessment of examiners, auditing of examiners, candidate feedback, visitor opinion and the maintenance of callover as a daily assurance of the process from the whole examining body.

## Examiners

The primary examination continues to be responsible for the induction and initial training of all examiners who join the examining body. This has been the largest cohort of new examiners which has led to significant strain on the process.

New examiners fill in a standard application form detailing their teaching, training, examination and administration experience. These are scored blindly by members of the exams committee and the top cohort of applicants duly appointed to the exam board.

All new examiners must attend a training day prior to commencing their first exam. In addition, they are expected to attend for the May exam immediately following their appointment and prior to commencing their term. These measures are designed to ensure new examiners are well prepared for their first year of examining.

During their probationary year, new examiners are paired with senior examiners to ensure they are familiar with the process. Videos are taken during both examining weeks and senior examiners audit their performance. This data, along with the videos, is discussed at an appraisal at the end of their first year to give them an opportunity to reflect on their progress, formally discuss any issues they may have and discuss future contribution to the exam.

In 2016 10 new examiners joined the board of examiners all of whom successfully completed their probationary year

- Sarah Bakewell, Meera Bryant, Victor Francis, Sridhar Gummaraju, David Jones, Sidd Nene, Sudhansu Pattnaik, Chris Seller, Simon Tomlinson, Jonathan Wills.
- Following the completion of the exam year 10 examiners from years two, three and four moved to the final examination.
  - Ed Carver, Claire Mearns, Cameron Weir, Satya Francis, Megan Jones, Tara Quasim, Raj Sethuraman, Nirm Soundarajan, Sesh Swaraj, Elaine Wilson-Smith
- Geraint Briggs and Jane Boden resigned from the board of examiners.

## Examination process

To ensure the exam process is consistent, fair and up to date we conduct regular working party meetings where groups of examiners in the MCQ, OSCE and SOE review and update their question banks. A senior examiner chairs each of these working parties. Given the expansion in numbers we can now normally accommodate these during exam weeks which greatly reduces the extra commitment from examiners throughout the year.

We continue to welcome and value the contribution of visitors. Whilst providing them with an insight into the exam process it will also help them to align practice sessions in their trust to the structure and standard expected in the exam. In addition, they are a valuable source of feedback on the standard of the exam as they are closely involved with trainees at this level and the standards expected of them. Reassuringly they generally assess the standard as appropriate and the quality of examiners as fair and consistent. We have recently changed the process of feedback delivery for these visits to use an online process, which we hope will ensure both more time and consideration is given to the feedback given and alone increase the independence of this appraisal.

We have regular visits from the Patient Liaison Group. As well as being interested in the overall exam process, they have been actively involved in the development of the communication stations and associated new assessment process.

At the end of each exam day the body of examiners meets at call over to discuss the exam for that day. Whilst not now reading the exam results each evening, call over remains a vital part of the exam process. Cumulative results for the week are discussed, exam process issues are presented and discussed and problem candidates and poor performance shared. Borderline marks are reviewed in both OSCE & SOE before publication. All '36' marks in the SOE and 'fail by one' marks in the OSCE are checked for accuracy and comments are logged.



Incident forms are filled in by floor supervisors and presented at call over to allow all examiners to learn and reflect on the process. Over the year we have introduced a candidate feedback form to enable candidates to feedback to the exam about their experience and suggest developments to make the experience more bearable.

A review group of senior examiners meets at the end of each exam week to discuss the exam process, prize winner, new developments and problems arising during the week. This is a vital part of the process to ensure that problems, improvements and developments are appropriately discussed and approved by the senior exam body.

