Cognitive Errors (Can They Be Prevented?)

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Cognitive errors of omission and commission are undoubtedly the most common types of medical errors. There are 2 types of such errors: those due to a lack of knowledge and those caused by the misuse, or the lack of use, of knowledge. The question is, can these mental activities be dealt with in such a manner that medical errors are diminished? The answer is maybe. This being true, this essay was created after 58 years of carefully observing the habits and behavior of medical students, house officers, fellows, and practicing physicians.

Background Information and Definitions

According to I.F. Stone, Aristotle gave Socrates credit as the first teacher to demand absolute definitions of words and terms. Since Socrates walked the streets of Athens, there have been many other wise individuals who have emphasized that accurate communication is not possible unless the parties involved agree on the definitions of the words and terms that are used. This point must be emphasized more vigorously today than it was 58 years ago, when it was, for example, acceptable to simply state that a patient with chest pain had a “coronary.” That term became grossly inadequate because medical progress made it possible to identify more precisely what actually happens to the heart of such a patient.

Also, the language we use as physicians must match our knowledge of the problem. Much could be written about this subject, because many of the words we currently use are “hangovers” from the past. For example, the left atrium is not located on the left on a chest x-ray film; it is located in the middle of the cardiac silhouette and posteriorly. It is poor communication to use the words “left atrium.” However, habits are difficult to change, and because of this misnomer, many nascent physicians will never know where the left atrium is located.

To communicate accurately, it is necessary to define the following words and terms, because they all play a role in our effort to improve our knowledge base and prevent cognitive errors.

**Memory:** Memory can be defined as the ability to recall information that has been stored in the brain. The items that are recalled could have been stored in the brain many years ago or only seconds ago.

Whereas individuals have different innate abilities, memory also depends on the willful linkage of new information to information that is already stored in the brain and the use of the new information as often as possible.

**Thinking:** Thinking involves the rearrangement of information that has been recalled into a new perception. Thinking is the manipulation of memories that were stored in the brain years, months, or seconds ago.

Most people forget the lessons of algebra. I always believed that algebra taught an individual how to think uninfluenced by emotional factors. Who can get emotional over A and B and X and Y? The thinker understands that A + B = C, where A and B are different items and C is a new perception created by their union. The nonthinker sees A + B = A and B, where A and B remain separate.

Visual thinking entails the creation of mental images that depict a specific situation. Architects visualize the specific information potential builders describe to them to create a 3-dimensional image of future buildings. The interpreter of an electrocardiogram visualizes the 3-dimensional heart and actually “sees” the spatially oriented diagnostic cardiac cardiac vectors.

**Learning:** No word is more misused than this. The word “learning” is often applied to physical acts as well as mental acts. The word should mean that individuals have practiced physical or mental tasks until they are fluent. They may or may not always perform perfectly—a professional concert pianist may miss an occasional note, and an Olympic champion pole vaulter may stumble—but the participants aspire to perform perfectly.

The word “learning” should not be used to designate a location in a building as a learning center. The learning center is the brain. It sits there waiting for repeated use in order to be fluent.

**Habits:** Habits are said to exist when individuals have performed mental or physical tasks until they are fluent and are able to perform accurately, almost as a reflex, without thinking. When people initially try to drive a car, they are “all thumbs,” but with practice and more practice, their feet strike the brakes the second a red light is seen; no new thinking is needed. As will be discussed later, excellent medical training includes the development of good habits of learning and behavior.

**Reading:** Reading is not the mere recognition of a string of words. Reading implies that the reader understands the meaning of the individual words and their union to make sentences and paragraphs. A reader should not turn the page of a book unless he or she understands what is written or illustrated on the page.

**Communication:** Communication is not simply informing someone by talking, writing, or using nonverbal signals. A communicator must have appropriate feedback from a receiver to be certain that the message was received correctly. This simple and basic concept is why lectures are not considered to be the best way to teach; lecturers rarely have adequate feedback from the members of the audiences they inform. In fact, lecturers rarely know what they have accomplished. They come, they speak, they go.
Classification: One of the great advances in medicine has been the development of a classification for many diseases. This encourages the brain to move from generalities to specifics. The point is that there may be several subsets of the same disease, and the treatment for 1 subset may be different from the treatment for another subset. For example, the specific treatment for cancer is often determined by the subset of the disease that is present. Likewise, using the New York Heart Association’s classification of heart disease encourages better thinking and dictates specific therapy.

Teaching: I have always divided those who teach into 2 groups. Those who announce information in lectures are often called teachers but should be labeled instructors or announcers. A true teacher is quite different from a teacher. True teachers are facilitators. They assist trainees in their effort to become self-learners. They have a long-term interest in helping trainees develop the proper habits of learning and actions.

The application of knowledge: All of the information that a physician knows about a subject may not be used in the care of a patient, but certain aspects of what is known should always be used in the care of the patient. For example, suppose that you ask a trainee, “Can you give me your view of a good diet? I know there is much argument about it, but what is your opinion?”

The trainee responds, “Sure.”
You then ask, “You believe this is important?”
The trainee states, “Yes, it’s very important.”
You ask, “What does your patient weigh?”
The trainee responds, “I don’t know, but he is very fat.”
You say, “Is that good?”
The trainee says, “No, of course not.”
You ask, “What does your patient eat? Does your patient exercise in an effort to lose weight?”
The trainee responds, “I don’t know.”
You ask, “Did you discuss this with the patient?”
The trainee responds, “No.”

The trainee possessed the knowledge but did not apply it in the care of the patient.

Checking one’s own work: A medical record for each patient should be produced that reveals the physician’s thinking and actions. What the doctor writes, what the doctor says, what the doctor thinks, and what the doctor does should all be the same and should be stated clearly in the medical record.

When the record has been completed, the doctor should review the record and ask a series of questions. This can be done in a flash when training has been adequate (see later discussion).

Self-checking is the key to decreasing cognitive errors. Just as smart individuals check their wills, grocery lists, and bank statements, physicians must check their own work before signing off on it.

The Improvement of Knowledge
Improving knowledge is the responsibility of doctors as long as they practice medicine or engage in medical research. The method used to improve knowledge should be well established during internship and residency. A trainee commonly arrives at an institution expecting to be taught by a group of seasoned true teachers. Good institutions are prepared to do that. Excellent true teachers will, when the time is right, begin to expect, and eventually require, that trainees become self-learners and self-teachers. This, when accomplished, ensures that nascent physicians will continue to improve their knowledge bases after they leave the institution and are no longer exposed to a plethora of true teachers. In fact, the true teachers they are exposed to during training must also prepare trainees to withstand the intense influences of advertisements and hucksters.

The prevention of cognitive errors due to a lack of knowledge cannot be achieved unless a trainee, who will later practice medicine, cares deeply for the welfare of his or her patients and intends to do the best for them. Those who teach the young must show them the way. The act of self-learning as a persistent habit must be learned during house-staff training.

There is no shortcut to avoiding cognitive errors produced by a lack of knowledge, except that the compassionate doctor, sensing that he or she does not know enough about a patient’s problem, obtains help. Even that sensible approach may not prevent errors, because even the compassionate doctor, who would gladly seek help, may not know when he or she does not know.

The Prevention of Cognitive Errors Due to the Misuse, or the Lack of Use, of Knowledge
The key to the solution is the medical record. The medical record should reveal the thoughts and actions of the physician in charge. The challenge for the physician is to make the record simultaneously brief and complete. The record should be easily understood by another physician. Each page of the record should be uncluttered, and important information should be displayed prominently so that it can be retrieved easily.

In addition to the attributes of an excellent medical record listed previously, the medical record should be arranged so that the physician who creates it can double-check it for accuracy and determine if the statements he or she has written are correct and that they communicate perfectly. For this to be accomplished, the record should be organized in a specific way. The problem-oriented record described by Weed4 can be used for this purpose. A database lists the items that a physician intends to initially search for in the history, physical examination, and laboratory work to discover the abnormalities needed to create specific diagnoses.

A generalist must screen all body parts for disease. A subspecialist screens a specific organ more intensively but screens the other body parts sufficiently to find the conditions that would influence decision making.

Generalists and subspecialists must search for each item in the defined database every time. They must know the mechanisms responsible for the abnormalities and have the skills to find them without fail. This is the first step in eliminating cognitive errors. To restate, a physician must know what information to collect from a patient and have
the skill to collect it. In addition, skilled physicians must understand the mechanisms responsible for the abnormalities they find. There is no shortcut for this.

Having identified the abnormalities in a patient, a physician must pause and think. The physician selects several items in the database and creates a new perception that is called a problem. The problem statements, which are listed on a separate page of the record, are the result of thinking and are numbered 1, 2, 3, 4, and so on. If physicians do not know how to cluster abnormalities and create a diagnosis, they must list each abnormality separately as a problem. An arrow should be placed after such a problem statement to indicate that it will be clarified. A physician then looks up the abnormality in a book or on the internet. To leave an abnormality unexplained is an obvious cognitive error of omission.

The same problem number and title are used to designate the initial plan for each problem. This makes it easy to identify what is being done for each specific problem. There are 3 types of planning: diagnostic plans, where plans for specific diagnoses are listed or where differential diagnoses are listed; therapeutic plans for the problem; and educational plans for the problem. The content of each sentence must be germane to the subject indicated in the problem statement. Orders are identified by the same problem title and number.

Finally, a numbered and titled progress note should be written for each active problem. The number should match the number in the problem list. All entries here must be germane to the problem statement. This forces a physician to determine what exactly should be followed for each problem. New data are collected under the headings “subjective” and “objective.” The physician then assesses the new data and creates a new plan. To repeat, all statements must be germane to the problem being followed. This act prevents the common cognitive error of covering up poorly understood abnormalities by burying them in a paragraph of disorganized and unrelated jargon. The physician should not write “A/P,” where “A” stands for “assessment” and “P” for “plan,” because these 2 mental efforts are entirely different and should not be blended together.

The medical record should also be arranged so that the classification of disease is implemented. For example the New York Heart Association’s classification of heart and peripheral vascular disease should be used, and the classification of neoplasm should always be stated. Such classifications are created when medicine advances to a higher level of understanding and should be incorporated into our daily work.

No redundant words should be included in the medical record. To reemphasize, the writing should be brief but complete, clear and germane, and ready for the quick review by the physician who created it. To this end, I recommend the little book written by William Strunk and E.R. White to all physicians who create medical records.

**The Quick Review**

**Questions physicians should ask themselves about the records they create:** A physician should ask the following questions: (1) Have I identified adequate data to permit me to make the diagnoses I have made? Have the criteria for diagnoses been changed? (2) Are all the significant abnormalities listed in the database accounted for in the problem list, either as attributes of a diagnosis or as separate problems that need to be pursued? (3) Do all of the items listed in the anatomic and physiologic parts of the classification fit the etiologic statement (when 1 of the problems is heart disease)? (4) Have I indicated the cause of each of the patient’s problems? (5) Did I use secondhand evidence to make a diagnosis? Did I accept the patient’s statement that she has lupus? Did I accept the diagnosis made by a colleague in the old record as being accurate? Doctors should respect the statements of patients or colleagues but should also verify the diagnoses with their own evidence. Many errors are made in group practice when a diagnosis made by 1 doctor is accepted without direct evidence by a colleague. (6) Does the patient agree with my problem list? Patients may wish to add problems that doctors have left out. (7) Are there any errors of omission of commission? Am I proud of this rendition of the patient’s medical problems? Can another doctor who reads this record understand what I discovered in the patient and what I did for the patient? The doctor who created the problem list should stand back, look at it, and think.

**Examples Bad and Good**

Assume that a physician has just examined a 55-year-old obese woman who has chest pain and hypertension. She states that she has diabetes. In 1950, a diagnosis might be produced as shown in Figure 1.

The format for the medical record gradually changed for the following reasons: in 1921, Paul White and M.M. Myers created a new classification for heart disease; the New York Heart Association simultaneously emphasized the same approach and has published several books on the subject; Weed created the problem oriented record; and my colleagues and I combined the 2 approaches.

Now back to the patient. Today, a physician would create a very different record than the kind commonly created in 1950, because the progress of medicine demands it. Unless this is understood, cognitive errors will continue to occur.

Today, a physician finds it useful to list all of a patient’s medical problems on a special page in the patient’s record. Physicians also find that they should classify disease more carefully than was done in the past. The simple accomplish-
Physicians should recognize that they could not complete the format shown in Figure 2 because they knew nothing about the functional class and objective assessment (note the blanks in figure). Conscientious physicians would pursue the matter. They would discover that there are several types of coronary disease and that they should state more precisely that the patient has the criteria needed to update the cause to coronary atherosclerotic heart disease (see Figure 3). They would discover that it is not wise to state that a patient only has angina pectoris, because stable and unstable angina are different. In fact, the recognition, pathophysiology, treatment, and prognoses of the 2 conditions are different. They would update the record as shown in Figure 3. For the first time, they are discovering about the 2 types of classification of angina pectoris, 1 for stable and 2 for unstable.

Physicians should ask if all of the abnormalities they discovered are accounted for on the problem list, either as problems or attributes of a diagnosis. They notice that they forgot to list the elevated serum calcium on the problem list. They add the abnormality to the list and add an arrow after it. They must complete the initial plan for elevated serum calcium. They also notice that they did not list that the patient had not had a mammogram. That omission must be corrected. They remind themselves that they must participate in the early detection and prevention of disease.

Figure 3. January 2, 2008, after checking. BMI = body mass index; wt = weight.

Finally, many records are filled with redundant or useless paragraphs, while others leave out important data for brevity. Above all, each of us must learn to communicate accurately by creating a medical record that is simultaneously accurate and understandable. It is the responsibility of every physician to create a meaningful and useful record. A record that is not complete or correct is of no value to the patient or the physician. A record that is correct and complete is a valuable tool for the physician and the patient. A record that is correct and complete is a valuable tool for the physician and the patient. A record that is correct and complete is a valuable tool for the physician and the patient. A record that is correct and complete is a valuable tool for the physician and the patient. A record that is correct and complete is a valuable tool for the physician and the patient.
brief and complete. When this is accomplished, it is easier for a physician to double-check it for cognitive errors.

Summary

Cognitive errors are common.

There are 2 types of cognitive errors: those due to a lack of knowledge and those due to the misuse, or lack of use, of knowledge.

The preamble to the discussion about the prevention of cognitive errors includes the definition of a number of items that must be understood to accomplish the act.

The format for the problem-oriented record and the New York Heart Association’s classification of heart disease are discussed because the medical record is used to organize data and display the conclusions of thinking. As discussed, such a record can serve as a vehicle to prevent cognitive errors of omission and commission.

An example is given illustrating how the physician’s knowledge base can be increased and how a series of questions decreases the misuse of information.

This type of recording and checking should be taught in medical school and should be perfected during house-staff training and the practice of medicine. Checking one’s own work to communicate accurately, briefly, completely, and quickly should be the goal.