

EDITORIAL

Creating High Quality Single Best Answer Questions: A Guide for Medical Educators.

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INTRODUCTION

The single-best answer (SBA) question is a type of the multiple-choice question (MCQ) used in the assessment of students in undergraduate and postgraduate medical education. This format of question is also known as the one best answer (OBA) question. This assessment tool assesses the problem solving and higher-order thinking skills of the cognitive domain of Bloom Taxonomy¹. The SBA questions are now increasingly in use in medical schools because of its high reliability in testing a varied range of topics and efficient marking scheme of the answer sheets in a very short time for a large group of candidates. Moreover, due to the availability of the definitive correct answers, it is not subjected to interpretation by the examiner². However, it is difficult and challenging to prepare a high-

quality SBA to ensure fair, valid and reliable assessments³.

In preparing the SBA questions, the first thing required is that it is to be aligned with the curriculum and the learning objectives for the course^{1,4}. In an effective student learning, the assessment and learning objectives are interrelated and these are the core elements of any instructional activity. The learning objectives are the learning outcomes that determine what students must be able to do after completion of the instructional activity and thereby help in designing an effective instruction and assessment⁵. Use of precise learning objectives in a teaching ensures the assessment using the proper tools. Therefore, learning objectives are necessary to be determined first in writing an SBA^{1,4}. The objective of this review is to give guidance in writing the SBA questions.

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How to write SBA/OBA

The format of an SBA question includes a question stem, lead-in, and 4-5 plausible answer options with one best answer^{6,7}. All SBA question stems, lead-in, and answer options should be written to a consistent style within the same assessment. There should be clarity of language with consistent terminology and their spelling. This ensures that the test solely assesses a candidate's knowledge and application of that knowledge, rather than their ability to interpret language discrepancies or to cope with distractions, such as inconsistent ordering of clinical material⁴.

WRITING STEM

The question stem describes a clinical vignette, telling the clinical scenario or a science-based scenario of a situation that a clinical or preclinical student might encounter in practice. It should be on a single, clearly formulated problem. The stem in clinical science should provide information in a standard format. It starts with a description of a patient's presenting problem in the opening line with the age and sex of the patient, followed by detailed history including duration of signs and symptoms, the past, family and social history depending on the relevancy, then physical examination, investigation, initial treatment, subsequent findings, etc. Vignettes may include only a part of the information, but it should be described in the specified order^{2,8}.

This is written as a scenario that provides the students necessary relevant information to answer the question. The SBA questions should include the typical presentations which are context-rich rather than the atypical rare presentation. A complicated stem does not invoke higher order thinking skills¹. It is not meant to catch out candidates. The focus of the question should be on common and important problems in real life for the students who are assessed. Such as, it could be on pre-operative assessment and administering intravenous fluids; or a potentially catastrophic clinical problem such as meningitis or obstetric emergencies etc.^{4,7,8}. Any tricky or very complex description or negatively phrased question (e.g. those with 'except or not' in the lead-in) should be avoided. It should be written in such a way that all relevant information, posing a clear question, whereby a competent student should be able to answer by reading the stem and the lead-in

without looking at the options. The stem and/or options should be revised if the students could not answer when the options are covered up reflecting the questions as non-focused^{1,8}.

It is recommended that item stems should include as much of the information as possible, with avoiding verbosity or use of extra words, any extraneous material or incidental findings known as 'window dressing', and any information intended to mislead the student known as 'red herring'⁸. Each question length including stem, lead-in and answer options should not take more than 45 seconds to read and answer, as students will get around 60–90 seconds for each question. Providing investigation results and/or a picture can help to reduce words in the stem⁴.

The actual data to be given to pose a better clinical scenario rather than the interpretation of data. It increases the question discrimination. For example, it should be written as "The pulse rate is 120 beats per minute" instead of "The patient is tachycardic"¹. It is necessary to avoid using pathognomonic terms. For example, it should be written as "Sudden removal of the palpating hand results in pain" instead of "rebound tenderness is present" while assessing a student's ability to identify peritonitis¹.

Writing Lead-in

The stem is followed by the lead-in-question, asking students the question from the described scenario, such as likely diagnosis or management of the patient. The lead-in is presented by a direct positive question that ends with a question mark; it can also be presented as a definitive statement that ends with a colon or semi-colon depending on the continuity of the statement⁶. Negative words like not or except should be avoided in the lead-in as it tends to be less effective and unfocused for the examinee⁸. If negative in some lead-in cannot be avoided, ensure that the word appears capitalized such as NOT or EXCEPT⁶. A good lead-in question should be answerable without seeing the answer options by covering the 4-5 options, using solely the stem and lead-in question⁶. This is known as the cover test⁴.

WRITING OPTIONS

The answer options include a list of relevant and plausible answers and students are asked to choose the best correct answer². The options include the key which is the 'one best response'

and three to four distractors^{3,6}. The distractors are selected in such a way that they are not entirely wrong; but they are less correct than the keyed answer for that particular scenario. They should be plausible, grammatically consistent, logically compatible, and of the same relative length as the correct answer^{7,8}. The most correct answer may be 80% correct while the distractors possibly 20–30% correct³.

All distractors and correct answer should be homogeneous and should address the same topic such as investigations, treatments, prognosis etc. This will avoid the risk of choosing two equally good answers from two different topics⁴. It is

essential to arrange the options in a logical order i.e. either in numeric, or in alphabetical order. The words such as always, never, usually, frequently, all of the above, none of the above etc. should be avoided in the options^{7,8}. -

Example of SBA question

Below Table-1, shows an example of a same SBA question asking for appropriate option using lead-in in three formats, (1) lead-in as direct question ends with question mark (?) at the end, (2) lead-in as a statement ends with colon (:) at the end and (3) lead-in as a statement ends with semi-colon (;) at the end⁶.

Table-1: Example of an SBA question asking for appropriate option using lead-in in three formats.

1.	A 20-year-old lady presents to a clinic with a history of lower abdominal pain, abnormal vaginal discharge, dyspareunia associated with fever, nausea and vomiting for 5 days.
	What is the most likely diagnosis?
	A. Acute appendicitis
	B. Acute pyelonephritis
	C. Ovarian torsion
	D. Pelvic inflammatory disease
	E. Ruptured ovarian cyst
2.	A 20-year-old lady presents to a clinic with a history of lower abdominal pain, abnormal vaginal discharge, dyspareunia associated with fever, nausea and vomiting for 5 days.
	The most likely diagnosis is:
	A. acute appendicitis
	B. acute pyelonephritis
	C. ovarian torsion
	D. pelvic inflammatory disease
	E. ruptured ovarian cyst
3.	A 20-year-old lady presents to a clinic with a history of lower abdominal pain, abnormal vaginal discharge, dyspareunia associated with fever, nausea and vomiting for 5 days.
	The most likely diagnosis;
	A. Acute appendicitis
	B. Acute pyelonephritis
	C. Ovarian torsion
	D. Pelvic inflammatory disease
	E. Ruptured ovarian cyst

In this example, five options are shown. In question-1, the options or choices start with capitalizing the first alphabet of the options answering a direct question. In question-2, the options start with a small letter alphabet relating to answer to the statement ends with colon, and in question-3, the options start with capitalizing the first alphabet relating to answer to the statement ends with semi-colon. However, the number of

the options to be accepted, either four or five, need to be determined by the faculty in consensus. Also, answering to the lead-in ends with a direct question, colon or semi-colon and alphabetical aspects of options need to be standardised by the faculty members in consensus.

Below Table-2 is another example of the same SBA question shown with context-free and context-rich stem^{6,10}.

Table-2: Example of SBA question with context-free and context-rich stem.

Context-free Stem	Context-rich Stem
What is the most important mechanism of Heart Failure in a child of one-year old? A. Pressure overload B. Ventricular dilatation C. Ventricular dysfunction D. Ventricular weakness E. Volume overload	A 1-year-old baby who is a known case of VSD, was admitted to the ER by his mother, complaining of cough, shortness of breath which disturbs his feeding for the last 3 days. On examination the baby was found ill, his temperature was 38.7°C, his pulse was 110/min, which was regular. He was dyspneic with respiratory rate of 70/min, having intercostals recessions. His liver was 4 cm below the costal margin. What is the most likely mechanism of his symptoms? A. Pressure overload B. Ventricular dilatation C. Ventricular dysfunction D. Ventricular weakness E. Volume overload

In this example, the context-free stem asks for a total recall of information, while the context-rich stem is inspiring to think and it resembles the real-life situation which the students will face in the future⁶.

Brief overview on assessment and issues in developing a good SBA question

Assessment is well known to drive learning and learning drives practice⁹. But assessment only drives learning that will expand performance in that type of assessment². A good assessment is the test that the tool assesses the higher level of thinking or cognitive skills of the students. Using inappropriate ways of assessment, underestimation in the use of assessment blueprint, creating context-free SBA question at the last minute with little time to review the quality of the question and lack of formal training in question construction are issues for a good assessment and thereby construction of a good SBA question^{6,11,12,13}.

Quality control

After complete preparation of the SBA question, it needs to be peer reviewed in supportive groups for accuracy, formatting and style⁴. An explanation of each question should be prepared with references⁴.

CONCLUSION

A well written SBA question can be able to assess

clinical and scientific knowledge of higher-order learning skills of students. However, creating a good SBA question is challenging. To write a good SBA question, it needs to follow a systematic approach and learning objectives to be determined to achieve the learning outcomes. Curriculum development cannot be done without faculty development. Faculties are assets of the institution and institutions must emphasize on faculty development programs concentrating on question construction, particularly the SBA, and implementation of assessment or test blueprint. This paper offers a comprehensive guide for medical educators on how to develop good SBA questions that assesses the higher-level thinking skills of the students.

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Conflict of Interest

The authors declare no conflicts of interest.

Authors' Contribution

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