

Writing Multiple-Choice Questions (MCQs) 101

Examinations using Multiple-Choice Questions (MCQs) have been demonstrated to be reliable and valid tools for assessment of cognitive knowledge and skills of medical trainees. They are time and cost-effective, allowing for wide sampling of objectives and topic areas. Careful writing and review to ensure high-quality MCQs is essential to the reliability and validity of examinations (Hawkins and Swanson, 2008). [The Medical Council of Canada Qualifying Exam Part I](#) (Touchie, 2010) and the [National Board of Medical Examiners](#) (Case and Swanson, 2002) use MCQs of the single-best-answer type in their examinations and provide useful guides and examples for item writing.

Anatomy of an MCQ

A single-best answer MCQ consists of 3 parts:

Part

1

STEM

The stem gives the background information and context necessary to answer the question. In medical assessment, it is often a short description of a common or clinically important patient presentation.

A 62-year-old man presents with a few days' history of peripheral edema and decreased urine output. On examination, his blood pressure is 195/90 mmHg with 3+ pitting edema of his lower extremities. His creatinine is 230 mol/L (70-120) and urinalysis shows 2+ leukocyte esterase with 3+ proteinuria.

Part

2

LEAD-IN

The lead-in is the question being asked, and is usually the last sentence in the stem. In medical assessment, the lead-in often directs test-takers to select the most likely or best answer in order to test clinical judgement.

Which one of the following is the most likely diagnosis?

Part

3

OPTIONS

The options give possible plausible answers to the lead-in question, including the one most likely or best option – the keyed or correct response. A typical structure for medical MCQ examinations is one correct response and four distractors, although more options can be presented.

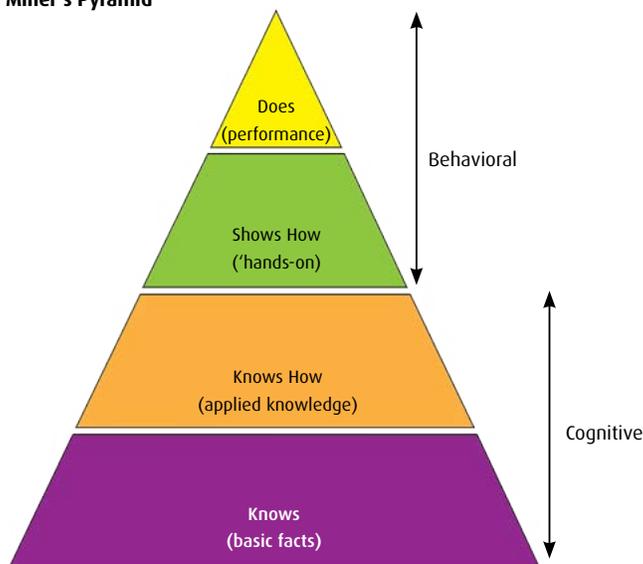
1. Urinary tract infection.
2. Urolithiasis.
3. Nephrotic syndrome. (correct response)
4. Hepatorenal syndrome.
5. Congestive heart failure.

Good Practice in MCQ Writing

The following principles (adapted from Amin et al. 2006) should guide your MCQ writing:

Recommended practice	Effect and rationale
Use blueprint objectives www.med.mun.ca/ugmecurriculum/	Improves content validity
Use Miller's pyramid (see below) and/or Bloom's Taxonomy (https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/) as conceptual models	Encourages question writer to target questions for desired level of thinking
Context or clinical scenario-based MCQ	Assessment of higher order knowledge in "knows how" level of Miller's pyramid
Use a standard checklist prior to submission of MCQ	Efficient in identifying the problem and providing feedback to the item-writer
Invite peers to review the question	Peer review will detect subtle hidden problems
Analyze MCQ by difficulty (percentage of students answering correctly) and discrimination (is the item discriminating between students who do well on the test as a whole and students who do poorly on the test as a whole?)	Quality assurance
Avoid true/false item format	Reduces negative effects of learning

Miller's Pyramid



Checklist for Writing a Good MCQ

STEM AND LEAD-IN

- ✓ Focuses on testing important concepts
- ✓ Most of information is in stem and lead-in; options are short
- ✓ Best students could answer question without looking at the options (hand or cover test)
- ✓ Uses new material to elicit higher-order thinking
- ✓ Content of items is independent of one another
- ✓ Clear and succinct; no window-dressing
- ✓ Worded positively; avoids NOT and EXCEPT format
- ✓ Avoids "Which of the following is correct/true/not?" format which is essentially a set of true-false questions

OPTIONS

- ✓ All plausible; avoid filler or nonsense options
- ✓ Worded positively
- ✓ Do not overlap
- ✓ About equal length
- ✓ Avoid specific determiners such as "always", "never", "completely" and "absolutely"
- ✓ Avoid "clang" associations (words identical to or resembling words in stem)
- ✓ Avoid pairs or groups of options that cue the correct answer
- ✓ Homogeneous in content and grammatical structure
- ✓ Defensively correct answer key
- ✓ Clear and simple alternatives; avoid "all of the above", "none of the above" and combination options (A; B; C; A&B; A,B,&C, etc.)
- ✓ Avoid vague frequency terms such as "usually", "often" and "rarely"
- ✓ Compatible with question in grammar, tense, pluralization, a/an, etc.

References

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