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Problem-Solving and Decision-Making in Family Practice

SUMMARY

The problem-solving strategies of family physicians have evolved in response to six features of family practice: the pattern of illness; the undifferentiated and unorganized nature of conditions seen; the early stage at which illness is seen; the family physician's unconditional commitment to patients; his continuing relationship with his patients, and the time pressure under which he works. The effect of these influences is described in terms of the model of the diagnostic process formulated by Elstein et al.[2] (Can Fam Physician 25:1473-1477, 1979).

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ALTHOUGH THE general principles of problem-solving are the same in all branches of medicine, each discipline has its own way of applying them. The differences between disciplines are due to differences in the problems they encounter and to differences of role within the health care system. The problem-solving strategies of primary and family physicians have evolved in response to six special features of family practice.

1. The pattern of illness approximates to the pattern of illness in the community. This means that there is a high incidence of acute, short term illness, much of it transient and self-limiting; a high prevalence of chronic illness, and a high prevalence of behavioral problems. Contrary to conventional wisdom, patients do not present with *either* physical *or* behavioral problems: they come with problems which are often a complex mixture of physical, psychological and social elements.

To deal successfully with this pattern of problems, family physicians' problem-solving strategies must be specially adapted for two purposes:

—They must be capable of separating, in the early stages of illness, the serious and life-threatening diseases from the transient and minor. Since the serious diseases come in the midst of the more common minor and transient illnesses, and since the symptoms are often very similar, this is no easy task.

—They must be capable of teasing out the physical, social and psychological elements of a patient's problem.

2. The illness is undifferentiated, i.e. it has not been previously assessed by any other physician. Because of this, the illness presented to family physicians is often in an *unorganized* state. The concept of unorganized illness is an important one for family medicine. What does it mean? When a patient first tells a physician about his problems and symptoms, he does so with little insight into their nature or cause. A patient who has had malaise, anorexia and discolored urine for five days, and fatigue, depression and headaches for three months, does not know that in the physician's mind these add up to two clusters of symptoms: one suggesting hepatitis, the other depression. When he presents his problems for the first time, they will not usually come out in an orderly sequence which reflects a clear concept of their nature and cause. He may, of course, have his own ideas about the significance of his symptoms, but this will often be very different from the assessment made by the physician. The way the symptoms are presented will also be strongly influenced by the patient's fears and anxieties and by his ability to express his sensations in words.

Once the patient has been through the process of assessment by a physician, all this changes. He learns that the malaise, anorexia and discolored urine are not isolated phenomena, but a cluster of symptoms associated with hepatitis. He learns that his tiredness is related to his feeling of depression, that his headaches are tension headaches, and that these are quite separate problems from the hepatitis. If we now imagine that his hepatitis becomes

worse and he is admitted to hospital, it is not difficult to see that the history he gives to the intern will be quite different from the one he gave to the family physician. It will be "organized" around the concepts of infective hepatitis and depression.

In summary, five factors contribute to the lack of organization in the data presented to the family physician:

- Patients often present more than one problem at the same visit. In one study,[1] the average number of problems was 2.54.
- The problems are often not presented in order of priority. The most serious problem may be left until last—or not even mentioned.
- The most sensitive problems may be expressed in indirect or metaphorical language.
- The problem is not necessarily the same as the disease.
- Much of the information presented is "noise", i.e. it is not useful in solving the patient's problems. At this stage, the patient usually has little insight into the significance of the data he is presenting.

3. Disease is often seen early, before the full clinical picture has developed. Information on which to base a precise diagnosis—the kind of information discussed in textbooks—is often not available to the family physician when he first sees the patient. Decisions have to be taken, therefore, with fewer cues than are available in the later stages of disease. They also have to be taken with different cues: symptoms change as an illness advances. Symptoms having diagnostic value in the early stages may be quite different from those which have diagnostic value in the later stages.

4. Since the family physician is available for all types of problem, he can make no prior assumptions about the type of problem likely to be encountered. His problem-solving methods must therefore be adaptable enough to deal with any problem. Since his commitment to patients is unconditional, he cannot make the categorization "my problem/not my problem," made by organ and system specialists.

5. The family physician's relationship with patients is continuous, transcending individual episodes of illness. This has two important consequences. Since the relationship is open-ended, the physician need be in no hurry to solve all the patient's problems. Observation over time can be used as a method for testing hypotheses—provided, of course, that there is no risk attached to waiting. Since the relationship is often a close one, the physician can use his personal knowledge of patients in formulating hypotheses, assessing probabilities and understanding the context of problems.

6. Since the family physician is directly available to patients, his workload can be predicted and planned to only a limited extent. This means that his decisions often have to be made under pressure of time. To be an effective decision-maker under these conditions the family physician must be particularly skilled in:

—ascertaining at an early stage what the patient's main problem is.

—formulating a strategy for dealing with the problem in the time available; focusing on the decisions which have to be taken at this visit; selecting the most efficient strategy for arriving at these decisions; formulating a plan for the longer term assessment and management of the problem.

—putting other problems in a priority order and formulating a plan for their longer term assessment and management.

The Problem Solving Process

Figure 1 shows a model of the clinical problem-solving process which applies to all fields of medicine. The model is based on the work of Elstein et al,[2] and Barrows et al.[3] When presented with a problem, the clinician responds to cues by forming one or more hypotheses about what is wrong with the patient. He then embarks on a search (the history, examination and investigation) to test the hypothesis. In the course of the search he looks for positive (confirming) and negative (infirming) evidence. If the evidence infirms the hypothesis it is revised and the search begins again. As indicated by the feedback loop in Figure 1, the process is a cyclical one, the clinician constantly revising and testing his hypothesis, until he has refined it to the point at which he feels justified in making management decisions. Even after this point, the clinician must still be prepared to revise his hypothesis if the progress of the patient is not as predicted.

Figure 2 illustrates the variety of hypotheses formed by family physicians. Besides the conventional clinical hypotheses, the family physician has to formulate hypotheses about such questions as why the patient has come, what his chief problem is and what kind of communication he is using. As indicated in the diagram, these do not follow each other in stages. The physician may have a clinical and behavioral hypothesis at the same time, or may move from one to the other and back again, wherever the evidence leads.

Cues

I define a cue as "an item of meaningful information". When a patient presents his problems, the family physician is confronted by a mass of data of varying value from the highly significant to 'noise'. Out of this mass of

Fig. 1
The Diagnostic Process
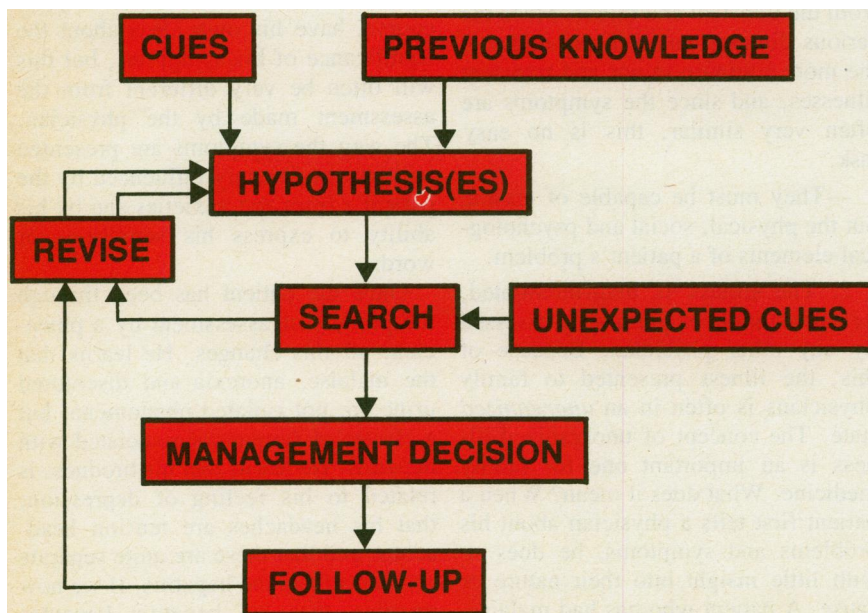
data he responds to *cues* which have meaning for him because they give him an idea about what is wrong with the patient.

Cues may point to certain or probable diagnoses. A cue may enable the physician to say with certainty what is wrong with the patient; this is usually what we mean by a spot diagnosis. These cues are unfortunately rare in family practice, as they are in most fields of medicine. Most cues indicate a number of different diseases with varying probabilities. The physician can then only formulate hypotheses, which have to be tested by a search for further information.

Of all the cues presented to family physicians, symptoms are the most important. In the early stages of illness, and in the varieties of illness seen by the family physician, signs are less frequently available. The family physician is especially concerned with two aspects of a symptom:

1. Its capacity to bring the patient to see him (i.e. its significance for the patient). Feinstein called this the "iatrotrophic stimulus".[4] For example, hemoptysis has a greater value as an iatrotrophic stimulus than cough.

2. Its sensitivity, specificity and predictive value in the early stages of illness.

Cues to the early detection of serious and life-threatening illness are of especial importance for the family physician. Even though he may see only one every ten years, he must still know how to separate the patient with subarachnoid hemorrhage from the thousands presenting with headache. He does this by recognizing key discriminating symptoms, described by Williams[5] as "red flags", which alert him to danger.

Hypotheses

Investigators of the clinical process have found consistently that clinicians form their first hypotheses very early in the process, very soon after the patient has presented his complaints. This is contrary to the orthodox view—often conveyed to medical students—that physicians collect a large body of data before formulating their hypotheses. Of course, medical students have to begin by going through a rather laborious routine, but this is because they do not yet have the knowledge and experience from which to generate useful hypotheses.

The clinician usually has between two and five hypotheses at any one time. To handle more than six is difficult for the human brain. The hypotheses are placed in ranking order, based on two main criteria: probability and pay-off.

Probability

Given the available data, the clinician estimates the probability that the patient is suffering from disease A, disease B, disease C, and so on.

This estimation has a mathematical basis—Bayes' theorem.[6] If we have accurate information about the incidence of the symptoms and diseases in question, we can calculate the probability of a disease, given the presenting symptoms. Before doing this, however, the clinician has first to go through the crucial step of deciding what weight to give to the patient's symptoms. The family physician's personal knowledge of his patients makes this a very important step. There has been little study of the contribution of personal knowledge to decision-making in family practice, but experience suggests that it may be the most important distinguishing feature.

How much does the ranking order of hypotheses matter? It matters because the order of hypotheses determines the search strategy. I heard a physician quoted as saying that he was "tired of admitting women to hospital with fatigue, doing hundreds of dollars worth of investigations, then finding that they were depressed and unhappily married." This is an example of a faulty search strategy based on an ordering of hypotheses not based on probabilities. The generation of depression as a first-ranking hypothesis would in these cases have led to a search strategy designed first to collect evidence in favor of the hypothesis, then to exclude other causes of fatigue with a few simple tests.

Before leaving the question of probability, two fallacies must be mentioned. The first is that the family physician always thinks of common diseases first. This is not necessarily so: it depends entirely on the cue. If the cue is a highly probabilistic one, like fatigue, this will hold true. If, on the other hand, the cue indicates a rare disease with relative certainty, this will be the physician's first hypothesis. If a hypertensive patient complains of attacks of sweating and flushing, for example, his first hypothesis may be pheochromocytoma, even though he may see only one case in his whole lifetime.

The second fallacy is that diagnosis in family practice is different from diagnosis in other fields of medicine because it is probabilistic. All clinical diagnosis is probabilistic: where family practice differs is in the relatively low levels of probability at which many decisions have to be made.

Pay-off

This indicates the consequences of diagnosing or not diagnosing a disease. The more serious the disease, and the more amenable to treatment, the greater the positive pay-off of making the diagnosis and the greater the negative pay-off of missing it. If a disease has a high pay-off it may be ranked high even though it has a low probability. In a child with abdominal pain, for example, acute appendicitis may be ranked high—even though of low probability—because of the high expected value of an early diagnosis.
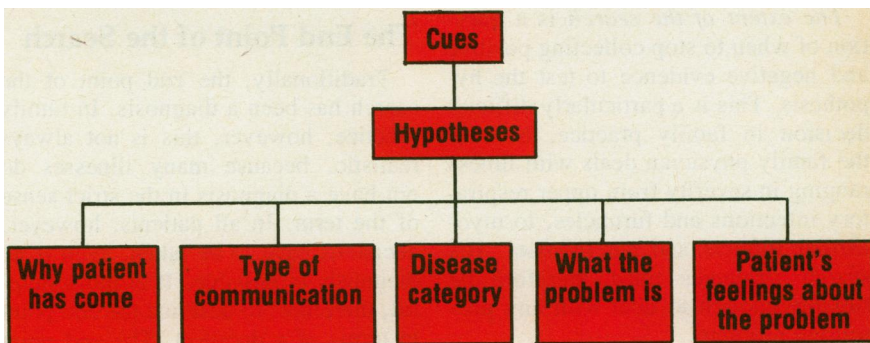
The Search

The purpose of the search is twofold: to test and validate the physician's hypothesis(es), and to bring to light new and unexpected cues. These purposes are fulfilled respectively by the directed and the routine search.

The Directed Search

Since its purpose is to test the physi-

Fig. 2.
Variety of Hypotheses Formed by the Family Physician

cian's initial hypothesis, the search strategy will vary with the hypothesis. In selecting a search strategy, the family physician has to make two kinds of choice: the choice of tests he will use and the extent of the search.

Choice of Tests. I use the term tests here to include history questions and items of physical examination, as well as pathological and radiological investigations.

Tests are chosen according to two kinds of criteria: sensitivity, specificity and predictive values, and calculations of risk/benefit.

Sensitivity, specificity and predictive value all measure the usefulness of a test in separating patients who have one disease from those with other diseases, or from those who are healthy. Galen and Gambino describe how these indices are applied in clinical diagnosis.[7] Two facts about the indices are significant for family physicians:

1. The predictive value of a test is strongly influenced by the incidence and prevalence of the disease. Since the incidence and prevalence of disease in a general practice population is very different from those in a hospital or clinic population, the predictive value of tests varies widely between family practice and other types of practice. Unfortunately, the advice given to family physicians by specialists is often based on experience with selected clinic populations. To learn family practice one must learn the symptoms and tests which have the highest sensitivity and predictive value *for a family practice population.*

2. Since the sensitivity of tests varies widely at different stages of a disease, and since he has a special responsibility for early diagnosis, the family physician must be particularly conversant with the sensitivity of tests in the early stages of disease. Most textbooks are written about the later stages of disease and do not describe tests in terms of their sensitivity, specificity and predictive value.

The extent of the search is a question of when to stop collecting positive and negative evidence to test the hypothesis. This is a particularly difficult decision in family practice, because the family physician deals with illness ranging in severity from upper respiratory infections and furuncles, to myocardial infarcts and carcinomata. His search strategies must therefore be flexible enough to deal with any presenting problem.

In family practice, the extent of the search is determined chiefly by the seriousness of the presenting complaint. A simple sore throat will normally require no examination beyond the head and neck. A cue to infectious mononucleosis, however, will indicate a more extensive search. A mild intercostal muscle pain will normally require no more than examination to elicit local tenderness. Tight sub-sternal pain, on the other hand, will indicate an extensive search. Another factor influencing the extent of the search is the physician's knowledge of the patient. A patient who tends to deny illness will warrant a more extensive search than suggested by the presenting complaint.

The routine search (routine systems enquiry and physical examination).

The chief aims of the routine part of the search are to bring to light cues which have not emerged in the directed part of the search; to collect baseline and background data on the patient, and to screen for symptomless conditions like hypertension.

The routine search is sometimes referred to as a "complete history and physical". This is a misnomer, for even the routine search is a selection from a much larger number of possible tests. As in the directed search, the tests are selected for their usefulness in achieving the objective. Internists would probably include ophthalmoscopy in their routine, but not laryngoscopy—for the very good reason that ophthalmoscopy has a higher utility for generating new cues in patients seen by internists. For similar reasons, otolaryngologists would probably make the opposite choice.

For two reasons, the family physician tends to use routine searches less than some other clinicians:
1. Since the patient is usually well known to him, he may already have all the baseline data he needs.
2. In minor and transient disorders, little in the way of a routine search is required.

The End Point of the Search

Traditionally, the end point of the search has been a diagnosis. In family practice, however, this is not always realistic, because many illnesses do not have a diagnosis in the strict sense of the term. In all patients, however, decisions have to be taken, even if no diagnosis is possible. It is more helpful, therefore, to describe the end point in terms of a decision. The end point

of the search on any particular occasion is the point at which enough information is available to make an informed decision without avoidable risk to the patient.

In family practice, end points are often different from those in referral specialties. A consultant seeing a referred patient will probably feel the need to make a definitive diagnosis before referring the patient back to his own physician. A family physician is not under the same constraint. The continuing relationship with patients means that all problems do not have to be solved immediately. Since the relationship itself has no formal end point, the search can be discontinued and resumed according to need. In this sense, there is no final end point, since the family physician should always be ready to revise his hypothesis if new evidence comes available.

The family physician, because of his role, makes two types of decisions which do not often arise in other branches of medicine:

1. *The decision to wait.* In making this decision, the physician is using the evolution of the illness over time as a test of his hypothesis. Obviously, he has also decided that no extra risk will be incurred by waiting. The use of time to validate hypotheses in this way can make many investigations redundant. One example of this decision is the *eliminative diagnosis*[8, 9] in which the physician decides that the illness is transient and minor, then waits for his hypothesis to be verified.

2. *The decision to refer.* The endpoint of a search may be the decision to consult with or refer to another physician. This decision may have to be taken before a definitive diagnosis can be made, for example, with a severely ill baby or a patient with an acute abdomen. It is clear that the objective of the family physician in these cases is different from that of the referral specialist. The family physician has fulfilled his obligation if he has decided to refer the patient in time for him to receive effective treatment. He has failed to fulfill his obligation if he has worsened the outcome of the illness by delaying referral in the interests of providing a diagnostic label.

Management Decisions

Diagnosis, in the usual sense of the term, is a categorizing process. Its end point is a probabilistic statement about what is wrong with the patient. A decision, on the other hand, cannot be pro-

babilistic. A clinician cannot "probably" prescribe an antibiotic or "probably" refer a patient. Management decisions have to be either/or. When he makes such a decision, the clinician takes the probabilistic statement and integrates it with a large number of other variables, many of them unique to the patient. Whereas diagnosis is a reductive, generalizing process, decision-making is a synthesizing, individualizing process. Among the variables which the clinician must take into account are:

—the diagnosis of the patient's main problem.
—other problems he may have.
—the prognosis.
—the personality and life situation of the patient.
—the risks and benefits of the decision alternatives.
—the patient's wishes.
—the family's wishes.
—ethical issues.

So complex are these interacting variables that two patients with the same diagnosis may be managed in different ways. Given the family physician's knowledge of his patients and their backgrounds, this may well be, as Stephens[10] has maintained, "the quintessential skill of clinical practice and the ground of what family physicians know that is unique." ◉

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