

# Patient Education



# An Approach to Patient Education

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## Learning Objectives

After reading this chapter, the healthcare provider will be able to do the following:

- Recognize the importance of patient education as the first step in managing a patient's health concerns.
- Outline the techniques involved in the communication-interview process in order to be able to effectively educate and motivate patients to be active participants in their own health care.
- Discuss issues surrounding patient education in terms of demographics and chronicity of disease.
- Evaluate how patients react to illness and its management according to their cultural norms and according to their own perception of the severity of the illness.
- Provide patient education to various patient populations.

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## Main Points

- Providers must be able to encourage patients to be participants in their health care toward the goal of affecting a healthy outcome.
- Whether it involves asking an individual simply to take medication or to make substantial lifestyle changes to promote better health, providers must be able to effectively communicate, educate, and motivate the patient.
- Careful attention must also be given to patients' emotional responses to a particular diagnosis or treatment method because these reactions can have a significant impact on the outcome.
- Effective patient education should be duly recognized as an integral building block in the entire health delivery process, of equal importance to clinical and technological advancements in the field.

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## Introduction

This chapter summarizes recommendations as originally proposed by Cole in the first edition of *Patient Education: A Practical Approach*.<sup>1</sup> As we continue in the 21st century,

it is an understatement to observe that the healthcare field is increasingly complex and diversified. In recent years there have been dramatic changes in the number of providers, advances in medical technology and the understanding of disease, and striking developments in various methods to treat these problems. The bottom line is to be able to provide better patient treatment toward the goal of affecting a healthy outcome. The chief means to accomplish this goal is through an interactive educational process. Whether it involves asking an individual simply to take medication or to make substantial lifestyle changes to promote better health, providers must be able to effectively communicate, educate, and motivate the patient.

Various approaches to patient education have been outlined over the years and still apply today.<sup>2-8</sup> They all emphasize the importance of providing accurate information and encouraging patients to assume more responsibility for their own treatment. Many of the techniques employed to accomplish such education share common characteristics. For example, explanations need to be given in simple terms, avoiding jargon that might be confusing. Also, the healthcare provider must assess the patient's understanding of the information in case further explanation is necessary to clarify questions or reduce confusion. Careful attention must also be given to patients' emotional responses to a particular diagnosis or treatment method because these reactions can have a significant impact on the outcome.

Effective patient education should be duly recognized as an integral building block in the entire healthcare delivery process, of equal importance to clinical and technological advancements in the field. For example, in 1989 Greenberg noted how important the patient and provider communication process is and how its impact can be felt way beyond the immediate medical problem being treated.<sup>9</sup> Still appropriate today, he suggested that good patient education will

- enable patients to assume greater responsibility for their own health care;
- improve their ability to manage acute as well as chronic illnesses;
- provide opportunities to choose healthier lifestyles and practice preventive medicine;

- improve adherence with medication and treatment regimens;
- increase satisfaction with care and thus reduce the risk of liability;
- attract patients to your practice;
- lead to a more efficient, cost-effective healthcare system.

## A Model for Patient Education

Recognizing the importance of patient education is the first step. Then follows the actual learning of techniques involved in the communication–interview process in order to be able to effectively educate and motivate patients to be active participants in their own health care, rather than passive responders. Utilizing a checklist can aid in learning how to put the interview together and cover both content and process aspects of the interaction. **Figure 1–1** displays the various elements involved in this checklist.

One can easily adapt this model to accommodate whatever disease problem needs to be reviewed with the patient. The following is a brief discussion of the elements listed, which can serve as a refresher for conducting the interview.

### 1. Opening the Interview

- Putting the patient at ease
- Use of social amenities
- Eye contact
- Professional demeanor
- Layout of interview plan

Opening the patient education interview, like opening any communicative interchange, can be enhanced by using several short phrases that serve as social amenities. These can include such remarks as, “Any problems getting into the office today?” or “Hope you haven’t had to wait long,” or “Are you enjoying the nice weather today?” All of these serve to break the ice and set the stage for the social interaction about to follow. Furthermore, they can be of clinical importance in that they allow the interviewer to quickly assess the patient’s general attitude. A smile and pleasant response communicates a mood far different from another one in which the patient simply grunts or stares back. This latter communication may suggest pain or discomfort, a *let’s get down to business* attitude, or perhaps underlying fear at what may be about to happen. Other essential ingredients of the interview involve using good eye contact and maintaining a professional demeanor (e.g., neat appearance, concerned and attentive attitude, appropriate note taking).

Finally, in setting the stage for the interview, giving the patient some sense of what is going to occur (e.g., a layout) is essential for the soon-to-follow educational process. Just as in a classroom situation where an outline of a lecture can help a student follow the material, so can a layout for the health education interview assist the patient. For example, one might say, “What I would like to do today is explain our findings to you and what we have come up with as a diagnosis. Then I would like to describe the treatment plan we have developed for you and respond

to any questions you may have about it. Does that sound okay?”

### 2. Discussion of Disease

- Report lab findings
- Give diagnosis
- Assess what patient knows
- Assess patient’s initial feelings and attitudes
- Explain pathophysiology
- Use vocabulary appropriate to patient
- Ensure correctness of information
- Assess patient’s final understanding

One can make the transition from the opening interchange to this section with a remark such as, “Now let’s talk about our findings.” This is the opportunity to report on lab work, X-rays, or other medical procedures so that a patient clearly understands what he or she was being tested for and what the results suggest. As noted earlier, using clear explanations with no jargon is essential.

After summarizing the laboratory and physical findings gathered during the patient’s first appointment, it is now time to give a diagnosis, which might begin, “After reviewing the lab findings and your physical examination, we have concluded that you have a problem called . . .” It is best then to ask the patient, “What do you know about this condition?” This will allow the interviewer to quickly identify any myths or misinformation the patient currently holds, as well as any particular fears the individual may have about the diagnosis (e.g., perhaps a relative had a similar diagnosis and experienced continuing problems). Clearly such issues will need to be addressed during the course of the education interview.

The importance of assessing the patient’s attitudes and feelings regarding a diagnosis cannot be overemphasized. This should be done early on in the interview and again toward the end. One might, for example, say, “How do you feel now about learning that you have this sort of problem?” Being able to provide support and reassurance to a patient who is apprehensive about his or her condition is an integral part of the treatment process and can help to ensure compliance with later treatment directives.

At this point in the interview, it is now valuable for the healthcare provider to explain the pathophysiology of the disease process. Such information should be provided in simple, straightforward terminology, and it can often be facilitated by the use of diagrams or analogies that are more comprehensible. Providing such information both verbally and visually may contribute to a more complete understanding. When the explanation has been provided, it is critical to check out the patient’s comprehension and understanding of his or her condition. To do so, one might ask, “I would like you to explain back to me, very briefly, your understanding of this problem.” Any misinformation can then be corrected to ensure full and accurate awareness of the situation.

### 3. Treatment

- Present treatment goals
- Present complete treatment plan
- Individualize treatment to patient

Student _____ Rater _____ Date _____																		
Instructions: Rate the student's performance in each of the following areas. Where appropriate, mark the narrative descriptors in the left column. Circle one number in the right column for each category.																		
										Weak	Outstanding							
1. OPENING THE INTERVIEW										1	2	3	4	5	6	7	8	9
Putting the patient at ease ____ Use of social amenities ____ Eye contact ____ Professional demeanor ____ Layout of plan ____										Notes:								
2. DISCUSSION OF DISEASE										1	2	3	4	5	6	7	8	9
Assesses what patient knows ____ Assesses patient's attitudes/feelings ____ Reports lab findings ____ Explains pathophysiology ____ Vocabulary appropriate to patient ____ Correctness of information ____ Assesses patient's final understanding ____										Notes:								
3. TREATMENT										1	2	3	4	5	6	7	8	9
Presents complete plan ____ Presents treatment goals ____ Explains side effects/complications ____ Treatment individualized to patient ____ Assesses patient compliance ____ Correctness of information ____ Assesses patient's final understanding ____										Notes:								
4. ASSESSMENT OF PATIENT'S UNDERSTANDING OF DISEASE AND TREATMENT										1	2	3	4	5	6	7	8	9
Assesses patient's overall understanding of disease and treatment ____ Assesses patient's attitudes ____ Allows for questions ____ Flexible in presentation ____										Notes:								
5. APPROPRIATE USE OF COUNSELING TECHNIQUES										1	2	3	4	5	6	7	8	9
Tried to clarify patient's statement ____ Reassurance and empathy ____ Appropriate use of silence ____ Appropriate vocabulary ____ Use of open-ended questions ____ Facilitative behavior ____ Use of notes ____ Use of educational aids ____ Flexible ____ Good use of probes ____ Good transitions ____ Appropriate pacing ____ Good use of summaries ____ Overall physical appearance ____ Nonverbal language ____ Appropriate use of patient's background ____ Makes clear the next step for patient ____ Asking for questions ____										Notes:								
6. OVERALL EFFECTIVENESS OF CONDUCTING PATIENT COUNSELING										1	2	3	4	5	6	7	8	9
Rapport building ____ Discussion of disease (pathophysiology) ____ Treatment program ____ Assessment of patient's understanding of disease and treatment ____ Use of counseling techniques ____										Notes:								
7. COMMENTS AND SUGGESTIONS FOR IMPROVEMENT:																		

**Figure 1–1** Patient education rating form.

- Explain side effects or complications of medication
- Ensure correctness of information
- Assess patient's compliance
- Assess patient's final understanding

Following the pathophysiology discussion, one now needs to review the specific treatment plan that has been designed for this particular patient. To move into this section one might say, "Now let's talk about how we're going to treat this problem." It's best to start off by highlighting the overriding goals of the treatment plan. For example, common goals can be to alleviate pain, reduce and eliminate the disease process, ensure satisfactory functioning, and maintain a satisfying quality of lifestyle. Then one might go on to say, "To accomplish these goals, we've developed a three-step treatment plan for you." This would be the opportunity to identify and explain fully the specific steps in the treatment plan (e.g., medication, exercise, weight reduction, smoking cessation, or whatever is appropriate for the defined condition). It should be noted that it is particularly helpful if the interviewer identifies the number of steps in the treatment plan, whether three or four or more. Doing so can provide a framework, which tends to be less confusing for the patient and aids in acquiring a full picture of what is being asked, rather than what so often happens when a healthcare provider tries to explain a treatment plan by saying, "And next . . . , and next . . . , and next . . . ." Facilitating the treatment explanation by providing handouts or diagrams and encouraging a question-and-answer dialogue can maximize the effectiveness of this interactive process (see Patient Information sections and diagrams).

When medication is being discussed as a treatment step, it is of special importance that one be very clear about the uses and side effects of such medication, including any potential interactions with other drugs or food as well as proper methods of storing the medication. Reviewing such important considerations and providing package inserts or other data sheets that a patient can take home are vital to increasing adherence and avoiding unnecessary problems (see Chapter 5).

As one might expect, certain aspects of a treatment plan will likely be easier for a patient to follow than others. For example, it may be easier for an individual to take medication than to try to make substantial changes in his or her lifestyle. One can always expect some resistance and difficulty when trying to effect the latter changes. To make some assessment of how a patient is going to handle the prescribed treatment plan, it can be prudent to ask probing questions such as, "Which of these treatment steps will be the easiest for you to follow?" and "Which will be the most difficult?" In some instances, it may be more practical to try to encourage the patient to accomplish those treatment steps that are easiest to comply with and save the more difficult ones to address for a later interview. Otherwise, one may run the risk of turning off the patient completely, and he or she may not return for any follow-up.

At the conclusion of this section, it is once again important to assess the patient's final understanding of what needs to be done. This might be accomplished by a request such as, "I would like you to repeat for me now

the treatment steps involved in your plan." By so doing, one can ensure that the patient comprehends the treatment program and is prepared to go forward with the prescribed plan.

#### 4. Summarizing the Interview

- Assess patient's overall understanding of disease and treatment
- Allow for questions
- Assess patient's attitudes and feelings toward disease and treatment
- Provide handouts
- Schedule follow-up visit

Upon completion of discussing both pathophysiology and treatment, it is helpful to assess the patient's overall understanding. This can be done by asking, "Are there any questions now about your condition or about the treatment plan we've developed?" This would provide the patient the final opportunity to raise issues that may be unclear as well as allow the interviewer to evaluate final comprehension and gauge compliance. In addition, this would be the time for the interviewer to ask, "Now that you are aware of your condition and the treatment steps you need to follow, how do you feel about this whole process?" Again, it is critical to ensuring an eventual positive outcome to assess how the patient feels about the situation. Underlying fears or doubts about being able to follow the treatment plan need to be addressed. Typically a patient may be overwhelmed by what has been presented and may feel that he or she is not going to be able to handle the necessary steps in treatment. This is often a point at which the healthcare professional can demonstrate empathy, offering support and encouragement. For example, one might say, "I know this is a lot to deal with right now, but I want to assure you that I will be here to support you throughout this process." This sort of reassurance can be timely and helpful to the patient about to leave and embark upon making changes. In addition, providing various materials that the patient can take home for further study and for sharing with family can be quite helpful. Finally, scheduling a follow-up appointment and making sure the patient will be able to attend at the appointed time brings the interview to conclusion.

#### 5. Appropriate Use of Interviewing Techniques

- Tries to clarify patient's statements
- Reassurance and empathy
- Appropriate use of silence
- Appropriate vocabulary
- Use of open-ended questions
- Facilitative behavior
- Use of notes
- Use of educational aids
- Flexible in presentation
- Good transitions
- Appropriate pacing
- Good use of summaries
- Professional in appearance and demeanor
- Appropriate use of nonverbal language

- Appropriate use of patient's background
- Makes clear the next step for patient
- Asks for questions
- Closure and follow-up

The preceding techniques are basic to any good interview process. It is critical to use appropriate vocabulary to make sure a patient fully understands the nature of the disease as well as the treatment being prescribed. In addition, patients should be encouraged to express their thoughts and feelings, and this can be accomplished with such techniques as facilitation, eye contact, use of silence, and open-ended as well as direct questions. The key to a successful interchange involves flexibility on the part of the interviewer. It may be important to vary from the didactic, informational aspects of the interview to pay attention to a patient's need for reassurance and empathy. Moving through the interview in a well-paced fashion and using smooth transitions from section to section makes the entire interview more understandable to the patient as he or she tries to absorb all the information being offered. Finally, the use of audiovisual aids or handouts can be critical to ensuring that a patient fully comprehends his or her medical problem as well as what needs to be done to address it.

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### **Specific Suggestions for Enhancing the Patient Education Process**

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The following suggestions can aid in enhancing the patient education process.

#### **Pay Attention to Using Good Interviewing Techniques**

Helping patients to successfully deal with medical problems involves being able both to educate and to motivate for change. This requires use of skillful interpersonal techniques. One needs to be attuned to both verbal and nonverbal aspects of the interaction. With time and practice, one will develop a sense of when it's best to be silent and listen to a patient and when to provide specific educational information or support. Being prepared and organized ahead of time (e.g., having lab work on the chart, pulling together handouts, having a written-out treatment plan specifically for the patient) will facilitate the entire process and likely improve understanding and compliance.

#### **Present Information Through Several Channels**

Do not simply rely on direct verbal communication to ensure a patient's understanding. For some people, verbal learning is not as successful as visual learning. That is, some individuals may understand and retain information better if they are able to look at a handout, chart, Internet site, or follow an examination of an X-ray. Also, some patients may benefit from the opportunity to meet and talk with others who have dealt with a certain problem or are currently undergoing treatment for a particular medical condition. Such peer support can be a very effective tool in motivating an individual to comply with treatment.

### **Always Supplement the Educational Process with Teaching Materials**

The patient education process can be overwhelming because so much information may need to be covered. It is therefore recommended to provide patients with brochures, handouts, medication inserts, electronic resources, an outline of the treatment plan, or other materials that will permit later perusal to reinforce what was covered during the actual interview (see Chapter 2).

### **Involve Families or Significant Others Where Possible**

Remember that the patients are part of a larger family system. Most often these family members are very concerned about the health of their loved one, and involving them in the treatment process can be very useful. Indeed, such involvement may in some cases ensure compliance with a treatment plan. Ask how the patient is going to explain a particular health problem to his or her family. Invite family members to attend a follow-up appointment so that they, too, can hear about the situation and learn how they can help.

### **Be Sure to Raise the Sensitive Issues**

There are certain subjects that tend to be highly sensitive, and some patients may have underlying concerns or fears that they may not openly voice. Such topics as sexuality or death and dying fall into this category. Because these topics may produce embarrassment or feelings of despondency, a patient may be reluctant to inquire about them. Therefore, it is critical for the healthcare professional to initiate such a discussion when it is clearly pertinent to the treatment plan (e.g., medications that might interfere with sexual functioning, the need for a patient to recognize that the treatment options for a particular condition may be only palliative). Raising these issues signals that it is all right to talk about more sensitive matters and allows the patient to openly express his or her underlying fears and concerns.

### **Be Attuned to Emotional Reactions**

As previously noted, patients experience emotional reactions to learning of a particular illness and the need to follow a course of treatment. Providing comprehensive health care requires exploring these emotional topics. Whether the patient is expressing fear, anger, anxiety, or depression, unless the healthcare professional inquires about such reactions and takes steps to address them, the treatment outcome may be in jeopardy. Allowing for ventilation of feelings and offering support are viewed as an integral part of the patient education process.

### **Don't Think That When the Topic Is Covered It Is Completely Resolved for the Patient**

For some individuals, providing education about a disease or treatment plan will be enough to motivate them to go forward and carry out what has been prescribed. For



others, however, there may be lingering confusion or questions after this interview that will need to be addressed at a later time. In addition, certain aspects of the treatment plan that are more difficult for a patient to deal with (e.g., making lifestyle changes such as smoking cessation or weight reduction) will need to be reviewed and further encouraged at a later appointment. It is always prudent to review a patient's treatment plan at each subsequent follow-up visit, offering praise for the accomplishments and noting areas for additional attention.

### **It's Okay to Say "I Don't Know"**

It is not uncommon for a healthcare professional to be asked a question that he or she is unprepared for and for which an answer is not immediately available. Rather than trying to stumble through a lame explanation or using technical jargon in an effort to cover up, it is always recommended that the interviewer simply respond with "I don't know." Realistically, one may not have the answer to certain questions, and it is best to acknowledge this fact. The interviewer might go on to say something like, "I really don't know the answer to that question, but let me look into it and I'll get back to you with an answer."

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### **Other Factors Influencing Patient Education**

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There are many parts to the concept of health, including how one thinks about disease and its cures. Health care in the United States is based primarily on treating acute, well-advanced disease processes, using an infectious disease paradigm. However, the causes of poor health and serious disease processes are no longer associated with a single infectious microbe but instead linked to a multiplicity of factors, particularly behavioral and cognitive habits along with specific social and physical environments. Patients often react to illness and its management in ways learned from others, according to their cultural norms, and according to their own perception of the severity of the illness.

#### **Age**

Although an obvious consideration, age is not always reflected in patient education materials and is often overlooked in the patient education counseling session. One must remember that the range of care starts with infants and ends with the elderly. Let us start with children. They are not small adults, and their wants, needs, thinking processes, and emotional and physical status differ from those of an adult. For example, small children often view hospitalization as a punishment, not as means of getting well.<sup>10</sup> This belief is further reinforced when parental figures make such statements as, "If you go outside without shoes on, you may get sick and have to go see the doctor." This type of belief often leads to false perceptions about clinicians and to a child's difficulty in accepting medical advice or treatment. Infants, although not directly involved in patient counseling sessions, have special needs and respond to touch and nonverbal communication.<sup>10</sup> As children grow older, however, one must

keep in mind the current fads, language, and norms. For example, teenagers often believe themselves to be experts in every area and, in some cases, do not heed advice. Furthermore, certain instructions given to teenagers regarding prevention of illness may not be "cool" or in line with the thinking of their peer group.

Adults are more mature and have different concerns from adolescents. For example, young adults (aged 20 to 40 years) are at a point in life where multiple activities (e.g., college, relationships, children) keep them busy.<sup>10</sup> These patients need practical approaches to education—approaches that are not time consuming and unrealistic in relation to their lives. As adults grow older (aged 40 to 60 years), they become more conscious of the possibility of health problems and in most cases are willing to follow a patient education prescription. However, some may lack self-confidence, which can cause avoidance of the risk of failure in learning anything new.<sup>10</sup> Adults over the age of 65 years are similar to middle-aged adults in their willingness to learn new ideas, but the provider must be aware of the individuals' past experiences, involve them in the learning process, and motivate them to learn.<sup>10</sup> Elderly patients may feel that it is hardly worth the effort to learn new information and skills, because they think their life is nearing the end.<sup>10</sup>

#### **Ethnicity**

Ethnicity pertains to a social group that claims or is accorded special status on the basis of complex, often variable traits including religious, linguistic, ancestral, or physical characteristics. Ethnicity is simply defined as the condition of belonging to a particular ethnic group. Examples of ethnic groups in the United States include African American, Asian, Caucasian, Hispanic, and Native American. There are at least 106 ethnic groups and more than 170 Native American groups in the United States.<sup>11</sup> Ethnic groups should not be confused with minority groups because the latter are seen as different from the majority group. However, some ethnic groups are also classified as minorities, such as African Americans in the United States. One can see that the phenomenon of ethnicity is complex, ambivalent, paradoxical, and elusive.<sup>12</sup> As clinicians, it is important to be aware of the ethnic backgrounds of patients. The differences in language and culture each group exhibits will certainly influence the way patient education is communicated.<sup>13,14</sup> For example, some people think that HIV prevention literature is not communicated effectively to African American populations. HIV programs are hampered because of the presence of culturally specific attitudes and beliefs, including those pertaining to the roles of males and females.<sup>13</sup>

#### **Family**

Although consideration of the individual is important in patient education, as mentioned earlier, the patient's family is also of central importance if teaching is to be effective.<sup>15</sup> How a family functions influences the health of its members as well as how an individual reacts to illness. Including the family members and significant others in patient education sessions will facilitate adherence, understanding of



the disease process, and confidence needed to perform specific skills. Hence, the healthcare professional should capitalize on what family members can do for the patient and work with them in encouraging the patient in tasks that may be difficult. For example, when educating a patient with diabetes mellitus who requires insulin injections, involvement of the family in teaching sessions demonstrating insulin injections will most likely improve compliance. Family members can also serve as trouble-shooters when the patient has difficulty performing complex tasks. However, not all patients have family or significant others available for support. This is frequently seen in cases of HIV infection. Patients are often isolated from others after their diagnosis is made known. These patients are often on complex medical regimens involving the use of intravenous catheters. Unavailable support sometimes leads to poor care, missed doses, and increased morbidity and mortality.

The healthcare professional can do much to facilitate the effectiveness of patient teaching by fostering discussion among significant others. A professional who has continued contact with the patient and his or her significant others may check on the progress of the patient when necessary (and when appropriate) and identify any new problems that may interfere with optimal care.

## Socioeconomic Status

The socioeconomic status of patients should be carefully considered when initiating education sessions. Individuals in lower socioeconomic groups are less likely to seek treatment; if they seek treatment they tend to access health care later in the course of their illness, and they die sooner than individuals in higher socioeconomic classes. Hence, the clinician should be aware of the patient's personal income, living arrangements, and employment status and also have an increased awareness of the patient's health. Lower socioeconomic status has been linked to the development of disease states, the most noted being coronary artery disease.<sup>16,17</sup> For example, the provider clearly cannot erase poverty and improve access to health care for all; however, he or she can exert a positive impact on lower socioeconomic groups by working with their members to promote healthier lifestyles.<sup>13</sup> Some individuals often do not know what resources are available. The provider should point individuals to local resources that provide services and, if not possible, attempt to arrange for those services for the patient.

## Chronicity of Disease

Finally, illnesses that are acute present differently from those that are chronic and will cause a variety of reactions among patients. Healthcare providers must be aware of those illnesses that require extra emotional support and possible psychiatric intervention when preparing for patient education sessions. Furthermore, it is not enough to simply inform a patient of his or her medical condition without time for an initial reaction. Patients require time to react to a new diagnosis. The perceived seriousness and natural course of a disease will help determine how a

patient will respond. For example, the patient diagnosed with acute pharyngitis may feel really terrible during the illness but knows that it is a curable disease and is usually self-limiting. Hence, this patient may have fewer emotional problems and require less counseling, whereas the patient diagnosed with end-stage congestive heart failure, in which the long-term prognosis is likely fatal, will have a response that may need further intervention involving a psychiatrist, social worker, or nursing care.<sup>18</sup>

## Conclusion

It is hoped that the model and suggestions offered in this chapter on how to approach the patient education interview will serve as a refresher for the reader. Although this is certainly not the only approach to use, it is one that is comprehensive and addresses both process and content aspects of the interview. It is expected that each healthcare provider will develop his or her own style of interacting with patients, perhaps altering this model to fit his or her specific needs.

As the reader goes through this text, he or she should imagine how each particular problem might be adapted to the framework presented here.

## Acknowledgment

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