THE HUMAN FACTOR AS A CAUSE OF DELAY IN DIAGNOSIS IN GENERAL PRACTICE

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This article is a record of delays in the diagnosis of major organic disease by a general practitioner during the two years 1956 and 1957.

As minor delays of diagnosis, in the strictest sense, occur from day to day, the following criteria have been adopted and all cases filling them have been included. (1) The case must be one of serious organic disease, which was for a time thought to be a minor or neurotic illness, or some illness not allied to the true condition. (2) The delay in diagnosis must be actually or potentially dangerous to the patient. (3) The practitioner must feel in retrospect that he might have diagnosed the case earlier, and feel worried on that account; this may seem a strange criterion, but in actual fact it is very important, as any practitioner who is reasonably conscientious and honest with himself will know if he might have made an earlier diagnosis with the evidence available.

The third criterion would not, therefore, include a patient with carcinoma of the lung who is sent for x-ray examination only when his cough becomes persistent; a patient complaining of abdominal pain who on observation develops signs of appendicitis, which at operation proves to be an "early appendix"; a patient who is sent to hospital for diagnosis, and the diagnosis is determined by special investigations.

It is difficult to assess cases in retrospect, and great pains have been taken to be as fair and frank as possible by trying to avoid distortions of memory and by referring carefully to notes made about the patient at the time. This is not an attempt to excuse delays of diagnosis, but to assess the factors that led to the delay. I have long formed the impression that many delays of this sort are due not only to the intrinsic difficulties of the diagnosis but also to a "human factor" which for some reason has obscured the issue. The following cases are recorded to determine if that impression is true.

Case 1

This patient was admitted to hospital with a compound fracture of the tibia and fibula. While in hospital he had considerable difficulty with his bowels, and in spite of the administration of purgatives his constipation was troublesome. When he returned home his practitioner visited him once a week in order to inquire after his leg, which was in plaster, and give him his certificate. During this time he complained of troublesome diarrhoea, which did not respond to treatment with mist. kaolin. et morph. or, later, to a course of succinylsulphathiazole. It was only on the sixth visit that careful questioning showed that he was actually suffering from tenesmus and faecal incontinence, and a rectal examination revealed a carcinoma of the rectum. This proved to be inoperable, and a palliative colostomy was performed.

It is quite clear that the correct diagnosis would have been made earlier if the patient had not fractured his leg. The practitioner and the hospital staff were concerned with the leg, and the bowel symptoms were regarded as an awkward side issue, and hence did not receive sufficient attention.

Case 2

The practitioner was called to see the patient's wife when she had a stroke. As he was leaving the house the patient said, "As you are here, Doctor, would you mind giving me something for my sore lip?" Somewhat irritated, the practitioner reopened his case, and filled in a prescription for penicillin cream, after glancing at the patient's lip to confirm that there was a sore place.

Four months later the patient came to the surgery with an unconnected complaint, and an indurated ulcer of the lip was noted. This proved to be an epithelioma, which fortunately responded well to treatment.

In this case the practitioner was concerned with a major illness of the wife, and the intrusion of the apparently minor illness of the husband, in rather irritating circumstances, prevented a diagnosis from being made.

Case 3

This patient was in the third month of pregnancy when she began to experience anorexia and nausea, and after 48 hours she sent for her doctor. On questioning she admitted to frequency of micturition, constipation, and a slight ache in the right side of the abdomen, in addition to the above-mentioned symptoms. Examination revealed rather diffuse tenderness under the right costal margin and in the right loin. She was pyrexial, with a temperature of 101° F. (38.3° C.), and her tongue was furred. The urine showed a trace of albumin, but was not sent for microscopy.

A diagnosis of pyelitis of pregnancy was made, but when, after 48 hours' treatment with sulphonamides and mist. pot. cit., the expected improvement did not take place, a specimen of urine was sent for microscopy, which revealed the absence of leucocytes. A consultant gynaecologist was therefore asked to see the patient, and she was admitted to hospital with a tentative diagnosis of appendicitis. Her symptoms remained unchanged, and after a further period of 48 hours laparotomy was performed. During the exploration a retrocaecal appendix abscess ruptured, and the abdomen was closed with a drain inserted. The patient made a rapid recovery and was delivered at term with no complications.

In this case no human factor was involved.

Case 4

A woman of 87 resided in a nursing-home and was visited about every six weeks by her practitioner. Five months before her death she had a syncopal attack with a transient weakness of the left leg, which was thought to be due to cerebral thrombosis. Her blood pressure was 90/60 mm. Hg.

On the day before her death she collapsed and had a convulsion. On examination shortly after this she was found to be unconscious, with signs of acute congestion of the lungs. It was also realized that she was a typical case of myxoedema, and had had the following signs and symptoms: mental slowness, susceptibility to cold (she always wore a shawl), scanty hair, croaking voice, baggy eyes, slow pulse, and low blood pressure. The matron, who had known the patient for a long time, said that she had been like that for many years, during which time she had been seen by several doctors.

The delayed diagnosis was of academic interest, as she was a dying woman, and death was thought to be caused by cardiac failure due to myxoedematous myocarditis.

In this case the patient was often visited, and as she was an old person the visits tended to be more of a social than a medical occasion. The diagnosis should have been made at the first visit; once the practitioner had become used to the appearance and eccentricities of the patient the diagnosis became difficult. It cannot, however, be said that the human factor was of major importance, and this was really a "classical" error. It is unlikely that the myxoedema shortened her life to a great extent, but with suitable treatment her last years would have been spent in closer contact with reality.

Case 5

In this case a diagnosis of carcinoma of the lung was missed in a hypochondriac. The patient, a man aged 68, was a long-established hypochondriac to the extent of being a byword in the practice. Since the death of his wife, three years previously, he had complained of pains in various parts of the body, and had spent long periods in bed. On one occasion a consultant surgeon was asked to see him at home during an attack of severe abdominal pain, and agreed with the diagnosis. During the last nine months of his life the pains occurred mostly in the chest. He was being visited at monthly intervals, and his chest was examined frequently but no abnormality was discovered. Finally the neighbours who looked after him felt that they could no longer manage, and a consultant geriatrician was asked to see him with a view to admission to a long-stay hospital. On examination the consultant made a diagnosis of carcinoma of the lung, with solidification of the left apex and deviation of the trachea.

This patient was seen so often that the gradual change of the pain "from the general to the particular" went unnoticed, as also did the gradual decline in health. The chest was often examined, but always with the expectation of finding nothing, and hence the localized signs at the apex were never elicited. There is a strong human factor in this case, as after many visits the practitioner developed an attitude of mind whereby he too readily assumed that the symptoms were hypochondriacal.

Case 6

A girl student, who was not on the practitioner's list but was living as a lodger with the practitioner's family, was noticed one day to be walking with a limp, and, when asked about it, said that she had strained her groin while climbing a hill three weeks before and had had some treatment from her own doctor.

The matter was forgotten, and the slight limp soon ceased to be noticed. Two months later she said one morning that she had been kept awake by pain in her groin. She was examined and a mass of lymph nodes was found in the groin; also a depressed circular scar was noted in front of the tibia, where a histologically benign melanoma had been excised one year previously. The diagnosis of metastasizing melanoma was unfortunately confirmed, and a block dissection was carried out by a consultant surgeon, but it was not possible to remove the growth entirely. The patient died six months later.

In this case the patient was living in such close contact with the practitioner and his family that the slight limp was ignored. If she had been the practitioner's patient and had come to see him at the surgery the diagnosis would probably have been made earlier, but the tragedy would not have been averted.

Case 7

This case is primarily one in which a diagnosis of acute appendicitis was delayed in an obese patient. However, the human factor was of some importance, although it is rather difficult to portray adequately in a short description.

The patient, a medical auxiliary by profession, telephoned the doctor to say that he had suffered from pains in the abdomen for 24 hours. He asked if the doctor could visit him at about 1 o'clock, as he had appointments to see clients until then. The practitioner complied with this request.

On questioning, the patient said that he had had abdominal pain with anorexia, but no vomiting or disturbed bowel action. On examination no tenderness was elicited, except for some slight tenderness in the right groin near the scrotum. The practitioner understood the patient to say that he had taken his temperature and that it was normal; afterwards the patient said that it had been raised, so there must have been some misunderstanding on this point.

The patient had recently been under treatment for renal colic, and the practitioner felt that the pain was probably

of renal origin, although a definite diagnosis was not made. He instructed the patient to telephone if the pain became worse or if the temperature went up, and arranged to visit next morning.

On calling next morning the practitioner found that the patient's pain had been worse, although, out of good nature, he had not telephoned. He was still at work. On examination there was some diffuse tenderness in the right iliac fossa, and the temperature was 100.6° F. (38.1° C.). He was sent to hospital with a diagnosis of ? acute appendicitis, ? genito-urinary disease.

At operation a gangrenous disintegrating appendix was discovered. The patient recovered well, but has unfortunately developed a small discharging fistula, for which further operative treatment is under consideration.

In this case it is unfortunate that there were several factors which helped to delay the diagnosis: the obesity of the abdomen; the recent history of renal colic; the fact that the patient was a medical auxiliary, which led the practitioner to put too much responsibility on the patient in that he did not take the temperature himself, and that he told the patient to telephone instead of making another visit himself in the evening. There was also a subtle factor in that the patient tended to play down his symptoms, and the very nature of the telephone call tended to lull the practitioner's suspicions. When the practitioner's partner was told about the case he said: "He is just the sort of person one would miss a diagnosis on." This was very true, although the human factor was not the major one.

Case 8

In this case the condition concerned was one of pregnancy, and, although this is not a major organic disease, it is a major organic condition, and the delay in diagnosis might have had serious consequences, particularly so far as the baby was concerned.

The patient was a very neurotic person who attended the surgery fairly often with symptoms for which there was rarely any organic basis. Three years previously she had given birth to a baby which had died three weeks after delivery.

On this occasion she was the last patient in the evening surgery. Her complaint was that of "bubbling in the stomach." Although this sounded a symptom which was unlikely to indicate organic disease, the practitioner examined the abdomen, and was surprised to find a definite enlargement of which the patient had been unaware. The abdominal muscles were so tense that he was unable to determine the nature of the enlargement. Vaginal examination was also surprisingly difficult, as the perineal muscles were so tense that he was unable to palpate the cervix, but was able to determine that there was a large mass attached to the uterus. The patient was vague when asked about her periods, but appeared to have had irregular bleeding. A search for foetal heart sounds, using an ordinary, not a foetal, stethoscope, was unsuccessful.

The practitioner, who was suffering from considerable fatigue at the time, was confused by the whole matter and referred the patient to a specialist. In retrospect it might have been wiser to have seen the patient again and searched for the foetal heart with a foetal stethoscope, or to have arranged for an x-ray examination of the abdomen.

However, fate stepped in (as the reader may have anticipated) and two nights later the practitioner's partner and the midwife were faced with the delivery of the baby without any preparation. The baby weighed 5 lb. (2.5 kg.), and was probably about four weeks premature.

There is no doubt that the patient, following the loss of her first baby, subconsciously repressed her knowledge of the second pregnancy to such an extent as to deceive herself and prevent her doctor from making a definite diagnosis. She therefore received no antenatal treatment, and this, with the history of the previous confinement, might have been disastrous.

This may seem an incredible case, but it is stressed that a thorough examination was carried out. Although the practitioner's course of action was probably affected by fatigue, it is considered there was no major human factor in this case, as is explained later.

Case 9

A man aged 77 came to the surgery complaining of a sore mouth. He was edentulous, and on the gum of the left lower jaw at the back of the mouth there was an area of exudate. He wore dentures, and had not had a new set for 15 years. It was felt that this was a traumatic lesion due to rubbing of the dentures, and he was told not to wear them and to see his dentist with a view to obtaining a new set. He was also given a simple mouth-wash.

At his next visit he said that the pain had almost gone, although the area of exudate was still present. About three months later he returned and said that his mouth still troubled him and was sometimes painful. On examination it was obvious that there was an ulcer present, although this was still partly concealed by exudate. The surgeon to whom the patient was sent wrote: "I agree with you that the ulcer is almost certainly malignant. It has rather rolled everted edges and seems to be involved in the mandible." A biopsy showed it to be a squamous-cell carcinoma, and deep x-ray therapy was begun.

The delay in the diagnosis was due to the fact that the practitioner came to the conclusion that the ill-fitting denture was the cause of the trouble, and, when improvement took place, did not follow the case closely. Also the case was in the borderline between medicine and dentistry, and was receiving treatment from both sources. The most important factor was that the practitioner had not seen a similar case before.

Case 10

This patient, an 84-year-old man, was deaf. He wore a hearing-aid that scarcely contributed to his hearing, for it was so noisy that the practitioner, while sitting in his surgery, could hear the squeaks and whistles from it while the patient was in the waiting-room. The usual procedure was for the patient to place a note on the doctor's desk, with some request written on it, as, for example, "Can I have some black medicine for a cough?" He was in fact a quaint and lovable character.

On three occasions in a period of four months the note read, "Can I have some medicine for diarrhoea?" On the third occasion the practitioner's suspicions were aroused, and he arranged to examine the patient at home. The rectum was full of faeces, but, following an enema, a high rectal tumour was palpated.

On questioning the relatives it became clear that the patient had had bowel symptoms for many months. The human factor is obvious, and in fact this case was included only after some thought, as, although there had been a dangerous delay, the practitioner felt that he had not done too badly.

At operation the consultant surgeon was able to perform an end-to-end anastomosis, and the prognosis is considered good.

Observations

This series is far too small to be of any statistical significance, but the following observations may be made on the 10 cases described. (1) The human factor played a major part in the delay of diagnosis in five cases (Nos. 1, 2, 5, 6, and 10) and a minor part in two (Nos. 4 and 7). (2) Six of the patients suffered from malignant diseases. This large proportion is due largely to the criteria of selection, but it does stress how insidious malignant conditions may be, especially in old people. Four of these six patients were over 65. (3) Four cases (Nos. 1, 3, 4, and 10) may be described as classical errors—that is, errors against which one is warned in standard textbooks. (4) Two cases (Nos. 5 and 8) could be described as neurotic. This is a surpris-

ingly small proportion, as from my own experience and that of my colleagues it appears to be a fairly common cause of the masking of a diagnosis. (5) It was hoped to make observations on the effect on the prognosis of the delay in diagnosis, but this has been difficult. In all malignant cases any delay will make the prognosis worse, but after studying the cases in great detail it is felt that the only one in which the ultimate prognosis may have been greatly affected was Case 9.

The Human Factor

The human factor may be defined as an attitude of mind of the doctor towards the patient, which influences his judgment in such a way as to make it more difficult for him to come to a correct diagnosis. This factor may be due to the particular circumstances of the interview or to an attitude of mind which has developed over many past interviews.

In the first type the doctor may be in a frame of mind where his judgment is clouded owing to fatigue, boredom, ill-health, worry, or because he is in too much of a hurry; or he may be irritated by the patient or the circumstances of the visit.

In the second type the doctor's judgment may be blunted in one of several ways. He may see the patient so often that the visit becomes social rather than medical; he may know the patient to be neurotic or a hypochondriac, and anticipate that all his symptoms are of this type; he may be treating the patient for one particular disease, and discard irrelevant symptoms without adequate consideration. Also he may know the patient socially to such an extent that he is unwilling to examine the patient thoroughly—for example, to carry out a rectal or vaginal examination. It is well known that if a doctor treats persons he knows very well—for example, a member of his family—he often treats them badly.

It is stressed that the mere fact that the patient is neurotic does not imply that a human factor is operating, but only if the patient's neurosis has built up an attitude in the doctor's mind.

These facts are, no doubt, well known to all doctors of experience, but it is felt that this article may be useful as a reminder to them, and as a warning to others entering practice. A medical student, in particular, is led to believe that the really serious error is, for example, to call a diastolic murmur systolic; time will show him how relatively unimportant this sort of mistake is. In general practice serious organic disease forms a small part of the daily work, and it is in the mass of vague, trivial, and neurotic complaints that the human factor thrives.

In hospital practice the human factor is of far less importance. Most cases are regarded as serious organic disease until proved otherwise and receive a full examination by at least one doctor, and probably routine investigations as well. It is not the task of the consultant to decide if the patient should be fully examined, whereas it is a decision which the general practitioner must make in every case; and that is one of the chief difficulties of his work. He is more likely to miss a diagnosis through failing to examine a case than through performing an examination and missing a physical sign. To make this clear it must be understood that at every surgery a general practitioner may expect to see several patients with vague complaints, particularly of "feeling tired" or "needing a tonic." These symptoms are usually due to mild depression or anxiety, but any of them may be due to serious organic disease, which requires urgent diagnosis and treatment. The practitioner has not the time to examine and investigate them all, and indeed if he had it would be a soul-destroying task. He must pick and choose, and his selection is bound to be affected by non-medical factors, in particular by the number of patients waiting to see him and by whether the patient presents the history intelligently or stupidly.

This article is concerned with the work of one particular general practitioner, of particular temperament and methods

of working. But it is felt that the experience of other practitioners may be similar.

To guard against the intrusion of the human factor the doctor must first of all know himself and know his weaknesses. Secondly, he must enjoy his work, and have adequate spare time and leisure. Thirdly, he must not have a larger list than he is capable of dealing with. Fourthly, he must organize the practice for his own and his patients' benefit, even if this means making rules which may seem petty and tiresome to the patients themselves. In short, he must have an efficient mental discipline; and herein the fundamental difficulty of general practice lies. If his mental discipline is too rigid he is bound to lose some personal contact with his patients; if his personal contact is too strong, on the other hand, he cannot exert efficient mental discipline. A book could be written on the subject.

Summary

A record has been made of delays of diagnosis, following stated criteria, over a period of two years. Observations are made on these cases. In 5 out of 10 cases a human factor was thought to have played a major part in the delay. This factor is defined and discussed.

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INFECTED CORK CLOSURES AND THE APPARENT SURVIVAL OF ORGANISMS IN ANTISEPTIC SOLUTIONS

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The dangers of infected cork closures have been repeatedly emphasized since the original description by Lowbury (1951). Antiseptic solutions are thought to be contaminated by contact with the cork during shaking and by being poured through the infected neck of the bottle. Since the organisms are frequently killed by the antiseptic when exposed *in vitro*, it has always seemed that such contamination must needs be intermittent, and that when the container is left undisturbed the contents should be sterile. A specimen of cetrimide sent to these laboratories for examination showed such persistent and repeated contamination, even when left undisturbed, that it gave support to the original comment that "organisms were growing in the solution." It was therefore decided to investigate the mechanisms of contamination which might lead to the apparent survival of organisms in an otherwise lethal fluid.

Examination of Infected Cetrimide Solution

The specimen consisted of half a gallon (2.2 litres) of 1% aqueous cetrimide contained in a glass flagon and sealed with a bark cork $1\frac{1}{2}$ in. (4 cm.) in diameter. On arrival in the laboratory the fluid level was below the bottle neck, which was dry. The cork was also dry, fissured but other-

wise intact. 0.1 ml. of the solution was placed in 100 ml. of nutrient broth and incubated for 18 hours. A segment of the cork, excised with a sterile scalpel, was cultured in a similar fashion. Both specimens yielded a heavy growth of a motile Gram-negative rod with the biochemical reactions of a paracolon bacillus. A pour-plate made at this time showed approximately 760 organisms per ml. of cetrimide solution. The container was left undisturbed at room temperature for seven days and the plate count was repeated. Samples were taken by removing the cork and passing a sterile pipette into the solution. Care was taken not to touch the neck of the bottle or the cork. The count on this occasion was 57×10^3 viable organisms per ml.

Experiment 1. Sensitivity of Infecting Organism to Cetrimide *in Vitro*.—Preliminary tests, using the tube titration method and pour-plates incorporating varying concentrations of fresh cetrimide, showed that the organism was consistently inhibited by a dilution of 1:1,000 cetrimide. The bacterioid concentration was determined by adding 1-ml. quantities of an overnight broth culture to 9 ml. of varying concentrations of aqueous cetrimide. After five minutes' exposure the inoculum was centrifuged down, washed twice with saline to remove residual cetrimide, and either placed in 100 ml. of nutrient broth or diluted for viable counting. With this technique, 1:1,000 cetrimide appeared bactericidal, in all but one of the experiments, for inocula of the order of $11,000 \times 10^{10}$ viable organisms per ml. The method used was more exacting than the random loop sample employed by Calman and Murray (1956), and this accounts for the greater concentration necessary to achieve a bactericidal effect in aqueous solution. The contaminating organism was none the less rapidly killed when exposed *in vitro* to one-tenth of the original concentration of cetrimide.

Experiment 2. To Exclude Growth Factors in Cetrimide Derived from Cork.—In view of the experimental findings of Nelson (1942), the cetrimide solution was examined for the presence of growth factors which might allow either survival or multiplication of contaminants. A portion of the solution was Seitz-filtered to remove organisms and examined by two-dimensional chromatography, using as solvent 80% alcohol and phenol saturated with water. The sample, which failed to reduce Benedict's solution, showed no hexoses, pentoses, or amino-acids. A cork extract, prepared by autoclaving 5 g. of cork in 100 ml. of distilled water, was similarly negative.

Experiment 3. To Exclude Physical Protection of Organisms by Cork Extracts.—10 ml. of the cork extract prepared in Experiment 2 was incorporated in 100 ml. of 1% aqueous cetrimide. This solution was used to repeat the sensitivity tests performed in Experiment 1. No protection of the inoculum could be demonstrated under these conditions, and the bactericidal figure remained unchanged. These findings agree with the experiments of Lowbury (1951), who concluded that his infected solutions contained insufficient solutes to protect added organisms.

Experiment 4. Self-sterilizing Properties of Contaminated Cetrimide Solutions.—Since the paracolon bacillus was rapidly killed by cetrimide *in vitro*, it was decided to investigate the behaviour of the contaminated solution after removal from its original container. 10 ml. of the contaminated cetrimide was carefully removed and transferred to a sterile screw-capped bottle. A time-clock was started and an immediate viable count performed (20 seconds elapsed between removal of the cork and the second tenfold dilution). The count showed 950×10^3 viable organisms per ml. Exactly five minutes after the transfer, volumes of 0.1 and 0.5 of the cetrimide were incorporated in pour-plates, and further samples were diluted for viable counting. No organisms were detected in these volumes of solution. This experiment was repeated on a number of occasions with identical results. It was therefore concluded that contaminated solutions of cetrimide are self-sterilizing within a short time of removal from their original container. Since, in this experiment, the solution had not come into contact with either the cork or