

Problem-solving by the physician

A human process

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A teaching and research project on medical problem-solving was set up at the University of Amsterdam in 1975. *Van Geldorp* (1980) has reported on the teaching aspects of this project in an earlier publication. This study considers the phenomenon that physicians often adhere persistently to primary hypotheses they advanced at their first contact with the patient.

Introduction

Eight physicians are watching the screen of a video-monitor which shows a general practitioner receiving a woman and her son in his surgery. The same information is available to the eight physicians as to the general practitioner: Mrs P with her 15-year-old son are seeking medical advice. The son is not known to have ever been seriously ill. The mother plays the central role in the family, the father being partly invalidated in view of „back complaints“.

The general practitioner asks mother and son what he can do for them and Mrs P answers: „Well, doctor, Michael was completely out of breath and had a heartbeat of one per second Wednesday, uh... Tuesday and Wednesday last week with judo and gymnastics, and it was still there after a 15-minute break and he was so terribly tired and he looked so terribly pale and his last medical for sports was a year ago and he should really have had another medical but this was postponed because he had to sit for an examination, and he came home absolutely fagged out, and his judo instructor did not like it much either. Now we'll have to go and see the doctor, I say ... I don't know if it is anything serious, of course but ... could it be that he is growing too fast?“

The screen goes blank and the eight physicians are expected to answer the following question in writing:

What hypotheses occur to you in view of

these complaints (this story told by the mother)?

This is the start of one of the meetings held with physicians (general practitioners and junior doctors receiving training in general medicine) in the context of a teaching and research project on „medical problem-solving“ (*Van Geldorp* 1980).

When in a later stage of the meeting the primary hypotheses formulated by the various participants (that is to say: the hypotheses prompted by the patient's – or rather, his mother's – first formulation of complaints) are considered, marked differences appear:

Physician A wrote:

- poor mother-child relationship;
- overanxious mother.

The fact that the mother spoke for her 15-year-old son and showed what he believed to be great concern about complaints which he thought unimportant, prompted him to make these notes.

Physician B wrote:

- perhaps pulmonary lesions and possibly cardiovascular disease.

He was prompted by the nature of the complaints (respiratory difficulties and a slow heart rate of 60/min after exertion) and by the fact that the mother was – he thought – very straightforward.

Physician C wrote:

- the complaints concern a boy who looks pale and has a fast pulse after exertion.

This physician sums up the information which she believes to be relevant and places an interpretation on it (fast pulse) because – she realizes in retrospect – the mother showed what she believed to be concern when she spoke about the heart rate.

The physicians all saw and heard the same, but there were nevertheless marked differences in the notes: a straightforward and an overanxious mother, the mother has the problem (physician A), the son has the problem (physicians B and C), the pulse after exertion is too slow (physician B) and too fast (physician C). Anyone confronted with such data can better understand the meaning of the statement that problem-solving can only be understood on the basis of the problem-for-the-subject (*Elshout and Frijda*).

The data generally available to the physician as problem solver are always unreliable to some extent, and partly of a subjective nature (*Van Geldorp et al.*):

- the patient is selective in his description of complaints; he interprets, reports spurious observations, supplies irrelevant information, and subjectively colors the intensity of various sensations (e.g. pain);

- the physician asks selectively, remembers selectively, interprets, overlooks information, overrates or underrates data, poses suggestive questions, and so forth.

For his information the physician must largely rely on people (the patients to begin with, but also others, e.g. specialists); as a human being he himself is subject to feelings of uncertainty, fear of making mistakes, the need to know all solutions, etcetera. He has to make diagnoses which can mean life or death: he may with impunity „find“ something that is not there but he will be seriously faulted – by others and by himself – when he overlooks something important that *is* there.

Two important trends can be distinguished in the literature on problem-solving: the normative trend, concerned with theories that define how problems should be rationally solved, and the descriptive trend, which attempts to define how human individuals actually handle problems in day-to-day practice. So far as the medical literature explicitly discusses problem-solving, this always concerns diagnosis. In the textbooks one finds the author's normative views on the desirable course of the diagnostic process. A fine example can be found in a textbook widely used by Dutch medical students. It is presented here by way of illustration.

To summarize, the diagnostic process should take the following course (*Oosterhuis*):

- a. Discriminate between signal (infor-

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mation of diagnostic relevance) and noise (information irrelevant to diagnosis).

b. Codify complaints and manifestations to symptoms.

c. Arrange symptoms in a syndrome or syndromes, if possible.

d. Trace the etiology of each syndrome and, given multiple syndromes, look for a common cause.

e. Trace the pathogenesis of symptoms or syndromes.

f. Arrange hypotheses on differential diagnosis in order of diminishing likelihood, taking into account:

- the symptom or syndrome
- the pathogenesis
- patient's age and sex
- previous illness.

g. Formulate a plan to verify or invalidate the differential diagnostic hypotheses, that is to make one of the disease either more or less plausible.

A physician who could establish a diagnosis in this way would be an unusually rational individual. In some cases a diagnosis may in fact thus be made, and it is certainly worthwhile at least to try to establish a diagnosis by the most rational means available. However, the nature of the information available to the physician (for example: can he determine in advance what is signal and what is noise?) and the psychological circumstances in which he has to make his diagnosis, will make it difficult for him to take so rational an approach.

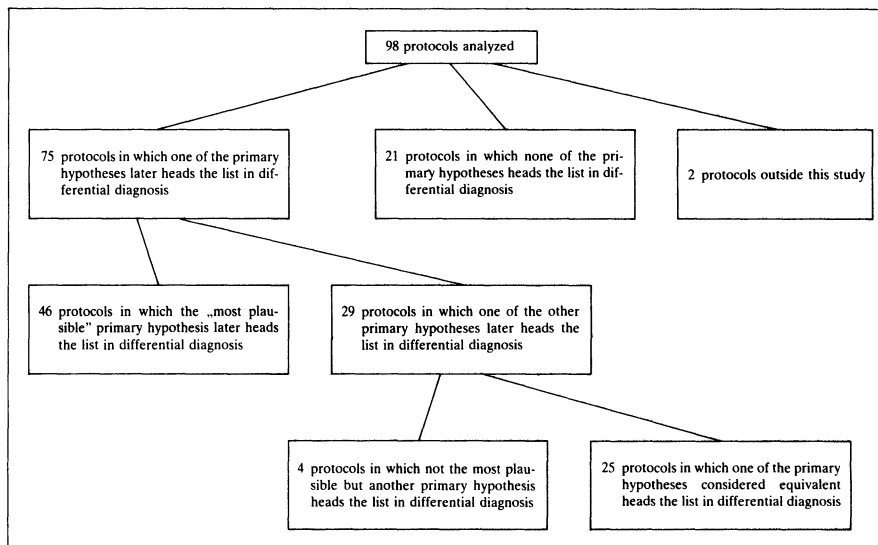
The first phase of the diagnostic process

Two phenomena are among the characteristics features of the first phase of the diagnostic process:

- Very early in the diagnostic process, physicians are believed to engender hypotheses of importance to their problem. *Elstein* maintains, for example, the experienced clinicians focus on a small area of tentative hypotheses very early in the course of their contact with the patient. This is at odds with the traditional view of medical problem-solving, holding that clinicians should first collect ample data before formulating a hypothesis. *McWhinney* reaches a similar conclusion with regard to the procedure followed by general practitioners.

- The so-called primacy effect: overrating the diagnostic value of the initial information (*Kozielecki*). Physicians, it is believed, tend to adhere persistently to the hypothesis engendered in the ini-

Diagram 1. A survey of the place of primary hypotheses in differential diagnosis.



tial phase. It is maintained that „the physician prefers to look for information which corroborates his original hypothesis rather than to look for information which would contradict it” (*McWhinney*). In other words: physicians want to confirm rather than test their hypotheses.

A similar theory can be found in the literature on problem-solving in a more general sense. *Wason* described some experiments which seem to confirm his postulate that people are generally reluctant to abandon a hypothesis they have accepted with regard to a problem: the majority of the test subjects proved exclusively to make attempts to find information in support of their original hypothesis; testing of the hypothesis by a search for information to the contrary was omitted. In this context, *Wason* mentioned „the failure to eliminate hypotheses”.

During our project, each of forty-one test subjects (thirteen experienced general practitioners and twenty-eight junior doctors receiving training in general medicine) was confronted with a number of cases (ranging from one to four). Analysis of the ninety-eight protocols* completed on these cases yielded several surprising data on the first phase – in which the patient for the first time explains his complaints.

* Protocols: observation forms completed by the participants after viewing (video-tapes of) the various phases of a consultation in the surgery. The phases were: 1) the initial formulation of the complaint, 2) the history, 3) physical examination. On the basis of this information the participants successively noted: 1) problem formulation with hypotheses, 2) hypotheses, 3) differential diagnosis.

Clinical look or blinders?

We have tried to deduce from the protocols whether the physicians in our laboratory situation adhered to their primary hypotheses. We have also tried to establish whether they did so rightly or wrongly: did they have a clinical look or were they wearing blinders?

In order to detect persistent adherence to primary hypotheses, if any, we considered how many hypotheses were mentioned first in the differential diagnosis formulated after completion of the history and the examination. By way of example: persistent adherence would be noted if physician A, whose primary hypothesis was „poor mother-child relationship, overanxious mother” would mention this hypothesis first in his differential diagnosis.

Diagram 1 shows that the primary hypotheses played an important role in our teaching set-up.

The second step in the analysis of the protocols concerned the quality of the persistent primary hypotheses. How close did such a hypothesis come to the correct diagnosis in the case concerned? On this point we confined ourselves to the seventy-five protocols which showed persistence. As a yardstick of the quality of the persistent hypotheses we used a so-called model protocol for each of the four cases (*Van Geldorp 1980*). The model protocol was composed by an experienced general practitioner with the aid of the relevant medical literature and contained the „ideal solution” for the case in question. For each case, the most plausible diagnosis in the model protocol were compared with the first diagnoses in the differen-

tial diagnoses given by the seventy-five test subject (diagram 2).

The first striking finding is that, in twenty-five protocols, the persistent primary hypothesis was at odds with the diagnoses mentioned as most plausible in the model protocols. It seems, therefore, that twenty-five of the ninety-eight test subjects adhered to a hypothesis insufficiently supported by information obtained from the history and physical examination. Did these twenty-five physicians act as diagnosticians with blinders, seeking only to obtain confirmation of the primary hypothesis and therefore ignoring information which might invalidate it?

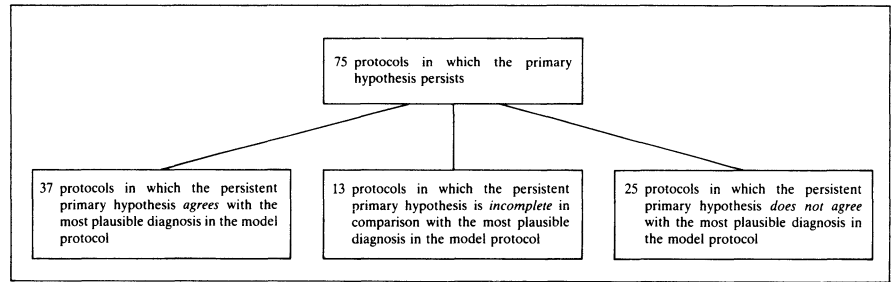
If the investigator himself is not to fall victim to „the failure to eliminate hypotheses”, then he must relativize the results of this exploratory study. A physician, and certainly a general practitioner, often works with more than one possible diagnosis in mind. That a given diagnosis is mentioned first in differential diagnosis often does not mean that it is the sole compass by which the course is set. In some cases the diagnoses mentioned as second, third possibility (and so forth) continue to play an important role in further contact with the patient. This implies that it is not clear how far the test subject goes wrong when the second or third diagnosis in his differential diagnosis corresponds to the most plausible diagnosis in the model protocol. This depends on, among other things, the conclusions drawn from the various diagnoses proposed.

When we re-considered the twenty-five protocols in which the persistent primary diagnoses were at odds with the most plausible diagnoses of the model protocols, we found that in fifteen instances the most plausible diagnosis was indeed mentioned in the differential diagnosis, but given a different ranking. In ten instances, the most plausible diagnosis was not mentioned in the differential diagnosis.

Another relativizing remark should be made about the fact that in seventy-five of the ninety-eight protocols a primary hypothesis persisted until it headed the list in differential diagnosis. When test subjects are confronted with a very simple problem, an analysis of their solutions is bound to reveal many persistent primary hypotheses, for the solution that presents itself first is correct and there is no reason – even after obtaining more information – to change it.

This has undoubtedly played a role in one of the cases used in our project. The

Diagram 2. Comparison between diagnoses placed at the head of the list in differential diagnosis by the participants, and the most plausible diagnosis in the model protocol.



diagnosis suggested by the first formulation of the patient’s complaint was confirmed by the history and the results of physical examination. This probably also explains in part the strikingly large number of (thirty-seven) protocols in which the persistent primary hypothesis was in agreement with the most plausible diagnosis of the model protocol.

If we nevertheless try to draw conclusions from the above outlined data, they should be:

- The hypotheses engendered by the physician in the very first phase of contact with the patient play an important role in the diagnostic process;
- the phenomenon of the persistent primary diagnosis and the „failure to eliminate hypotheses” play a role in the diagnostic process.

The psychology of the medical situation

Elshout and Frijda define a problem as a situation in which the subject is confronted with a task, assignment or difficulty to which he has no immediate answer and to which he cannot find an answer by means of an automatized series of actions. The factors which play a role in such a situation are:

- uncertainty;
- role expectation;
- time and problem space;
- physiological limitations.

Uncertainty. A problem implies uncertainty, the tension between problem and solution. People (and doctors) dislike uncertainty. The tension created by uncertainty is generally perceived as unpleasant.

Life is full of uncertainties, and people are constantly looking for ways to abolish them. At the social level this is facilitated by, for example, religion – the faith in supernatural certainties. And the irradicable phenomenon of prejudice can in part also be so explained. Prejudice protects people from the

uncertainty which arises when they must separately judge every individual. It allows people to say: women are; negroes are And new experiences or events are often so interpreted as to confirm the established views.

This human frailty – of constantly seeing (wanting to see) one’s views confirmed – constitutes the basis of *Festinger’s* cognitive dissonance theory. This theory holds that people ignore information which is at odds with their preconceived ideas, or so deform it that it is no longer at odds.

The decision theory employs the term illusory correlation (*Chapman and Chapman*). One postulates a correlation between two things (for example the fact that a patient is making drawings of strange eyes and the diagnosis paranoia), and finds the postulate confirmed by material which in actual fact does not justify the postulate. An attractive example of a persistent illusory correlation in medicine was presented by *Treffers* in his oration. He mentioned a conclusion from a statistical study which indicates that – at this time in The Netherlands – a causal correlation between the rate of maternity hospitalization and the perinatal death rate should be regarded as exceedingly implausible. He went on to say: „Yet this remains a debatable point. In any case it is incomprehensible that a slight statistical correlation between two factors, calculated on dubious grounds, is still being professed as evidence of the causal correlation between these two factors”.

Apart from these two phenomena, the need to control uncertainties, too, can play a role in the desire to have a solution ready for every problem, and to adhere to this by simply ignoring all contradictory information.

Role expectation. The physician is usually under pressure from his patients to suggest a solution to the problems they present. And in some cases the finding of a solution may be a matter of life and death. Of course the offer of a solution

(or of that which the physician regards as such) is not always that important. Nevertheless a physician will generally find it difficult to accept that he is unable to suggest a solution to a given problem, even if this problem is outside the range of his own specific expertise. The physician's urge to solve and the patient's expectations can preclude a nuanced, balanced approach to the problem.

Being right is important to the physician in certain situations because his being right or wrong can have enormous consequences for the patient. That the pressure of circumstances probably also plays a role in the diagnostic process became apparent in a teaching project with junior doctors in pediatrics in Rotterdam. The purpose of the project was to prepare the juniors for and familiarize them with the procedures in the treatment of acute pediatric cases. The physician's emotions in such a situation (uncertainty, fear of making mistakes, and so forth) also received attention. One of the methods used was to analyse the video-taped activities of a junior doctor in an acute case. In this case the junior in question proved to adhere to his primary tentative diagnosis even when the therapy instituted on this basis initially remained ineffective. As he later recounted, the junior was unable to consider alternative diagnoses until the very last moment, but desperately clung to his primary hypothesis.

Time and problem space. Whether one takes much or little time to solve a problem often influences the quality of the solution. The decision theory handles the term „contenting” (*Wagenaar*): one does not persist until the „best” solution is found, but contents oneself with the first solution that meets minimum requirements. And time is one of the factors which determine what is considered to meet minimum requirements. A person who wants to cross a busy highway has to choose between a series of spaces between passing cars. As he waits, he tends to shift the criterion safety to more risky, smaller gaps. And the way in which a solution is sought, is likely influenced by the factor time: a hospital specialist is better able to establish a diagnosis via careful collecting of data, hypothesizing and testing in a chronic than in an acute case.

A general practitioner often has to take many decisions within a limited time. The information on which he can base his decisions is limited, and the problem space is enormous: the problems pre-

sented by patients can be psychological, social, or somatic.

We have seen that physician A sought an explanation of the complaints in the psychological problem space (an over-anxious mother and a poor mother-son relationship), whereas physician B primarily placed the problem in the somatic problem space (lung lesions and possible cardiovascular disease). There comes a time when one must decide which problem dimension is to be considered, and this decision has its implications for the nature of the solution and the therapy to be instituted. How long this decision is postponed, depends on the individual, for example on the physician's personal views on the body-mind relationship and his personal task interpretation. Particularly if he is pressed for time, he will try to limit the problem space as much and as quickly as possible, and ask aimed questions to collect information.

In such circumstances it is conceivable that he is disinclined to tolerate uncertainty „what is the matter with the patient”, „in which direction should I diagnose?”) for any length of time.

Physiological limitations. Some publications on problem-solving (*Elstein; Miller*) emphasize the existence of a short-range memory (SRM, or working memory) and a long-range memory (LRM). The LRM has a virtually unlimited capacity and a long input time. The SRM has a very short input time, but a limited capacity (see also *Van der Kooy*).

Proceeding from this hypothetical division of memory, we must accept a physiological need to select information made available to us (*Broadbent*). When the perception system is bombarded with information, the SRM's ability to assimilate it is exhausted sooner or later. The SRM can no longer properly select what is to go to the LRM, and what is not to go. It continues to receive information but can do nothing with it. Of course this is not an entirely conscious process, but a physician whose primary concern is to exclude vitally dangerous diseases is likely not to assimilate information he regards as irrelevant in this respect.

Apart from this physiological, not entirely conscious selection, the number of simultaneously manageable hypotheses based on this information is presumably also limited. In the problem-solving context, *Elstein* postulates that the SRM can cope with no more than 4 ± 1 hypotheses simultaneously, and

Miller estimates this number to be 7 ± 2 . With these limitations in mind, we can regard a diagnosis as a kind of mnemonic. It is a code for a complex of symptoms and, as such, more easily manageable than the individual symptoms. Research is believed to have shown that data not related to a hypothesis or a diagnosis, are forgotten (*Kleinmuntz; Barrows*).

These are of course important obstacles to a broad-based problem-solving process in which all alternatives continue to play a role as long as possible.

The moral of the story

Although it is certainly meaningful that physicians have professional ethics that strongly emphasize the functional aspects of the relation to their patients (one must help patients, do what is good for them, sometimes at the expense of one's own health), the relativity of this conception should nevertheless be borne in mind. A physician is a human being and as such he will always – consciously or unconsciously – serve his own interests in his relations to other human beings. He will try to conceal or disguise his uncertainty and vulnerability, consider the degree of plausibility for others in his decisions, be motivated more strongly or less strongly by sympathy or antipathy, and so forth. Even though he may find this morally wrong it will always play a role in his relations with the patients. The stronger the admonitions against such feelings, the more likely they are to find byways – often unknown to the person involved. It therefore seems important in teaching and training to enable physicians and physicians-to-be to gain some insight into the rational and irrational aspects of their diagnosing, and to learn to distinguish the favorable from the unfavorable aspects. This will enable them to correct their approach in the second instance. An important objective of medical teaching should be: to produce physicians who understand that they do not work solely on the basis of rational considerations about what is good for the patient, but are (mis)guided also to some extent by their own emotions and needs.

The initial phase of contact with the patient merits full attention in this respect also.

Summary. At the first contact with the patient, when he presents his problem to the physician, the latter engenders hypotheses with regard to the diagnosis.

The physician tends to adhere to these hypotheses in the further course of his investigation, and to collect data which can support them. This paper reports on an exploratory study of this so-called persistence of primary hypotheses. Some possible explanations of this phenomenon are suggested in conclusion.

Samenvatting op pagina 324.

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Patient-doctor communication

An evaluation of a new training course

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A new training course on patient-doctor communication (PDC) was introduced in The Netherlands in January 1978: the PDC-course Roche. ** This report outlines the starting-points, objectives and design of this training and refresher course, and evaluates the results of forty-seven courses given in 1978 and 1979.

Introduction

Objectives. The objectives of the PDC-course are to foster awareness and provide training in basic skills, mostly in three areas:

- observation of verbal and non-verbal behavior of patients;
- self-observation during contacts with the patient;
- exploration of the physician's possibilities of aimed and efficient elucidation of complaints and problems together with the patient.

For this course, a staff group of experienced trainers/supervisors prepared a leaflet (*Looking, listening and asking questions*) and a course manual (*Patient-doctor communication*).

Starting-points. The development of this PDC-course proceeded from the following premises:

- any physician can make use of the course;
- the course concerns important aspects of the doctor-patient relationship, specifically its establishment and maintenance;
- the course is attuned to contacts between patients with organic and/or functional complaints and physicians with or without a special interest in psychosomatics or the psychosocial aspects of medicine;
- the course is suitable also for specialists, for example specialists in social medicine.

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See (1977) *Medisch Contact* **32, 1658, and H. G. M. van der Velden (1978) *huisarts en wetenschap* **21**, 113-114.

*Methodology.**** The two-day program takes the form of a strictly structured course with a phased learning process. This learning process aims successively at:

- observation of the patient;
- self-observation by the physician;
- establishing contact and optimal methodical exploration during the contact.

In each of these contexts, the activities looking, listening and asking questions receive special attention. In addition to the course manual, various video-tapes with casuistics in the form of doctor-patient interviews are used. Participants' initiatives are stimulated and time is reserved for discussion. Supervision of the courses is in the hands of specially trained psychologist-physician pairs.

A follow-up day is held six months after completion of the course.

This day is devoted, not only to re-training of various skills but also to the effect of the course on the participants' practice: to what extent is the training effective in day-to-day communication with patients? On this day the groups are guided by the same psychologist-physician pair that supervised the course.

At least three-quarters of the 546 participants attended this follow-up day - a response which clearly shows that the course is positively appreciated.

Activities. In the past two years, forty-seven courses were held in several places in The Netherlands, led by many different trainers.

*** The methodology was evolved by the psychologist Mrs Schönhalz-Abrahamson.