

## **The Primary FRCA MCQ examination: one year on after the introduction of Single Best Answer questions.**

**Single Best Answer (SBA) questions were introduced into the Primary FRCA MCQ examination in September 2011. This article reviews candidate performance of the three cohorts who have taken the examination during the past year and the impact of SBA questions on the overall pass rate.**

### **If it aint broke, don't fix it.**

Why was the established format of the Primary FRCA MCQ examination comprising 90 Multiple True False (MTF) questions, which had performed well over many years and with which candidates were very familiar, revised to include Single Best Answer (SBA) questions? Dr Susan Hill, Chair of the Primary FRCA MCQ Core Group at the time, discussed the introduction of SBA questions in the March 2011 issue of the *Bulletin* (1). She stated that the initiative had not originated from the Royal College of Anaesthetists but was a response to criticisms made by the Postgraduate Medical Education and Training Board (PMETB) that the focus of MTF questions was too narrow and addressed rote knowledge only rather than the understanding and application of knowledge. We were challenged to “modernise” the examination to accord with models of best examining practice, in line with all of the other major UK post-graduate medical examination boards, which had already adopted alternatives to MTF questions, including SBA questions. In this context the Board of Examiners and Council of the Royal College of Anaesthetists agreed to work towards the introduction of SBA questions as a component of the MCQ examination and to exploit the opportunities that this would present to improve the examination.

### **The rationale for inclusion of SBA questions.**

The MCQ component of the Primary FRCA examination is a test of knowledge of the basic sciences underpinning the practice of anaesthesia. MTF questions are ideally suited to assessing this domain of learning.

Assessment of “knows how” and “knows why” rather than simply “knows” is better assessed by SBA questions and provides the MCQ examination with a new dimension. SBA questions also have the potential to be more discriminatory as the range of candidate mark taking account of guesswork is 20-100% whereas that for MTF questions is 50-100%.

Statements of basic science fact are either true or false. In order to construct SBA questions with five plausible answers, one of which is the best, the questions often have an applied clinical context and many of the SBAs are more correctly described as single correct answer (SCA) questions – all five answers are plausible but only one of them is correct.

## **Format of the MCQ examination and marking scheme.**

The format of the examination currently comprises 60 MTF and 30 SBA questions. Each MTF leaf gains one mark for a correct answer and therefore the MTF paper has 300 functional questions and is marked out of 300. Although each of the 30 SBA questions also has five leaves, there are only 30 functional questions to be answered. Each SBA question gains four marks for a correct answer and therefore the SBA paper is marked out of 120. The rationale for this SBA marking scheme is that four incorrect leaves must be eliminated by the candidate in order to answer each question correctly.

## **Validation and standard setting.**

SBA questions are new and so we have worked hard to devise a process which allows us to be confident that question setting is as robust as we can make it. As such, the writing and preparation of SBA questions involves many people devoting a considerable amount of time to the process. Questions are written in draft form by Primary FRCA examiners and forwarded to the ten-member MCQ Core Group for further revision. Each finalised question is mapped to the examination syllabus and at least one reference sought from source material, which should be familiar to candidates ready to progress to ST3 training: eg standard textbooks, guidelines and protocols of professional bodies (e.g. Resuscitation Council UK, Difficult Airway Society etc), e-Learning Anaesthesia. Questions may be piloted before first use by trainees attending revision courses run by the Royal College of Anaesthetists and by Primary Examiners from outside the Core Group. The aim of SBA question writing is to produce questions that address important aspects of basic science, discriminate well between candidates of different ability and are well constructed such that the correct SBA leaf is answered by the largest group of candidates.

Appropriate standard-setting is key to the successful introduction of SBA questions. The pass mark for the Primary FRCA MCQ examination is determined by criterion referencing using a modified Angoff process. In essence, this is based on the collective judgement of Core Group members of how likely the “borderline” candidate is to know the answer to each question on a scale of 0-10. The MTF and SBA papers are assessed separately so that an Angoff pass mark is determined for each component. However, there is no requirement to pass each component separately and candidate marks from each paper are summated. Thus, the Angoff pass marks for both the MTF and SBA papers are nominal and the overall MCQ examination Angoff pass mark is a summation of the two. A downward adjustment to the Angoff pass mark is then applied to the MCQ examination, equal to the Standard Error of Measurement (SEM). This has been 8-10 marks (approximately 2% total examination mark) over the three examination sittings since September 2011 and is a statistical tool to allow for the fact that no examination is 100% reliable. Thus, a candidate who fails the examination by one mark has

actually underperformed with respect to the Angoff standard set by examiners by a more significant margin.

Core Group convenes immediately after each sitting of the examination to evaluate the performance of both candidates and the examination paper itself. Each of the MTF and SBA questions is examined in turn and the Angoff pass mark for the combined paper reduced accordingly for any question where there is evidence of unreliability – one mark for a single MTF leaf, five marks for a MTF stem, four marks for a SBA question.

Members of Core Group are only too aware that SBA questions are new, unfamiliar and require a different skill set than MTF questions. There is a lack of published SBA questions, particularly when compared with the wealth of MTF question material that has evolved over the years. For these reasons MCQ Core Group has been careful not to set its expectations of candidate performance too high at this early stage. The Royal College of Anaesthetists will publish further specimen SBA questions on the website as and when the SBA question bank is large enough to release them. However, the examination data presented in this article should allay any anxieties that candidates are generally performing badly in the SBA component of the MCQ examination.

### **Summary data on candidate performance and pass rates.**

Table 1 summarises the data on candidate performance in the three MCQ examinations to date which have included both MTF and SBA questions. It should be noted that the pass mark and pass rate of each component are nominal and for guidance only. The overall pass mark for the MCQ examination is derived using statistical data relevant to the combined examination. It is therefore possible to perform relatively less well in one component and still pass overall by a relatively better performance in the other component.

It is clear that on each of the three occasions when a combined MTF and SBA paper has run, mean candidate performance in the SBA component has exceeded the nominal pass mark (pass rates of 86.5%, 79.0% and 71.6%) whereas mean candidate performance in the MTF component has fallen short of the nominal pass mark on two out of the three occasions (pass rates of 42.4%, 41.3% and 55.0%). The impact of adding SBA questions has been to increase the overall pass rate in these three examinations. The mean candidate MTF % mark is higher than the mean SBA % mark because guessing MTF questions gains 50% marks on average compared with only 20% by guessing SBA questions.

One of the ways in which the standard setting process for the MCQ examination is validated is to look at the pass rate of UK medical school graduates sitting the examination for the first time. Historically this has been observed to be in the range 60-70% over a number of years. For the three

combined MTF/SBA examinations held, the relevant pass rates have been 69%, 70% and 72%.

### **Publication of specimen SBA questions.**

The introduction of SBA questions into the MCQ examination was a huge undertaking, requiring as it did many examiner hours of work. Anyone who has written SBA questions as examination preparation material will be aware how very much more difficult and time consuming it is to write SBA questions compared with writing MTF questions. The Primary FRCA SBA question bank has therefore taken some time to become populated and is still a work in progress. It has not therefore been possible before now to release more than a few examples of SBA questions on the Royal College of Anaesthetists website. However, Core Group has published a further series of SBA questions with explanations of the rationale for why the correct answer is indeed the single best answer. I hope that future candidates will find this helpful and wish them all good luck!

### **References.**

1. Hill S. The Primary FRCA MCQ exam: introduction of single best answer questions. *RCoA Bulletin* 2011; **66**: 23-25.

Table 1. Candidate performance in MCQ examination.

	September 2011	February 2012	June 2012
Number of candidates	304	271	493
Overall MCQ examination pass rate (%)	71.4%	55.4%	61.3%
<b>MTF paper</b>			
Candidate mean mark/300 (%)	233.4 (77.8%)	231.8 (77.3%)	237.3 (79.1%)
Angoff pass mark after SEM correction	240	239	237
Nominal pass rate (%)	42.4%	41.3%	55.0%
Range candidate marks (%)	185-280 (61.7-93.3%)	167-276 (55.7-92.0%)	156-286 (52.0-95.3%)
<b>SBA paper</b>			
Candidate mean mark/120 (%)	82.7 (68.9%)	69.9 (58.3%)	65.3 (54.4%)
Angoff pass mark after SEM correction	65	60	60
Nominal pass rate (%)	86.5%	79.0%	71.6%
Range candidate marks (%)	40-120 (33.3-100%)	28-104 (23.3-86.7%)	32-100 (26.7-83.3%)

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