

# Spare Parts for Humans By Dr Wong Tien Hua

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A recent headline news article in The Straits Times, dated 10 June 2002, caught my attention. It highlighted the role of science and technology in medicine in our society, and raised a number of issues worthy of further discussion.

Entitled "Human Spare Parts Made in Singapore", the article reported that the scientific community in Singapore has developed new ways of generating human tissue, bones and ligaments, nerves and teeth. It said that much of the developments come from the NUS Engineering Department; "Engineers will no longer just wear hardhats and be seen at construction sites or factories... some of them will also wear lab coats and conduct research to treat illnesses and save lives", said the Dean of Engineering.

The layperson reading this article will no doubt be made to feel that progress in science and technology has once again proven itself, that there is now more hope for humanity, and wonder at the marvels of technology previously used in textiles and construction being applied to create "spare parts" for humans. Science has once again offered new opportunities for treatment to patients in need of organ systems. With the exactness and rigorous standards required in engineering industries, these new tools promise more efficiency, reproducibility, and less side effects.

## BENEFITS OF SCIENCE AND TECHNOLOGY

The benefits of science and technology are obvious for all to see. It has

changed medicine over the past century, providing new methods for diagnosis and treatment, in some areas even creating entirely new disciplines. This is no doubt due to the superior methodology of science, with its deductive and inductive techniques to evaluate, interpret, and explain clinical observations. The aim is to seek reliability, accuracy, and standardization of data. It is in this reliability that science has achieved much more certainty in obtaining objective data, which clinicians can use to make diagnosis and therefore plan treatment.

Some examples of where science has excelled include the use of x-rays and imaging machines to analyze the human body, advances in laboratory testing techniques to aid diagnosis, treatment of infectious diseases with antibiotics, prevention of diseases with vaccinations, and the use of high-tech methods in surgical techniques such as laser refractive surgery, gamma knife, telerobotics, and so on.

## LIMITATIONS OF SCIENCE AND TECHNOLOGY IN MEDICINE

Is science and technology the panacea: is it able to solve all problems in diagnosis and management in the context of clinical practice? We can go back to the news article again and use this to examine the issues that are at the core of the ongoing debate on the relentless pursuit of science in medicine:

**a) That the human body is now equated with a mechanical machine that can be replaced by spare parts**

Rene Descartes was responsible for fostering the reductionist view of medical science by equating man with machine. He asserted that all the structures and operations of the human body are reducible to mechanical models. He encouraged the focus of scientific efforts into the "body machine", to divide each of the difficulties presented by the system under consideration into as many parts as possible, and then analyze them separately in the hope that knowledge of the complex aspects would emerge. This has led to the belief that one can easily fix the body machine once it's broken, and the answer lies simply in finding the right materials to replace defective organ systems.

The success of this reductionist approach in inventing new diagnostic and therapeutic tools has distracted society from thinking of the human body as a unique person with individual emotions and perceptions. The uniqueness of each individual person means that the generalizations of science may not be applicable. Awareness of such limitations has now resulted in an ever-increasing emphasis on the "whole man". This holistic approach views disease as the result of an interaction between many factors (genes, environment, biology, and psychology), which cannot be broken down like the parts of a machine. The reality of looking after people in the community



### About the Author:

Dr Wong, MBBS (1993), MRCP, did his hospital rounds for 2 years before leaving for Hong Kong where he spent 4 years in private practice in post-handover Hong Kong. He decided to return to Singapore after having too much Wun Ton Meen, Char Siew, and roast goose. He is now practicing as a solo GP in Seng Kang and can be seen in the area once again indulging in Mee Pok, economy rice, and Cheng Tng.

Dr Wong can be contacted at email: [tienhuawong@pacific.net.sg](mailto:tienhuawong@pacific.net.sg)

demands such an approach, where the context of the patients in their family and social environment may affect their illness as much as the disease itself.

### b) The high regard given to science and technology in society

Society continues to be in awe with the wonders and the novelty of scientific invention, sometimes to the point of blind faith. This arises from the curiosity to understand more about health and diseases, but underlying it is the basic human need of being able to take control of one's health and thereby to have control over one's destiny. Clinicians and philosophers have cautioned that this high regard for science is sometimes seen as a modern religion, that there is a widely held belief that there is something special about science and its methods. What tend to be ignored are the many disadvantages and adverse effects of technology, one of which is its contribution to the escalating costs of the practice of high tech medicine.

### c) The perception that disease and illness are the same

Disease terminology arose from the need to label and to classify. This was fueled by the belief that each disease has a specific cause. The biomedical model supports and encourages the pursuit of the disease in the hope of finding the cause and therefore the cure. However, disease does not exist independent of the social and personal context of the patient. The ideas of disease do not take into account ideas of illness, which is what the patient is suffering from. There is a fundamental difference between treating a disease and healing a patient.

### d) Over reliance on technology in clinical practice

The preoccupation with science has led to the illusion that humanity is making sustained progress and that any problems encountered can be solved by more technology. However, it can be argued that the contribution of science to the dramatic decline in mortality rates in industrialized countries over the past 150 years may have been negligible, as the declines occurred in association with improvements in nutrition, sanitation, and social conditions.

### SUBJECTIVITY IN CLINICAL PRACTICE

Technological advances have certainly benefited the process of diagnosis in medicine, and have replaced much of the physical examination. Where there is still a need to perform a physical examination, technology can quickly confirm what we suspect. For example, a chest x-ray can confirm lung pathology on the same day, or an ECG test is able to confirm the presence of heart disease. Technology has therefore removed doubt and reduced subjectivity. In many instances, technology is now a natural extension of the physical examination.

The precision in medical diagnosis depends on three characteristics: the intrinsic accuracy of the measurement or test, the constancy of the phenomena being measured, and the ability of the observer to interpret and record the phenomena<sup>1</sup>. There is therefore a subjective element involved. In dealing with the problem of observer variation, doctors may sometimes give more weight to the measurement's accuracy. They should instead try to develop a better insight into the patient's feelings and environment, by carefully listening to the patient. The art of medicine is in developing a talent for understanding the human needs of the patient and using this knowledge to manage his illness better.

The danger of technology, therefore, is that it over-emphasizes objective data, leaving little room for a human element in the process. Technology threatens to replace the skill of history taking and physical examination by bypassing the subjective reports of patients with apparently objective evidence of illness. Such is the basis of the disease-orientated approach as compared to the patient-centered approach. Technology may put a barrier between the doctor and the patient, where both may trust more in machines than man. However, we know that the functions of machines are finite, and they are also subject to fault and failure.

### CONCLUSION

It is suggested that man's main problem with a new and accepted technology is its regulation. He must adapt, control, and use wisdom to govern the use of new technology. To rectify the imbalance, we as doctors must always stay focused on the patient-centered medical model, and to treat the patient's illness, not his disease. We must emphasize and educate them that machines are only tools to assist in diagnosis and management.

Socrates was said to criticize Greek physicians in his day for foolishly neglecting the whole when attempting to heal a part. He argued that "just as one must not attempt to cure the eyes without the head or the head without the body, so neither the body without the soul".

The ultimate decisions still fall within the doctor-patient relationship, with the necessary advice and treatment options given by the doctor, and thus, decisions should be shared taking into account all factors, including subjective thoughts and feelings. ■

### REFERENCE

1. Reiser S. *Medicine and the reign of technology*. Cambridge: Cambridge University Press, 1982; 194.