

Editorial

# You Will Be Held For Questioning: The Secrets of Multiple-Choice Test Makers & Test Takers

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## Introduction

I have been taking multiple choice tests throughout most of my life, and I have also spent many years creating these tests. While I myself earned some ‘street cred’ over the years by being fairly good at multiple choice tests, I candidly did not know why that was.... Similarly, I have known some great doctors (residents and faculty) who were not particularly good at multiple choice tests. By that I mean I do not think that being a great multiple choice test taker means much as far as real-life performance and expertise goes. While I have also been an educator throughout my career, I have been at least somewhat unsure of how to help those of my students and trainees who struggle with these tests. However, I have accumulated some reflections and suggestions that maybe useful to current and future multiple choice test takers. And, I asked my coauthor, a splendid test taker, to add some of his own perspectives, as well. Let’s get started.....

## Learning on the Go

In the common give and take of the questioning that occurs on ward rounds, in clinics, and in the operating room, you must be able to articulate, in plain language, your answers. This style of teaching is known as ‘The Socratic Method’, in recognition of the teaching methods attributed to Socrates in ancient Greece. This style of questioning, however, bears little resemblance to the questions found in multiple choice tests.

There is, of course, nothing wrong with reading from books or from on-line sources, because this type of reading, as an initial approach, will allow you to gain some familiarity with a subject. However, reading alone will NOT facilitate optimal mastery of the material. In fact, on a ‘first pass’ through subject matter, we all read to understand and gain familiarity with the material. However, familiarity is not enough, at least for important medical information. You must own that knowledge, and the only way to get to that level of mastery of the information is to test yourself, one way or another. In fact, the best learners, and the best test takers, are almost always thinking of how the information

to which they are being exposed can be converted into questions that they will be asked, on rounds or on tests, or that they should be asking themselves.

## The Hierarchy of Thinking and Learning in Medicine

The hierarchy of thinking and learning in medicine can be thought of as:

- First order thinking, which involves learning and knowing facts.
- Second order thinking, that involves using those facts to make plans and decisions.
- Third order thinking, which requires learning from the outcomes of what has been done.

So, with this hierarchy in mind, multiple choice questions are designed, at least mostly, to test first order thinking, such as facts, information, and basic knowledge, while oral exams are designed to assess second order thinking. And, third order thinking, and learning, is assessed by the evaluation of outcomes, in both formal and in informal ways.

## Why do We have Tests, Anyway?

Despite the fact that test results can affect your chances of being accepted by schools or into training programs and that failing to pass board exams may affect your ability to get and keep a job after you finish your training, these issues are **not** the only purpose of the many tests that you will take throughout your educational trajectory.

An important purpose of these tests can actually be thought of as providing an impetus to get people to study and learn. All learners know that they will be ‘held for questioning’ at some points during their educational trajectories. And, as blunt an instrument as written tests are, they do have a way of focusing the minds of learners, at all levels of training and practice.

## What are the Best Ways to Learn the Information that will be Tested with Multiple Choice Tests?

Preparation for multiple choice tests includes, of course, reading books, overviews, and review articles, since these compilations primarily focus on facts and knowledge that are generally agreed upon, at any given time. One can, of course, revise this knowledge and information based on observations and feedback, and by keeping up with new developments. You can also enhance retention by taking some kind of action on the information to which you are exposed, including by taking notes and by teaching others. Retention of this knowledge can also be enhanced by review of one's notes afterwards. This principle has been described as being analogous to the development of a photograph (in a dark-room, in a time gone by) after a photo is taken. This analogy, though now archaic in the era of digital photography, is an apt one for 'developing' and remembering information to which one is exposed in an educational environment. An interesting, relatively new system of creating 'AI powered flash cards' is called Anki [1]. Some learners report finding this process useful.

## Knowing the Questions may Actually Take Priority over Knowing the Answers

It's worth noting that knowing the questions may be more important than knowing the answers. After all, the answers will change over time, while the questions may remain relatively timeless. Furthermore, learning the questions that should be asked of learners is essential to becoming a good teacher, as well as a capable practitioner. In fact, I believe that there is a correlation between good teachers and good test takers. If true, that may be because good teachers are always thinking of good questions, either to ask a protégé or to be asked themselves, in one setting or another ....

## Written Exams are Blunt Instruments

Do educators in our discipline (Thoracic Surgery) believe that being really good at written tests signifies that someone is a truly capable Thoracic Surgery Resident or Thoracic Surgeon? No, not at all. What we do believe is that having regular 'formative' tests (such as the TSITE), that will be followed, eventually, by a 'summative' test (like the ABTS written exam), will emphasize the need to study broadly and deeply. And, as blunt an instrument as written exams are, combined with oral exams, as well as day to day conversations and observations, we do believe that, as educators and test creators, we will have done our best to

encourage broad and regular study by our trainees which, by extrapolation, will enhance the care of future patients.

On a related note, these realities are reminiscent of the themes of the best-selling book, *Moneyball: The Art of Winning an Unfair Game*, written by Michael Lewis and published in 2003 [2]. One of the primary themes of this book is that various systems (professional baseball, in this book) may dwell excessively on inappropriate characteristics. In the case of professional baseball and in our own discipline (Thoracic Surgery), once properly contemplated, one of the characteristics that we are all looking for is good decision making, perhaps more than some other issues, like athletic prowess (in baseball) or test scores (in medical training programs).

## Optimal Learning Strategies to Prepare for Written Tests

Many learners believe that studying collections of multiple-choice questions is an effective way to learn subject matter and to prepare for tests. This strategy may not only be suboptimal but can even be counterproductive. The principle behind my assertion is that you, as a learner, need to know the answers, the simple answers, to the questions. Therefore, I (and many other educators) believe that the most effective way to study for the multiple-choice tests, to which you will be subjected throughout your life, is to study simple questions and simple answers as a complement to your regular reading.

Many will be familiar with The Recall Series of medical study guides. This series of books was the brainchild of Dr. Lorne Blackbourne, one of the savviest and most effective teachers of students and residents that I have known. Dr. Blackbourne, like most of us in medicine, realized that, when studying for organic chemistry tests in premed college courses, he had to cover up the second half of the organic chemistry equations he was studying and make himself write, on scratch paper, that second part of the equations. Otherwise, one may be lulled into thinking that the second part of these equations looks so sensible that it would be easy to reproduce on a test. He, and most of us who endured organic chemistry courses, and other similar courses, realized that **familiarity** with this type of material was not enough and that one must test oneself to truly **own** the information. And, it is worth noting, studying and learning clinically relevant information is more important to future cardiothoracic surgeons than studying organic chemistry, as I am sure that we would all agree.

This 'remembrance of things past' inspired Dr. Blackbourne to create the first of the Recall books, which was *Surgical Recall* [3]. When this book was first published by one of the large medical publishing companies (Lippincott Williams & Wilkins), it became one of the best-selling medical books in their catalog. In fact, this book was eventually

translated into virtually every language used in medical education around the world. This format was intuitively appealing for students who knew that they would be asked these types of questions on rounds and in clinics and operating rooms. And, students also realized that this type of study guide would help them on their written exams, as well. To summarize these principles, the optimal strategy to ‘own the material’ that you are studying is to test yourself. This strategy is enhanced by writing out the answers to such questions, at least partly because writing has been shown to ‘light up’ three parts of your brain while just thinking about, or even saying aloud, the answers involves only one part of your brain, according to studies done with functional magnetic resonance imaging.

Having emphasized the value of studying ‘simple questions with simple answers’ here, I will admit that some thoughtful and successful test takers have told me that they do believe that there is some value in occasionally practicing by studying multiple choice questions.

### Why are Some People Really Good at Multiple Choice Tests?

Most of the folks that I’ve asked this question of don’t really have an answer.... I myself suspect that they have a knack or an instinct for ‘seeing a question lurking’ in each concept or set of facts that they learn or are exposed to. There is also, I think, a correlation between good teachers and good test takers, an observation I have frequently made of our residents who are viewed as really good teachers. Perhaps that’s because the good teachers seem to always be thinking of good questions, either to ask someone or to be asked themselves, both in the clinical arena or on an exam.

### Think Like a Writer of Questions

We have an old saying in cardiovascular surgery which is that we need to ‘think like a blood cell’ to create vascular conduits that work and anastomoses that don’t bleed. An analogous thought is that a good test taker needs to learn to ‘think like a test maker’. Once you start thinking in this way, you will realize that the correct answers provided in a multiple-choice test must be, at least somewhat, disguised or camouflaged and that the incorrect answers must be made to seem almost correct to serve as effective ‘distractors’.

While I myself may have come to intuitively understand these principles as a nearly life-long test taker, I had to shift to another level when, as a member of the American Board of Thoracic Surgery (creating board exams) and as a member of the Thoracic Surgery Directors Association (creating in-training exams), I had to spend countless hours writing and revising questions for these various exams. In addition to writing new test questions as members

of these organizations, my colleagues and I also had to edit and upgrade questions that were deemed not to have performed optimally when used on prior tests. For instance, if any particular question from a recently administered exam was answered correctly by almost everyone who took the test, it was, of course, considered to be inadequately ‘discriminating’. And, a similar assessment of how the question performed was, of course, also true if almost everyone who took the test answered the question incorrectly.

### ‘Trickeration’ in the Creation of Good Multiple-Choice Questions

Successful test **takers** should also be keenly aware that good multiple choice question **writers** must try to trick the future test takers. Said differently, question writers cannot make the correct answer obvious. Otherwise, the question will not discriminate between those who really know the material and those who do not. Therefore, good question writers must make use of camouflage, disguise, and ‘trickeration’. That is, those creating these multiple-choice tests must make the correct answer to a question almost wrong and the wrong answers almost right.

Therefore, a savvy test taker must learn to think like a test maker.

Thus, it fell to those of us creating, and fine tuning, these Board exams to attempt to ‘tune-up’ the choices offered amongst the answers. We realized that we had to ‘disguise’ the correct answers to the point of being ‘almost incorrect’ and the incorrect answers to be close enough to being correct to serve as effective ‘distractors’. As a test taker, if you can begin to think like a writer of test questions, you will be better at answering these types of questions. Simply put, you must realize that the correct answers are disguised, at least to some degree, and that the incorrect answers must have been created to seem to be at least plausible.

I found it very interesting that, in the case of the questions being created, or fine-tuned, for the official board exams, the Board employed professional testing experts, called psychometricians, who are experts in offering advice on the creation of high stakes exams. I learned that these psychometricians applied statistical methods to measure the performance of questions from prior exams. For instance, if a given question was consistently answered correctly by those test takers who had done well overall on the exam and was consistently answered incorrectly by those who had not performed well, that question was rated highly. That is, such a question was rated as an effective ‘discriminator’. These approaches, of course, make plenty of sense, once you think about them. However, in all my years of formal education, taking countless exams of all sorts and helping to create such tests, it had never occurred to me that the ‘performance’ of multiple-choice questions (and the answers to those questions) would be evaluated in this manner. There-

fore, once I had dedicated quite a lot of time to creating and assessing the performance of these exams, I developed both an increased respect for the validity of them and a better understanding of how to advise my proteges on how to take these tests.

### Lessons Learned from Writing Multiple Choice Questions

When I was a member of the American Board of Thoracic Surgery (ABTS) and helping to create written exams, the members of The Board were explicitly coached on the creation of ‘good’ exam questions. While it probably should have been obvious, the approach we learned in this setting was to:

- Create a good, clinically relevant and current question
- Answer the question (as if it were a fill-in-the-blank question)
- Tailor that correct answer so that it did not seem completely obvious
- Create three other answers that will seem at least somewhat plausible, to serve as distractors

The psychometricians employed by the ABTS used statistical methods to evaluate the performance of each question on each of the exams. They create a statistic called the ‘P-bis’ which distills the overall performance of each question to a single number. These statistics are then used by Board members to focus on and to modify the questions that did not perform well. Then it becomes the job of the Board members to revise the questions, with hope of making them ‘perform better’.

How do the ABTS Board members and their testing experts evaluate the performance of each of the questions after each exam has been completed? To reiterate:

- If most everyone gets it right, it’s not a good question
- If everyone gets it wrong, it’s also not a good question
- If those who did well on the other questions get the question right, it’s a good question
- If those who did NOT do well on the other questions get the question wrong, it’s also a good question

It is worth noting that this type of scrutiny is not applied to the Thoracic Surgery In-Training Exam (TSITE), which the members of the Thoracic Surgery Directors Association (TSDA) manage without input from the ABTS. It is also worth noting that the ABTS passes poorly functioning or older questions along to the TSDA for potential use in the TSITE. The ABTS similarly hands off questions that have been used repeatedly to the TSDA for the TSITE, in essence ‘retiring’ those questions from use in the ABTS exams. In summary, the high stakes ABTS exams are much more carefully constructed and scrutinized than are the relatively lower stakes TSISTE exams.

### Additional Reflections of a Question Writer

Having some appreciation of how hard it is to write good questions may allow you to ‘think like a question writer’. One way to do that is to try writing some questions yourself, which can be an enlightening thing to do. You can also try to think like camouflage experts in the military, who strive to:

- Distract the ‘enemy’ (the test taker)
- Draw eyes away from the ‘target’ (the answer)

As noted earlier, it can also be beneficial to try your hand at creating your own questions as you study, either by thinking of them or even by writing them out. You can also consider looking at *Advanced Surgical Recall*, by Dr. Lorne Blackbourne, at least partly to see how a simple question, simple answer format looks and feels. The benefit of this process is that you will be better prepared for answering not only these types of questions but also multiple-choice questions. As an aside, in this book (*Advanced Surgical Recall*), you, as a Thoracic Surgery trainee, would likely benefit from reviewing the questions that deal with:

- Critical care
- Trauma (especially related to thoracic or vascular trauma)
- Surgical oncology
- Vascular issues

You should also pay attention to questions on the Thoracic Surgery In-Training Exam (TSITE) that you will take each year of your training, as these questions, or ones a lot like them, will surface time and again. It is worth noting again that many questions that are on the TSITE come from the ABTS, with those ‘second hand questions’ being ones that the ABTS folks have decided haven’t performed optimally on the Thoracic Board exams but may still ‘qualify’ as being adequate for the TSITE, which is, obviously, a ‘lower stakes exam’.

### Some Test-taking Strategies that May be of Help

First of all, stay calm (especially when starting into a ‘high stakes’ exam). Focusing on your breathing (with deep, regular breaths) can help. Look over the entire test first, if feasible, and answer the questions that you think you know, during a ‘first pass’ through the exam. You should read each question entirely before attempting to answer it.

On any multiple-choice test, I believe that you should attempt to answer the question before you look at the answers. And, once you have done that, try to find that answer ‘disguised’ in the choices offered. It is worth noting that some savvy test takers have suggested that glancing at the

answers before reading the question might have some value. You should also do your best to avoid getting stuck on any one question, because subsequent questions may trigger a memory, or even an epiphany, that could pertain to an earlier question.

And, you should answer every question, at some point, even if you have no idea what the correct answer is. By answering, you will at least give yourself a chance to get the question right. One of my all-time favorite residents once told me that “sometimes you just have to make a wild-ass guess, and when I have to do that, I chose ‘C’ and move on”. I have called the perseveration on an unfamiliar question ‘the insanity of indecision’, by which I mean that dwelling too long on a question with which you are unfamiliar can, literally, make you crazy! Finally, if time permits, review your answers.

With all of the earlier background information in mind and assuming you have a reasonable command of the information you are expected to have learned, what more granular advice can be offered about taking a multiple-choice test on that material? Here are some additional approaches that I recommend:

- Don’t overthink the question.
- Know that the correct answer to each question will be disguised, at least to a degree, in the choices offered.
- Understand that the wrong answers will have been set up as valid ‘distractors.’ (That means, of course, that these distractors need to be almost, but not quite, correct.)
- Consider ranking the answers to each question as best you can by picking the two answers you think are best and the two that you think are the least likely to be correct.
- Then, pick one of your two top choices, even if it’s a coin flip.
- But, if you can’t, at first, pick only one answer, you should move on, for the time being because:
- Your brain will keep working, subconsciously, on the right answer, to at least some degree, as you move through the exam.
- And, other questions may provide a clue or stimulate a memory that will help you when you review the questions and your answers later.

It is worth noting that many, if not most, exam environments will allow examinees to bring clean sheets of paper to the exam (though the proctors will usually insist on examining any material of this sort that an examinee brings with them). Some testing sites will actually provide the test takers with scratch paper (something you can ask about prior to taking a test at a testing center). Therefore, if allowed, you should use paper to make notes during tests, for the following reasons:

- As noted earlier, writing by hand uses three parts of the brain, which neuroscientists claim may create some associations, or, even, epiphanies.

- You can keep notes on what you have thought about each question, so far.
- You can enhance your efficiency even further by creating 3 tiers of the answers, to define your level of confidence, such as:

A - confident of your answer (don’t need to re-look at that one)

B - unsure (dwell on these in your second look)

C - have no idea (don’t spend too much time on these, if time is limited)

### **Some Additional Thoughts about Studying for and Taking Multiple Choice Tests**

While we will delve more deeply into ‘learning on the go’ on busy clinical services in a later treatise, there are a few points worth making here about the intersection of optimizing learning while also preparing to be tested. Obviously, the top priority in studying in any medical discipline is to learn clinically relevant information and to gain the knowledge and wisdom that will benefit the patients you will care for throughout your career. Learning the facts that will form the foundation of your medical knowledge is one important part of the never-ending educational process that you should employ throughout your career. The wisdom necessary to utilize that knowledge will be gained continuously, as you care for patients and reflect on your outcomes and experiences [4].

The reality is that the rate at which specific facts in medicine will become outdated or even obsolete speeds up, for all sorts of reasons. Stated more specifically, many of the facts that you study at any given point will likely become outdated as your career moves relentlessly forward. However, this reality does not relieve you of the need to learn the facts and principles as they are taught, just as you must be ever vigilant and aware of new developments that will fairly regularly change your practice. In essence, you will have to learn ‘the facts of the day’ while also striving to learn the ‘principles of a lifetime’. Some have emphasized these realities with the phrase: “What got you here (being a great test taker), won’t get you there (becoming a master clinician)”.

Great teachers in medicine (and in many other realms) are always thinking of questions to ask of their proteges, while great test-takers ‘see’ a question in everything that they see, hear, or do. It is crucial to remember that being a good clinician IS NOT based solely on knowing facts. Being a good clinician IS based on having the wisdom to synthesize facts to aid in making good decisions for the benefit of your patients and to staying the course when what you are doing is working, while changing course when what you are doing is not working.

## Summary

- Multiple choice tests will frequently be the bane of your existence.
- You WILL have to take those tests, throughout your career.
- You CAN improve your performance on multiple choice exams by understanding how these tests are created and fine-tuned.
- You should learn the strategies that can optimize your performance on these tests.

## The Authors

Dr. Wisniewski is a senior resident in the Integrated Six Year Thoracic Residency program at the University of Virginia. I (CGT) asked Dr. Wisniewski to assist me in writing this paper because of his demonstrated test taking prowess, having, in two recent years, made the highest score of any I-6 resident in the country (The U.S.) on the Thoracic Surgery In-Training Exam (TSITE) and because of his staunch commitment to education of himself and others. Many of Dr. Wisniewski's thoughtful suggestions have been incorporated in this treatise.

Dr. Tribble is a Professor of Thoracic and Cardiovascular Surgery at the University of Virginia. He has been 'a successful multiple choice test taker' throughout his own educational trajectory, and, during his career, has been a member of The Thoracic Surgery Directors Association (TSDA) and a member of The American Board of Thoracic Surgery (ABTS). In those roles, as well as serving as a Surgery Clerkship Director and as a Program Director for both Surgery and Thoracic Surgery residencies, he has dealt with many aspects of 'testing' in surgical disciplines, including creating tests and test questions and working with students and residents who have been challenged by these types of tests. Although this essay is written in the first person (by Dr. Tribble), Dr. Wisniewski's contributions, as an astute mid-level cardiothoracic surgical resident, were invaluable in shaping the final version of the essay.

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## Additional Resource

Recall Series, E-MED Books: <https://medicsoul.com/ebook/series-collection/recall-series/>.

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