

A Framework for Successful Preparation

By the time you reach medical school, you have been a student for most of your life. You have learned in a variety of settings and have achieved a number of personal goals. There is probably little that you have not observed about your own learning. Despite this, you may still approach medical studies with some degree of apprehension and have questions about the effectiveness of your study strategies, specific skills, and attitudes.

After experiencing medical courses during their first year or two, most students accommodate well and, if necessary, make whatever adjustments in their study patterns seem warranted. But even the most competent student, given the pressure of frequent and demanding examinations, will have occasional doubts regarding the efficiency of a particular study method.

For those planning to take USMLE Step 1, many questions arise about how best to proceed. "How much time is adequate for review?" "What materials should I use?" "What should I study and in what order?" In discussions with other students, you will hear about approaches they took and what worked for them. But, eventually, you will need to make important decisions for yourself about how to *initiate* and *sustain* a preparation plan that results in success on the exam.

This preparatory guide selects and summarizes from many different areas of cognitive and educational psychology those findings that have most applicability to a medical learning context. Strategies, skills, and functions are organized according to their potential utility for students as

they move progressively from initial encounter with new learning at stage I, acquiring information, to stage II, consolidating information, and finally to the goal of self-confident achievement, stage III, reaching mastery. In the sections that follow, a conceptual framework will be used to discuss specific suggestions and activities. Three main subdivisions are represented in this medical Learning

Framework: cognitive learning strategies, self-management skills, and monitoring functions.

Cognitive learning strategies. These strategies can be used to acquire, retain, and master a massive amount of information in the basic sciences. The strategies will be arranged according to which ones are appropriate at each stage in the learning sequence.

Self-management skills. At each stage of learning noted previously, there are skills that can help students allocate time efficiently, expend effort productively, and use study resources effectively.

Monitoring functions. In addition to the cognitive dimensions, medical learning requires metacognitive functions__ the ongoing self regulation that helps students track their progress and decide whether they need to modify or fine-tune any behaviors. Students also need to monitor and try to control potentially interfering negative feelings and stress.

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Cognitive Learning Strategies

Any learning experience a student engages in, whether listening to a lecture, reading a text, observing a demonstration, or viewing a video presentation, can be said to move through three stages as the learner proceeds from initial encounter to eventual mastery. Many factors influence the progression from one stage to another, among them the characteristics of the student, such as ability, motivation, attitudes, and interests. Also influential are the characteristics of the material, its conceptual difficulty, how it is organized, and how closely it matches the learner's prior knowledge. The specific study activities the student uses also will have an effect. Whether you are trying to learn medical material for the first time, or reviewing information you learned before and are now trying to reactivate and strengthen, the three-stage concept of how learning takes place offers a handy scheme for deciding which study strategies to use when.

Strategies for Acquiring Information

In this first stage, as you read or listen to a lecture, the main task is consciously and intentionally to generate as much *meaning* (understanding) as you can. Because studies have shown that strong initial *encoding* influences to a large extent what will be stored in long-term memory, there is a payoff for being *activate* at this stage. The ongoing task is to decide if what you are reading or hearing is unfamiliar information, somewhat familiar, or already part of your fund of knowledge. Rarely will you encounter something that is completely new, but some topics will seem more remote than others if your previous experience with them has been limited. As you move through the information, do so at as brisk a pace as you can without sacrificing meaning. Following are some productive strategies that can be used at this stage:

1. Preview. Before starting to read, notice how a topic or other chunk of material has been

organized. Use external arrangements such as titles and subheadings to get an idea of how the topic has been segmented. One technique is to convert these subdivisions into questions. Study any pictorial material such as figures and diagrams. Read the introduction, summary, and questions, if available. Read anything that is printed in different type, italic, or highlighted. Notice unfamiliar terms and look them up.

Remember that the purpose of previewing is to give you a preliminary cognitive "map" that should help you extract more meaning from your subsequent reading.

2. Read actively. When reading a text, handouts, and notes, some parts will trigger recollection from your previous learning. When you encounter familiarity, try *prompting*: Pause and look away from the page, anticipate what will be coming, and try to bring forth from your memory whatever you can recall about that topic. Also, try to read as if on a... Having looked at the subheading of a section and raised questions in your mind about what to expect, read to see if you can find responses to your questions.

3. Link information. Many medical students acknowledge that this is an important and useful strategy for enhancing understanding, yet few actually implement it. As you read, stop periodically and (a) summarize in your own words, (b) draw relationships to other knowledge by comparing and contrasting, (c) make an educated guess (inference), and (d) raise questions (What would happen if...?). If you are wondering whether you have time to think about the material given the usual pressures, remind yourself that these are the very thinking processes that are built into the questions of the Step 1 exam.

4. Construct notes. You probably have been taking notes in class since your earliest school days, and you may have developed a system for reducing and compacting lecture information that has served you well in the past. If so, continue using it. If, however, you are still trying to listen and write as much as you can, and as fast as you can, then perhaps you want to try a different method. When an instructor has provided a handout or other type of script before a lecture, preview it ahead and "cue" the sections that are obscure and need more elaboration. Then, you can limit note taking to what is essential to make sense of that script. Use whatever symbols you wish as cues (e.g., stars, circles, triangles) and assign a particular meaning to each. When you return to that handout after the lecture, you can translate your cues into further study activities (e.g., rewrite a particular section, supplement from a text, memorize a procedure).

One activity you might find helpful to institute fairly early is a last-minute study list consisting of those topics, mechanisms, procedures, and details that you find particularly problematic. Record either a brief explanation or the page and reference source where the information can be found. This list is particularly useful toward the end of your exam preparation sequence when you will want to make the most effective use of whatever time remains.

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Self-Management Skills

At this early stage there are certain activities related to time, effort, and resources that are appropriate to carry out.

TIME

Form a realistic study plan. Before plunging in, give some thought to how you want to organize your plan of study and which factors you need to consider. What is the amount of time you can reasonably allocate to preparation for the exam? If you are preparing for Step 1, it might be 3 or 4 months. Obviously, if your experience with basic science material goes back a number of years, you will be doing more than simply activating former learning. There will be chunks of recent scientific knowledge that will require more intensive processing and more study time to reach a level of familiarity.

There are a few principles worth observing regardless of the total time actually allocated: (a) Use whatever diagnostic information you have (data-based, if possible) to assign time on the basis of relative strengths and weaknesses. Your review should be comprehensive, but some topics should be given more time than others. (b) Draft a long-range, tentative plan across the time you have available and estimate approximately how much you want to assign to each segment of content. Even a rough plan written down will reduce concern about whether you can fit everything in. You will be able to observe whether you underestimated the number of hours needed and increase them as you implement your plan. (c) Leave the last 2 weeks unscheduled so that you can return to areas that need a second pass. (d) At the end of each week, look at your plan and make changes based on your experiences during that week.

EFFORT:

Get started. Perhaps what takes the most effort at this stage is just lifting off and getting into

some type of study routine. You may find yourself putting off the actual start until you can finish other essential things, but you are probably procrastinating. It may help if you begin by studying something that you are strong in because a feeling of success will encourage you to continue. Gradually, shift to a topic that is less familiar and requires a little more intentional effort.

Select conditions conducive to study. Find a place where you can sustain a study block with few or no distractions. Put yourself in an active study posture, sitting upright, not lying on a couch or bed. Make yourself go to your study place as part of your routine. Staying in your apartment may be convenient, but it also makes it tempting to give in to other distractions.

Establish a reasonable, steady pace. If you are highly motivated, you may be tempted to work for exceptionally lengthy stretches, particularly during the early days of your review. Try, instead, to establish a reasonable routine that allows you to get a return from each study block. Know what your peak work periods are and do your most difficult studying at those times. Pay attention to whether you are getting fatigued and losing your ability to concentrate. Build in breaks that will re-energize you and help you feel refreshed when you return to studying.

RESOURCES

Select effective study materials. Whether you are studying for a class exam or USMLE Step 1, finding just the right study material often can prove frustrating. Although quite a number of study resources are available in book stores, each differs in purpose, format, depth, and comprehensiveness of coverage.

For review, your own notes, charts, and handouts are good sources if you still have them available. They are familiar and have personal associations helpful for recalling information. To initiate review, look for publications that summarize or compact information, are not excessively wordy, but still provide enough narrative for you to make sense of the topic. The purpose of such books (e.g., Williams & Wilkins' *Board Review Series*) is to stimulate recall of material learned previously. Finally, have a reliable text available in each of the basic sciences that you can use selectively as a supplemental resource, if needed.

MONITORING FUNCTIONS

Since you are just beginning to get into your study routine, this is the time to:

Initiate self-observations. These are the informal impressions, thoughts, and reactions that you form as you experience certain learning activities. For example, as you listen to a lecture, everything is making sense and fitting in with what you already know. Or, you feel some discomfort because the lecture material is moving at too rapid a pace for you to process meaningfully. Your reactions may be telling you that all is going well and you should continue without change, or they may be signaling the need for some attention and possible adjustment in your study strategies.

Monitor emerging negative thoughts. If in reviewing you are reactivating without difficulty material you studied previously, you will feel productive and have a sense of accomplishment. But there will be times when the proportion of understanding will seem relatively meager, and some discouragement will be felt. Try to confine your discouragement to the specific event that prompted the feeling without allowing it to generalize to *all* study activities.

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Strategies for consolidating information:

After you have listened to lectures or have read sections of material, you probably have acquired a reasonable percentage of the meaning. But, you also know that to what you understood, you will need to engage in other study activities. Of the multitude of activities from which you could choose, the following have been found to be effective to *maintain, consolidate, integrate & synthesize* your knowledge.

1. Fill in gaps in your understanding. As soon after a lecture as is practical, follow up any of the cued sections in your notes or handouts by filling in what was unclear or incomplete. You can use another reference book, discuss the lecture with a peer, or ask for clarification from the instructor. Whatever action you take will make your learning stronger and move the information to long-term memory.

2. Reorganize for recall. Most students are familiar with the devices that can be used to reorganize information for better retrieval and recall: outlines, charts, index cards, concept maps, tree diagrams, and so forth. Following are guidelines for whether you should bother restructuring information, and if so, when it should be done. If the material being used for

study is already well organized, little if any restructuring may be needed. Sometimes, however, a different schematic format may make even well organized material easier to recall. If you reorganize, arrange the information so that the *meaning* is emphasized. Note prototypes such as the most common and least common disease form a category, and the most frequent and least frequent treatment. In a set of diseases sharing similar symptoms, note particularly the differentiating feature(s). If you decide to use one or more of the preceding devices, remember to do so during this stage, rather than close to the exam deadline, so you will have sufficient time to incorporate what you have restructured into your memory.

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3. Synthesize from multiple sources. Avoid studying the same topic in three or four different sources. Use one substantive source as your "road map" and check other sources if you think yours is not comprehensive enough. Notice what needs to be added to make yours more complete, but end up with one dependable "script" that you can use for any subsequent study.

4. Rehearse to strengthen recall. Many students read things over and over. Rereading alone is not likely to be effective. The following habits could lead to more durable learning because they involve more active processing:

- *Visualize imaging:* you are trying to learn. by "seeing" it in the form you ??? You will use when you want to retrieve it later (e.g. an anatomic structure as as you saw in the lab, or as a schematic representation from the text, or as the instructor detailed it on a transparency).
- *Form analogies :* Whenever possible, try to associate a new concept to a similar and simpler one that is already familiar to you

-----FINE READER 2nd reading-----

Strategies for Consolidating Information

After you have listened to lectures or have read sections of material, you probably have acquired a reasonable percentage of the meaning. But, you also know that to *retain* what you understood, you will need to engage in other study activities. Of the multitude of activities from which you could choose, the following have been found to be effective to *maintain*, *consolidate*, *integrate*, and *synthesize* your knowledge

1. Fill in gaps in your understanding. As soon after a lecture as is practical, follow up any of the cued sections in your notes or handouts by filling in what was unclear or incomplete. You can use another reference book, discuss the lecture with a peer, or ask for clarification from the instructor. Whatever action you take will make your learning stronger and move the information to long-term memory.

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Use visual imaging Visualize what you are trying to learn by "seeing" it in the form you will use when you want to retrieve it later (e.g., an anatomic structure as you saw it in the lab, or as a schematic representation from the text, or as the instructor detailed it on a transparency)

Form analogies Wherever possible, try to associate a new concept to a similar and simpler one that is already familiar to you

Elaborate verbally Talk about what you want to remember Say it either to yourself or to others, but in your own words "Stretch" beyond the script in the book or handout and develop inferences (make reasonable guesses about other relationships or applications)

Use mnemonics These are mental cues that can be used to associate a wide range of medical information Many can be found in student resources, or you can construct your own Although you can be creative and even bizarre, avoid complexities that make the mnemonic harder to remember than the material itself Using the first letter of each word to **form acronyms** is a common mnemonic device For example, the causes of coma are AEIOU TIPS, which means alcoholism, encephalopathy, msulm excess or deficiency, opiates, uremia, frauma, mfection, psychosis, syncope. **Method of loci** is one of the oldest pneumatic devices You "place" mentally what you want to remember in certain familiar locations, such as rooms in your house, or locations within a room

5. Establish patterns of practice. There are certain "essentials" that may need to be memorized and recalled almost verbatim For such learning, **distribute the practice** so that you rehearse for a number of short periods with breaks and other activities interspersed, rather than trying to sustain one lengthy period Try **cumulative practice** by learning a few "chunks" at one session, then at a subsequent session, review those and add a few more Continue the same pattern until all you want to memorize has been incorporated

6. Study with others. This can be an effective study activity if used properly An initial exploration of material by each student in the group will make group discussion more valuable Discussion can then focus on clarifying material and confirming and extending understanding Studying with others works best if the group is small so everyone participates and if some ground rules are established about how the sessions will be conducted

7. Self-test periodically. The purpose of self-testing at this stage is **to guide further study** Self-testing can help you decide which topics need more intense study, which are fairly close to being learned, and which have been learned well. Resources to use for this purpose and the sequence to follow will be described in later sections

Applying Effective Testing Skills

Following are suggestions that will increase the likelihood that what you have learned and can recall from your study will translate into correct responses on multiple-choice examinations

General test-taking skills

Read carefully for comprehension, not speed and

respond to questions in sequence Mark every item on your answer sheet as you go along, even if you are not completely sure of your choice Cue the questions to which you want to return if there is time

Be positive. Suppose the first question you see as you open the test book is a particularly difficult one, and you can feel yourself getting anxious After giving it a try, go to the second question and respond to that one, which in all likelihood will feel more accessible

~~**Avoid mechanical errors.** At the end of each page of questions, before going on to the next page, check to make sure the **number of the question** you just finished **matches the number on your answer sheet**~~

Be alert to key terms in the question stem such as "most," "least," "primarily," "frequently," "most often," and "most likely" Notice transition words that signal a change in meaning, such

as "but," "although," and "however"

Let your original response stand unless you have thought of additional information, if you don't know whether to change a response

Pace yourself. You will have approximately 60 seconds per question. Avoid dwelling on any one question, or rushing to finish. Set up check points in your test booklet of where you want to be at the end of the first hour, second hour, and so on. You will know before you get close to the end whether you need to adjust your pace.

Analyzing questions

When you first read a question and look at the options, the answer may not be immediately apparent. Although you may be uncertain, don't just pick an answer arbitrarily. You can apply systematic skills of logic and deduction to narrow the five options to two or three possibilities.

Search for key information. As you read the question stem, notice key information (e.g., age, symptoms, lab results, chronic or acute condition, history). Highlight the key information by underlining or circling.

Notice particularly the request of the question in phrases such as "the most likely diagnosis is," "the most appropriate initial step in management is," "which initial diagnostic evaluation is most appropriate?" Take a quick look at the last line of the stem before reading the specific information in the remainder of the stem, especially if it is lengthy.

Analyze options. As you read each option, **try to eliminate** those that are inconsistent with the information you highlighted in the stem. For example, if a question concerns a 65-year-old woman, you would eliminate a procedure that you know applies only to children.

Cue each option. As you consider each option, mark down your initial reaction. In a "one best answer" question there are four "false" options and one "true" answer. For negative one-best answer questions, the reverse applies. As you read each option, cue those you are sure of with a symbol such as "F," "N," or a minus sign. Cue true responses with a "T," "Y," or a plus sign. Cue those options you are uncertain about with the symbol you are using and a question mark.

Analyze structural clues in words. Pay attention to the meaning of prefixes, suffixes, and root words, which can sometimes help you decide whether to eliminate an option.

Example:

Amikacin is ordered for a patient with pyelonephritis due to *Klebsiella pneumoniae*. The clearance and volume of distribution of amikacin in this patient are 50 ml/min and 20 L, respectively. What dose should be administered every 8 hours to obtain an average steady-state plasma concentration of 20 mg/L?

- A 125 mg
- B 400 mg
- C 460 mg
- D 760 mg
- E 1000 mg

Analysis This is a basic pharmacokinetics question. I can compute the dose needed to reach steady-state plasma concentration by using the information given. Both clearance and the volume of distribution are provided. I remember that only one of them is used in calculating the dose, but which one? My inclination is to use clearance and to multiply by plasma level and time. In that case, my choice is C.

Comment Although this is a fairly elementary pharmacokinetics question that is probably part of most students' fund of knowledge by the time they take Step 1, it illustrates the possibility of making an error if volume of distribution rather than clearance is used in the computation.

Example:

Which of the following individuals has the highest risk of developing schizophrenia?

- A The brother of a patient with schizophrenia
- B The child of one parent with schizophrenia

- C The child of two parents with schizophrenia
- D The monozygotic twin of a patient with schizophrenia
- E A child raised in an institutional setting

Analysis I know this question has to do with the genetics of mental illness and the chances that relatives of people who have schizophrenia will develop the disease. I can eliminate E because there is no genetic relationship there. The likelihood is greater for a child of two parents with schizophrenia than one, so B can be eliminated. Although I don't remember specific rates associated with the remaining options, from what I know of hereditary patterns in general among monozygotic twins, I am inclined to choose D.

Comment Although this question, too, may not be particularly difficult, the strongest possibility for making an error is in misjudging the genetic pre-eminence of one relationship over another, and thereby choosing A or C instead of D. Students may be unable to remember specific concordance rates for the disease, but from their knowledge of genetic principles, they can infer which relationship presents the highest risk.

Relying on test question cues

The ability to use the characteristics or the formats of the test itself to increase your score is sometimes referred to as "test wiseness." It is possible to make use of idiosyncrasies in the way the questions are constructed to decide on the correct choice. This technique should be used only if you are unable to answer the question based on direct knowledge or reasoning. The following are examples of the principles of test wiseness, but you may have little opportunity to use them on USMLE Step 1 because the experts who construct the questions eliminate these cues.

Length of an option. If an option is much longer or much shorter than the others, it is more likely to be correct.

Grammatical consistency. Options that are not grammatically aligned with the stem are probably false.

Specific determiners. Options that contain words such as "all," "always," and "never" overqualify an option and are likely to be false.

Overuse of the same words or expressions. Some test makers have a tendency to repeat words or phrases in the options. If you are unsure of an answer, select from the options with the repeated words or phrases. Another variation of this principle is to select an option in which a key word from the stem is repeated.

Numeric midrange. When all options can be listed in numeric order (e.g., percentages), the correct choice will most often be one of the two middle values.

Self-Management Skills

Pay attention to

- Time
- Effort
- Resources

Study in blocks. Assuming you plan to study 4 to 5 hours each night, you might consider dividing those hours into two study blocks. This allows you to study two areas, one that is weaker and therefore requires more time, and another that is relatively strong and can be allocated less time. The advantage of studying two sciences concurrently is that you will move through your strong science with ease and feel a sense of accomplishment, even if the weaker science does not let you reach the same level of confidence.

Set goals for each study block. Begin by identifying a few goals you think can be accomplished within that block of time. The goals need not be elaborately stated. Identifying what you think is important to study increases the chances that you will study *actively* (with heightened awareness) since you are controlling the purpose, direction, and rate of the studying.

Set realistic deadlines. Although your accuracy in estimating how long it takes you to complete a study agenda will vary, observe whether you habitually overestimate. Arbitrary

deadlines are self-defeating if you have little or no chance of meeting them Set more realistic targets and attempt to meet them most of the time

Use record-keeping devices. Calendars and appointment books will help you schedule your study agenda and permit you to look ahead and adjust plans to meet deadlines

Control distractions. There are many kinds of distractions, some of which are self-imposed Others, such as telephone calls, can interrupt concentration and make it harder to get back to work If a call is not urgent, decide on a response within the first 30 seconds (e g , I'll call you back later I'm in the middle of something important) When you do call later, use it as a reward for having worked well, and enjoy it Also, learn to say "no" to requests that take time and distract you from your schedule

Effort

Avoid activities that dissipate effort. Be aware of whether there are things you do each day that reduce your total energy and, particularly, the energy you want to give to studying Think about which of the "nonessential" tasks you can delegate to other family members, or to friends who want to be helpful Give them some direction about what kind of help you would appreciate most

Tiy to anticipate crises. There are disruptive life events that happen to all of us that we cannot anticipate but must deal with as best we can But there are other events of a less traumatic nature that, if they occur, can interrupt the flow of a study plan and throw you off course (e g , the car breaking down and needing immediate repair, a relative who wants to come and stay with you, or a friend who needs your advice on a troublesome problem) Anticipate crises that may happen during the span of your preparation and have alternative plans ready that permit you to be a part of what is going on but do not derail you completely

Reward yourself for good effort. After having sustained a stretch of "heavy duty" studying, reward yourself by doing something that for you is pleasurable A phone call to or from a friend that might be a distraction if it happens when you are trying to study can be a source of pleasure if you can defer it until you have completed your agenda for that day

Resources

The following testing materials are appropriate for self-testing to guide further study Their use is described in the next section

Instructor content tests. These tests consist of questions prepared by the instructor who taught a particular segment of content Some medical schools retain former course exams on file for student practice Although the questions may not be structured as they appear on the Step 1 exam, they are good for pm-pomtmg specific gaps or confusions in your knowledge base Keep records of each practice test result and note relative performance across sciences and across topics in each science For example, in pathology, note if one system (e g , respiratory, cardiovascular, endocrine) is notably weaker than another Cue topics that will need more sustained study Take advantage of the instructor's presence to seek help, if needed

Published books of practice questions. The Board Simulator Series books arrange basic science content into "principles" (two books) and "systems" (three books)

Computerized question sets. There are now a few of these question banks available from various publishing companies Some offer explanations for incorrect responses, whereas others simply indicate which option is correct Most are organized so that you can call up a batch of questions by topic within a science, by mixed topics, or by randomly arranged questions in all of the topics covered on the Step 1 examination

Monitoring Functions:

- Monitor Study Progress
- Use Questions to Monitor Progress
- Monitor Test Anxiety
- Combat Negative Self-Statements

Monitor study progress

During this phase, when you are strengthening your learning, you will want to get **data-based feedback** using numeric scores to chart your progress

Use questions to monitor progress

The pattern that works best is study, test, follow-up. Although there are times when it is appropriate to use questions before study to stimulate motivation or trigger recall, at this stage the best use of questions is after preliminary study. When you believe you have learned a segment of material, try a batch of questions. If time permits, you might want to test yourself on each major topic after completing its study and before testing yourself on a mixed batch of topics in a science. However, if time is limited, select those topics about which you feel the most uncertainty, and use the feedback to guide additional study.

Select a representative sample of questions and complete them using the same time limits as will be used on your class exam or Board exam (approximately 60 seconds per question).

Do not do questions one at a time and then read the answer. The purpose is not to learn a particular question, but to find out which topics require follow-up.

Score your responses, but do not read answers immediately since you may want to give some questions a second try. After performing error analysis, decide which topics need further study and the type of study needed.

Compute an accuracy percentage by dividing the number correct by the total number of questions. Keep a record of your scores and note whether your accuracy level is approaching the percentage required for passing (for Board exams, between 55% and 65%). For class exams, the percentage may be higher.

Analyze for errors. It is important to analyze more specific aspects of your study and test-taking behavior to direct further study and make it more focused and productive.

1 Were patterns of errors noted? (e.g., questions related to DMA principles, or questions about immune responses, or questions regarding quantitative methods)

2 Did you misread or misinterpret the question?

3 Were questions missed because, although you understood the concept, you forgot important details?

4 Did you note errors in addressing the *decision* required by the question? For example, although you knew much about the disease process described, you could not differentiate a likely diagnosis, or you were unable to form a judgment about a mechanism involved, draw an inference about the appropriate next step in management, or make a prediction about which drug would cause an adverse effect. In other words, you were unable to transform your conceptual and factual knowledge to meet the request of the question.

Monitor test anxiety

One aspect of self-testing that you should be monitoring is whether you are experiencing *inordinate* anxiety when dealing with test questions. It is not unusual to feel some elevation in anxiety when facing a comprehensive and consequential examination such as Step 1. But, if the amount of worry and the physiologic aspects (rapid breathing, sweaty palms, increased heart beat) become so preoccupying that they interfere with productive studying, then some professional attention may be needed. If, however, test anxiety is of reasonable proportion, then remember what many studies have found: The best defense against test anxiety is a combination of strong review of subject matter, practicing tests similar to the target test, and positive self-reinforcement throughout the preparation process.

Combat negative self-statements

Part of your monitoring should include awareness of your moods and general state of being... Be sensitive to when you are about to give yourself a negative self-evaluation and combat it with an accurate but positive one. "What if I don't pass" statements will intrude periodically, and if permitted, can change your mood and distract you from your study. Start practicing self-talk by having a positive statement ready to use to redirect yourself back to your agenda ("I've been studying well and my scores show I'm making progress. I just need to keep going" or, "I can't afford the time to worry now, maybe late tonight, back to the topic now.")

Strategies for Reaching Mastery

By the time you reach this stage you should feel more confident that your knowledge is firmer and that you can retrieve information dependably. The tasks of this stage deal with refining, or

fine-tuning, for increased accuracy

1. Focus on follow-up study. Your study agenda at this stage should be based on findings from your error analysis of questions you practiced, as well as any behavioral observations you noted from monitoring your performance. If there are topics you need to reinforce, check your resources to note if those explanations are adequate, or if confusions still remain that may need to be clarified through use of another text or discussion with a peer. If details are eluding you, engage in some of the memory strengthening activities noted in the previous stage, particularly use of mnemonics, and cumulative practice. If you misread information in questions, remember to highlight pertinent cues as you read, to focus on comprehension and avoid regressions, and to vary your rate to emphasize meaning. If one of the patterns you noted is that errors were made on questions with very long stems, practice by first reading the "request" at the end of the question stem. You may then be able to interpret the direction and relevance of the information in the question more quickly and accurately. If you found that you were unable to translate your knowledge to the specific *thinking* requirement of the question (form a judgment, integrate information to form a conclusion, draw an inference), first check to make sure you know the principles or mechanisms the question assumes you know (e.g., biosynthesis and degradation, dose-effect relationships, alterations in immunologic function). Then, analyze the question through a "think aloud" procedure, with a peer if possible, and try to identify why your thinking is inaccurate.

2. Engage in comprehensive self-evaluation. If you have practiced questions topically and through a systems approach, as in this series, and followed up with focused review, you should be ready to test yourself with comprehensive question sets. These sets will contain questions that sample most of the domains of information represented on the target exam. The procedure in using those questions, scoring them, and analyzing errors is the same as described previously. Since the question sets are likely to be longer (approximately 150 questions), schedule them during the last 2 or 3 weeks, with time between each to benefit from the feedback. Some students end self-evaluation before the last week because further testing too close to the exam date heightens their anxiety.

3. Deal with interfering test-taking behaviors and attitudes. If your self-observations have noted any test-taking behaviors that need improvement, this is the time to correct them.

Impulsive responding Do you find yourself getting annoyed if the answer to a question is not immediately apparent, and simply choose an option impulsively? Try to curb your impatience, and remind yourself that some questions are designed to engage you in an internal dialogue before deciding on a response.

Inability to move on Are you unable to disengage from a particularly troublesome question and move on to the next one? This is especially bothersome when you have that tip-of-the-tongue feeling that the answer is something you know, but seems just a little out of reach. Difficult as it seems, try not to allow yourself to become irritated and get "stuck" to that question. Choose an answer and move on. It is likely that if you return to it later on, something may trigger recall.

Carrying over previous unsuccessful testing experiences If comprehensive multiple-choice exams have been problematic for you in the past, and particularly if a recent attempt has not been successful, you may be tempted to see yourself as a "poor" test-taker and allow a defeatist attitude to permeate your self-testing activities. It would be better to start by asking yourself, "Why do I not do as well as I would like on multiple-choice exams?" Then, through your self-observations and data-based assessments, note any interfering behaviors you would like to change and implement activities that are more effective and can lead to success on such exams.

Self-Management Skills

Set and maintain study priorities. One of the biggest problems experienced by some medical students at any level of training is approaching an exam deadline realizing that there is still so much to learn that they will not reach the stage of "mastery." After some last minute cramming they may even pass, but the feeling of personal accomplishment eludes them. Although this has happened to all of us at one time or another, if it occurs as an ongoing pattern, then some change is needed. Make a list at the beginning of the week of all the study activities you want to accomplish and rank them in order of *importance* and *urgency*. At the beginning of the next week look at any low priority items left undone and decide where to arrange them in that week's list. Make a record of each time you procrastinated or gave in to other distractions. Also note how often you kept to your schedule—it can motivate and

encourage you to stay with it

Schedule time for self-testing. Avoid deferring your first self-testing until just before an exam deadline Build it into your schedule as part of your ongoing study activities and benefit from the feedback You can then do "last minute" testing to aim for greater accuracy

Effort

Avoid excessive fatigue. It is expected that you will work hard to be ready for an exam, but allowing yourself to get excessively tired and sleep deprived sabotages your goal Respond to your body's need for rest instead of pushing for another hour's study with little to show for it Try to pace yourself so that you have energy left to think clearly when you take the exam

Keep motivation high. One of the possible pitfalls toward the end of your review is a reduction in your level of attention and concentration, because of either fatigue or emerging apprehension about the imminence of the exam If you have done some record keeping during the preparation sequence, it now is helpful to look back and acknowledge how far you have come from the point where you started Reward yourself for progress by planning a pleasurable activity following a block of concentrated study, and enjoy it without guilt

Resources

Comprehensive question sets. For USMLE Step 1, materials such as Lippincott Williams and Wilkins' *Review for USMLE Step 1* (NMS series), which provides five practice exams with approximately 200 questions in each exam, will be useful for comprehensive evaluation

Monitoring Functions

As the exam deadline approaches, you may find that you are experiencing frequent mood shifts When things are going well, your spirits may be high, but after a disappointing day you may feel blue, gloomy, or even angry Some recent research has found that there are some techniques that work better than others to escape from a bad mood

- 1 Take some action If possible, do something to solve the problem that is causing the bad mood
- 2 Spend time with other people, particularly to shake sadness Focus on something other than what is getting you down
- 3 Exercise: *The biggest boost comes to people who are usually sedentary, rather than the already aerobically fit.* Pick a sensual pleasure, such as taking a hot bath or listening to a favorite piece of music Be careful of using eating for this purpose, it may work in the short run, but may backfire, leaving you feeling guilty Drinking and drugs are to be avoided for obvious reasons
- 5 Try a mental maneuver such as reminding yourself of previous successes to help bolster your self-esteem
- 6 Take a walk Cool down before confronting whatever gave rise to your negative feelings
- 7 Try to see the situation from the other person's point of view-why someone might have done whatever provoked your anger
- 8 Lend a helping hand to someone in need If you are studying, offer to help someone understand a science topic in which you feel very competent
- 9 Use stress reduction techniques Among the most effective are progressive relaxation, which uses tension and tension release in the body's muscle groups, mental imagery, which is putting yourself mentally in a location that evokes feelings of calm and peacefulness, and meditation, which aims for a state of relaxed alertness