Man, Medicine, Technology and Utopia

JR Kriel

Summary

This article takes one through the different historical stages of medical practice, from the time when the patients' own narrative of his illness was the basis for the doctor to work on, up to the final stage these days where attempts are being made to replace the physician entirely by computors. It explains the rôle of the patient's body and inner suffering, the doctor's relationship to these as well as the effect of technology.

KEYWORDS: Physicians; Physician-Patient Relations: History of Medicine, Modern; Holistic Health; Interviews; Technology, Medical; Diagnosis; Education, Medical; Percussion; Auscultation; X-Rays; Emotions.

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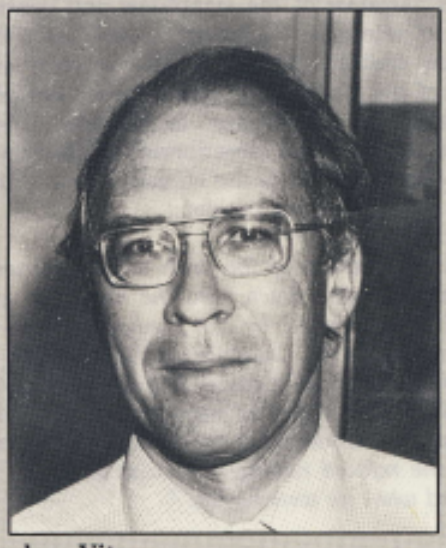

Curriculum Vitae

Jacques Kriel started his studies at the University of Stellenbosch where he obtained a BA Hons (Philosophy) in 1961. He then studied medicine at Wits and received the MB BCh in 1968. He worked as a Registrar in the Dept of Internal Medicine, UOVS from 1971-1974, received the M Med (Intern) 1974 and FCP (SA) in 1973 and became Senior Specialist in this Dept in 1975. He then moved to Bophuthatswana where he worked from 1976-1982 : first as Director of Health Services (1978-1979) and then as Rector of the University of Bophuthatswana (1979-1982). Since 1982 Professor Kriel has occupied the Claude Harris Leon Chair of Medical Education and is Director of the Centre for the Study of Medical Education.

In order to understand the impact of technology in the world of medicine, it is necessary to describe the world of the 17th century physician. Midway through this century, the split between mind and body that has so deeply influenced Western man (therefore also the medical man's) understanding and experience of himself, was proposed by Descartes to resolve certain philosophical issues. This dualism made it possible for science to escape the control of the Church by assigning the non-corporeal spiritual realm to the church, leaving the physical world as the domain of science. Thus the body was "freed" to become the object of limitless scientific investigation. The stage was set for the view of the body as a biochemical and bio-mechanical machine and for the eventual reduction of the image of man to what has become known as "the clock-work image" of man[1].

This contextual background is important because developments in medicine always parallel the developments in the socio-cultural context in which it is embedded, sometimes itself influencing that context, sometimes being influenced by it[2]. Technological developments both within and outside medicine consistently reinforced the clock-work image of man and fundamentally influenced the Western physician's understanding of the nature of illness, the nature of the goals of medicine and his relationship with his patient.

THE 17TH CENTURY PHYSICIAN

The 17th century physician relied mainly on the patient's narrative of the symptoms and course of the disease to determine the nature of his illness. Narrative technique enabled him to develop a clear subjective portrait of the illness. He never stepped out of his rôle of listener or interrogator to become a detached observer. If you read descriptions of disease of this time, you are drawn into the human drama of the illness and the suffering of the patient:

> *"On the evening of the 30th when I arrived, I found her lying down, and the hiccough, which had been stopped by the medicine which had been sent by the Countness of Boilingbroke, was again tearing her to pieces. She was very restless, anxious, found the bed uncomfortable, could not sleep, was delirious but not quite out of her mind, for she refused nothing that was given her and heard what we were saying".*[3]

A modern physician could not give a description such as this because his frame of reference brings to his notice other aspects than those noted down by this physician.

The narrative evidence was supplemented by observation of the outward appearance of the patient's body and behaviour, but this observational posture did not free him from consciousness of the patient as a person and of a sense of her inner misery. Physical examination was rarely done and if so, he would only use his sense of touch to estimate the quality (not the rate) of the pulse, less frequently to judge the body's temperature and occasionally to detect tenderness of abnormal masses by briskly probing the tissues, often through the bedclothes. He would attach far less weight to his sense of touch than to the patient's narrative and to his own visual observations.

The patient's home used to be the centre of medical practice; the patient's own expression of his illness, used to take the central position in evaluating the disease.

It is only in relatively recent times, following the development of a totally different concept and experience of the human body as a result of Cartesian dualism and the objectifying impact of technology on the physician/patient relationship, that physicians and patients learned to accept physical intrusion upon the body as necessary to the diagnostic process.

The centre of medical practice in the 17th and 18th centuries was the home of the patient or the physician. In cases of serious illness the physician might move into the house of the patient or if the patient came from far and required prolonged treatment it was not uncommon for him to lodge with the physician.

The difficulties of travel, the confidence in the patient's subjective account of his illness and the relative unimportance ascribed to personal observation in arriving at a diagnosis, led to the widespread practice of diagnosing and prescribing through the mail. Disease was not organ related. Health depended on the harmonious mixture of four fundamental components of the human body called the ***humors***, namely, blood, mucus, black bile and yellow bile. A disturbance in their balance or a displacement or putrefaction of the humors produced disease. Although symptoms grouped themselves into certain recognizable identities, there was essentially only one disease state and all therapy was directed at restoring harmony to the humors.

Medical information became more precise, but the doctor's insight into his sick patient, more limited.

VESALIUS, DESCARTES AND MORGAGNI

A hundred years before Descartes, the anatomist Vesalius established a new principle of fact finding and truth testing in anatomy which was to transform medical thinking. Vesalius formulated the principle that all anatomical statements and hypotheses were to be subjected to a methodical review by the dissection and observation of human cadavers.

Although autopsies had become common by the opening of the 17th century, no systematic classification of pathological lesions occurred until in 1761 (200 years after Vesalius and 100 years after Descartes) Giovanni Battista ***Morgagni*** established the foundation of the modern understanding of disease through anatomy. In his work ***The Seats and Causes of Disease investigated by Anatomy*** he included carefully selected case histories about the clinical course of illness in patients and reports of pathological lesions found at autopsy. He was the first definitely to formulate the relationship existing between occurrences in the living and changes found in the dead body.

According to Reisser, the work of Morgagni and the French physician ***Bichat*** that anatomized disease was vital in transforming the 18th century physicians from word-oreintated, theory-bound scholastics, to touch-orientated observation-bound scientists. But they did not take the further step of advocating an analogous physical examination of the living which would enable the physician to link anatomical changes to specific diseases in the living.

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This had to await the subsequent adoption of a manual and instrumental approach to the patient which could enable the physician as it were to autopsy the living.

RUENBERGER'S PERCUSSION METHOD

The first step in this direction was taken by the Viennese physician Ruenberger in 1761 in which he described a method called percussion by which the body is struck with the fingers to produce sounds indicating the condition of underlying structures. Ruenberger formulated the now growing conviction that the history obtained from patients was unreliable, inconsistent and untrustworthy compared to the objective evidence to be obtained by his method of examination. This signals a new relationship which has developed between the patient and the doctor.

By this stage therefore, disease entities had been anatomized, that is related to specific structural changes in specific organs in the dead body. An emphasis had developed on finding objective evidence of disease, thus removing the personality and physical appearance of the patient from its central position in the evaluation of illness.

But for the adoption of manual and instrumental techniques to become routine in diagnosis and treatment, the relationship between the physician and his patient had to become depersonalized exactly to accommodate the greater physical intimacy required by such procedures.

The anatomical perspective on disease required a profound alteration not only in the physician's perception of disease and methods of diagnosis, but also in his relationship to his patient and in the understanding and experience of this relationship by his patient. To overcome what Forbes (1821) called the natural and even proper repugnance felt by the patient and the doctor for physical examination, the patient had to objectify or depersonalize his own body in order to submit it to manipulation and scrutiny by the physician.

The stage was now set for a key figure in medicine who would alter the nature of clinical diagnosis and of medical practice and who would introduce the first routine application of technology into medicine.

RENé THEOPHILE-HYACINTH LAENNEC

In 1819 the French physician Laennec published his book ***On Mediate Auscultation*** which not only contained the most detailed accounts yet written of pathological lesions found in the chest at autopsy, but also described a new technique which made it possible for the physician to detect chest disease and to infer the underlying pathological changes by studying the character of the sounds the damaged tissues produced in the living person with an instrument which he named the "stethoscope". The word literally means "to view into the chest".

The cornerstone of Morgagni's work — linking symptoms during life to pathological changes found at autopsy — was also of great importance to Laennec who considered anatomical change to be "the least variable and positive of the phenomena of local disease". The symptoms that the patient could feel and discuss were not only limited but also unreliable as a means of discriminating illness. With his instruments, he stated, he could not only identify the presence of disease early and in an objectively verifyable manner but he could also infer the underlying anatomical faults that he would find at autopsy. The technique also placed an instrument between the patient and the physician thus alleviating the antipathy of close physcial contact.

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Non-verbal sounds, picked up through an instrument now become the signals of disease and were elevated to the level of concrete reality because of the close demonstrable correspondence between the sound and the visible lesions found at autopsy. ***Lathem*** in 1835 stated: "*We anatomize by auscultation, while the patient is yet alive*".

Auscultatory sounds were demonstrated in the laboratory by Francois Magendie (1835) who showed that sound in the animal body followed the same principles as in the external world. Such evidence was venerated by the physicians of that period because it brought them close to the dream of being able to base medical practice on scientific law. It also helped to entrench the view that the human body was only a biomechanical and biochemical machine which could be totally understood from these perspectives.

VALUE OF PRECISE CLINICAL DIAGNOSIS

A central point of debate in the development of the anatomical concept of disease and its clinical localization was whether such precise diagnosis really had any value because of the limited therapeutic options available. Morgangi contended that the ability to diagnose fatal disease in the living would prevent attempts to restore health through vigorous therapy which could only increase the suffering or hasten the death. In such cases the correct diagnosis could lead to gentle therapy directed only at the relief of suffering. The followers of Laennec insisted that early diagnosis enabled more vigorous and successful treatment to be instituted, that more accurate diagnosis enhanced the physician's reputation and even if the disease was incurable, spared the patient and family the pain and financial ruin of moving from one physician to another seeking cure and thus allowed the patient time to prepare to die.

Here we therefore still find an acknowledgement of the limitations of medicine and the acceptance of death as a dignified human experience in contra-distinction to the latter day approach in which death is experienced by the physician as a failure and ever-increasing technological sophistication is compulsively applied to keep patients alive as long as possible and the right to die has on occasion had to become the object of a legal battle between the families and the profession. Initially some patients were embarrassed and frightened by the assault on their bodies made by the stethoscopic examination, some thinking they were going to be operated upon because they associated instruments with surgeons. Others ascribed healing properties to the stethoscope. Some physicians rejected the stethoscope because they feared it would class them as mere craftsmen but later, when popular sentiment began to favour the stethoscope, a physician who refused to use the instrument placed his professional reputation in jeopardy. By the 1840's the mystical properties were disappearing and the stethoscope became appreciated as merely a good conductor of sound.

NEWER TECHNOLOGY LEADS TO NEW METHODS OF DIAGNOSIS

Although new technological developments improved the technical quality of the instrument *eg* the development of the binaural stethoscope) it became increasingly clear that auscultation was not as objective a technique as Laennec had supposed and that a well trained ear and previous knowledge and understanding were the prerequisites for successful auscultation. Nevertheless auscultation helped to create the "objective physician" who could move away from involvement with the patients' experiences and sensations to a more detached relationship, less with the patient but more with the sounds from within the body, sounds that he believed to be objective, bias-free representations of the disease process. The stage is set for the reduction of the patient to a disease process and a doctor-patient relationship in which the intrusion of the patient's own personality into the diagnostic and therapeutic process is experienced by the doctor as a hindrance and irritation. Its success also encouraged the physician to favour techniques that would yield data independent of the opinion or appearance of patients. This encouraged the development and acceptance of new methods of diagnosis which extended the power of senses other than that of hearing.

It became possible to debate the medical problems of the patient without requiring his presence at all.

Basically these are represented by four sets of techniques which encompass practially all technological developments in medicine up to the present time:

1. The first revealed gross anatomical structures *eg* the ophthalmoscope, laryngoscope; X-rays; computer tomography and isotope studies of organ architecture.

2. The second revealed the invisible cellular sub-structure of biological life: *eg* the microscope, the electron microscope etc.

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3. The third analysed the functions of organs and gave the results in the form of graphs and numbers;

4. The fourt disclosed the composition of the solids and fluids of the body by means of chemistry.

All these techniques have in common that they represented a desire to reduce the physician's dependence on the faltering judgement of the untrained patient through objective techniques, substituting the skill of the expert who, reasoning from "scientific data", is able to come to diagnostic and therapeutic decisions in less time and with greater satisfaction to himself and his patient.

Helmholtz developed the opthalmoscope, ***Czermak*** the laryngoscope and from 1860 onwards devices were developed which could illuminate every possible hollow organ for inspection: the stomach, bladder, rectum and the vagina. Up to the first half of the 19th century physicians were still reluctant to risk offending feminine delicacy by using a speculum for internal gynaecological examinations but in the latter half of the century the speculum became an acceptable feature of gynaecological practice. The number and complexity of eye diseases motivated some physicians to specialize solely in disorders of the eyes thus heralding the now acknowledged relationship between technological development and the tendency to specialize. The increased ability to visualize organs represented a continuation of the anatomic tradition to which the stethoscope belonged and sustained the tendency of doctors to regard illness in terms of discreet pictureable lesions, as a disturbance of one part of the body more than of the person himself.

THE DEVELOPMENT OF X RAYS

The development of the X ray obliterated the distinction between inner and outer spaces of the body — both now being susceptible to visual examination so that it challenged the diagnoses based upon touch and upon the stethoscope. In the search for objectivity, physicians now found the visual evidence of internal disease more satisfactory than those based on sound. Of all the instruments of visual diagnosis, the X ray produced the most significant changes in the method which physicians used. While the opthalmoscope and the laryngoscope could be used by one person at a time only with the possibility of subjective distortion the X ray allowed many people to view simultaneously and discuss what they saw. It was even possible to debate the medical problems of the patient without requiring his presence at all. Nevertheless, there were observers that pointed out that, as with the stethoscope, the opthalmoscope and the laryngoscope, the X ray was not completely objective in the sense that it was not a photograph and that evaluating an X-ray shadow required both experience and knowledge by the reader.

MICROSCOPIC EXAMINATION

The microscope brought about two major changes in

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medical thinking in that it formed the technological basis for Koch's formulation of his germ-theory of disease and for ***Virchow's*** cellular theory of pathology, which stated that orderly cellular function was the basis of health and a disruption of cellular function was the basis of disease. Virchow's statement that mechanical matter is active in the locus of the cell "according to physical and chemical laws" not only further confirmed the image of the human body as a bio-mechanical and biochemical machine, but also stimulated the search into these fields by insisting that physical and chemical investigations were also fundamental to comprehending cellular phenomena. The microscope, like the X ray, encouraged a physical separation of the doctor and his patient and the signs of disease elicited at the bedside became of secondary importance. **Sir Dyce Duckworth** warned: *"we must, if we are to be great in medicine, sometimes lift our eyes from the microscope and away from the engrossing researches of the laboratory. If we do so, we shall certainly come to know more of the inwardness and due proportions of matters which relate to the life of man as he passes through his present environment"*. **Dr Henry Bence Jones** warned against the uncritical acceptance of the objectivity of these various methods by stating:

"Each sense has its own fallacies, and our fears, our hopes, and our prejudices distort our perception".

CHANGES IN BODILY FUNCTION AND CHEMISTRY

The next major change in the concept of diagnosis took place when it was realized that important measures of illness could be found in changes in bodily functions such as breathing, blood circulation and temperature often not associated with any identifiable structural changes. This conceptual development had to await the development of instruments that could portray such vital functions by inscribing them on graphs or measuring them in numbers thus changing subjectively experienced or monitored phenomena to "objective events" which several observers could jointly evaluate and discuss. The technological developments relevant here include the development of the spirometer, the sphygmomanometer, the thermometer and the ECG. The graphs and numbers provided a factual transcription of pathology equivalent to the discovery of an anatomical lesion, and Hutchinson, during his work on spirometry, became convinced that observations that could be expressed in objective numerical statements were to be given the greatest diagnostic weighting. The reduction of the patient to a numerical disease portrait was on its way.

The view now became established that evidence acquired by instruments that simply extended the natural faculties of the physician (such as the stethoscope or the opthalmoscope) could be unreliable because of observer error because the person behind the instrument could crucially influence the interpretation of evidence. Machine-produced information began to appear more trustworthy, objective and unambiguous.

The essential link between chemical alteration of a body fluid and an anatomical derangement of an organ found at autopsy was only shown in 1827 by ***Richard Bright*** in kidney disease. What Laennec did with sound in relation to the lung, Bright did with chemistry for the kidney and thus formed a crucial link between the school of anatomy and the school of chemistry. So great became the faith in chemical analysis that it became acceptable for doctors and patients that a diagnosis could be made without any other signs of disease.

MEDICAL SPECIALIZATION AND CENTRALIZATION

As physicians now came to realize that chemical, micro-biological and microscopial evaluation required skills, experience and apparatus that they lacked in their practice, they increasingly delegated their right to apply these techniques to other physicians and technicians. This led to the development of the diagnostic laboratory which, after a rather shaky start, added certainty to the diagnosis of many diseases but also created other problems.

The reasons for the phenomenal growth in medical specialization is complex but one important factor is the fact that the student, trained in a high technology environment by specialists, becomes imbued with the belief that laboratory aids and complex instruments are indispensable to diagnosis. He feels safer amid technology which he can use and amongst specialists to whom he can delegate diagnostic problems. General practice, divorced from technological and specialist assistance, is experienced as threatening and meaningless.

> ***Expensive, high technology has convinced the public that they will reach the utopian state of diseaselessness.***

The final phase of technological development within medicine seems to be one in which attempts are being made to replace the physician entirely by computers.

It is therefore clear that since the 19th century, physicians have moved through a series of stages:

from direct communication with their patient's experiences through a verbal technique of information-gathering to direct connection with their patients' bodies through techniques of physical examination to indirect connection with both experiences and bodies of their patients through machines and technical experts. The aim has been to find ways and means to look for medical evidence that is both reproducible and standardized.

Technological applications to medicine allowed the subjective experiential situation to be reduced to numbers, graphs and pictures in order to eliminate controversial evaluation. Medical information became more precise but the doctor's insight into the sick person became more limited.

The increasing amount of medical knowledge made available by the technological advance led to increasing specialization. This tendency and the increasing dependence on highly sophisticated technology has, on the one hand, fragmented medicine but has, on the other hand, led to an increasing centralization of medical practice in the large cities and the locus of activity has moved from the patient or the doctor's house to group practices and large hospitals.

High technology has influenced the doctor's image of himself and his goals in medical practice.

The combination of dependence on technology, specialization and centralization in medical practice, has led to a situation in which the rural areas are rapidly being depleted of doctors. It has also led to an ever increasing number of tests being done on every patient in a routine manner and to the escalation of medical costs. More and more money therefore has to be poured into the centers of high technological excellence available to only a few and less money is available for service to those living in more rural areas. This tendency is present both in first and third world countries. If unchecked it has been estimated that the whole GNP of a country could be spent on medical care without adequate service being rendered to the more rural areas.

The public has become convinced however, that by increasing the expenditure on this type of high technology medical care, it will reach the utopian state of disease-lessness. Civic leaders are therefore prepared to spend enormous funds in the erection and equipping of extremely expensive centres of technological excellence in the belief that these will help them to live longer instead of realizing that they can live longer by a change of lifestyle.

Technology has affected the doctor's relationship with his patient.

CONCLUSIONS

It is clear from the above analysis that different kinds of facts are revealed through different methods of collecting data therefore giving the physician a different view of the patient and his illness. But the technique chosen also influences human attitudes and relationships. The technological orientation within medicine has thus influenced the doctor's image of himself and the goals of medical practice, it has affected his relationships with his patient, the association of physicians with each other and thus the institutions into which medical practice is organized. Technological innovations change the perceptual experiences and the social relations of those who use them as well as the language used. The doctor has come to see his task as that of curing or at least alleviating ***physical*** pain and discomfort. He is no longer sensitive to the subtler modes of suffering which his patient is experiencing and is unable to care adequately because the relationship with his patient has become devoid of interpersonal meaning. The possibility has also arisen that technology itself has become the source of new forms of suffering which are not recognized by the profession.[4] The inability of the health professions to offer comprehensive care has led to the situation in which this aspect is being taken over by other professionals (*eg* the social worker) and to the paradoxical situation in which the increase in technological power of medicine has become associated with a decline in the image of the medical profession and recourse being taken to alternative forms of health care.

What has happened in industry has also happened in medicine — the machines not only seem to run themselves, but develop an identity of their own. They become enveloped in a new mythology in which they are assumed to produce uniformly trustworthy results free from human flaws and bias and therefore more valuable than humans in treating and diagnosing disease.

Although the evidence produced by machines is extremely valuable, it is invariably influenced by the human hand that operates them and the human mind that evaluates their

Technology itself has become the source of new forms of suffering.

results. Furthermore, the reality of the patients' world consists of much more than that which is accessible to machine-analysis. The doctor who comes to accept a fundamentally mechanical view of his patient is therefore denied access to a whole range of non-measurable facts that he can only find and describe with his own senses within a personal relationship.

It has been argued that the involvement of machines in medical practice will give the doctor more time to spend with his patient as a human being. This is an illusion because the machine environment invariably directs the attention of doctor and patient to the mechanical, measurable aspects of illness and away from the human factors, and diminishes the chances of a close, personal, caring relationship developing.

The physician, over the last century, has therefore relinquished one partial view of disease (the attachment to subjective verbal evidence) for another (his devotion to technological evidence and procedures). This has led him to perceive his patient more and more through a screen of

machines and specialists and he has had to relinquish more and more of his control of the diagnostic and therapeutic process. It has estranged him from his patient as a human being and from his own judgement.

The reality of the patient's world consists of much more than that which the machine can analyse.

SUGGESTIONS

To overcome this alienation and estrangement it is necessary that we come to realize that the human setting of a disease, those aspects related to the individual's beliefs, hopes, illusions, values and other facets of mental and cultural life, are as important, forceful and significant in the relationship between the doctor and his patient as are the purely biological aspects which are approached through technology. These human aspects of illness are a part of medical responsibility and of the goals of the medical profession. How to develop this within medicine is an awe-inspiring problem.

A machine environment directs the attention of doctor and patient to the mechanical and measurable; and away from a human, caring relationship.

However, communications technology may be of assistance here. By allowing prompt access to the knowledge of specialists and the analytical capacity of modern machines, a larger number of physicians might be prepared to practice outside the protective environs of the big institutions and the cities. In such a decentralized medical environment the rural physician might discover, trust and exercise his own judgement more and thus conduct a more personalized practice in which he really cares for his patients' human needs.

The accuracy, efficiency and security of technology has been bought at a high price both in terms of impersonal medical care, undermining the physician's belief in his own ability to care and the public's image of the medical profession as a caring profession as well as in terms of actual capital and running costs.

No matter how useful and important technology may be both patient and doctor must reject this bondage to it. The technological tools must be regarded ***as tools*** to be chosen as necessary for a particular task and not be allowed to dominate the clinical situation. Only in this manner will the physician, while making full use of technological advances, be able to regain and reassert his faith in his own medical judgement, accept the patient as a full human being and take upon himself the full and primary responsibility of his profession to care for the whole man from the cradle to the grave.

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