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May 8, 2006

MEDICINE AND SCIENCE

Beginning in medical school I became interested in the historical basis of what I was spending so much time studying. When for instance did medical students start dissecting cadavers? At the time I was spending an average of six hours out every day tediously teasing out the various nerves and blood vessels from an almost petrified body of a poor indigent who I am sure had no idea that his mortal remains would end up in an anatomy laboratory. Later on, my classmates and I became bleary-eyed looking down our microscopes at purple and pink dyed bits of human tissue attempting to memorize the microscopic appearance of the healthy and diseased. Long before we ever laid eyes on a patient countless hours were spent learning to determine the constituents of urine and blood and learning the essentials of the circulation, respiration, digestive and kidney functions in experimental animals. Where did all this come from and who started it? And what had all this to do with dealing

with disease and helping in the lives of real people? Since then I have graduated medical school, gone through a seven-year residency and almost 50 years of neurosurgery practice. I have had time to think about these and other questions having to do with the development of our profession.

The medical specialty that I selected was that of surgery of the nervous system. I have always been interested in medical history. Surgeons have always been somewhat distinct from other physicians who generally treat patients by prescription. Traditionally, physicians have looked down on those who willingly got their hands dirty with the messy business of cutting and sewing. Surgeons on the other hand were often contemptuous of healers who they considered mere talkers and pill pushers. The interface became blurred very early on when the prevailing theory of disease entailed the taking of blood, considered harboring the source of illness. Historically the conventional routine was for the physician to prescribe drugs

and to call in and direct a surgeon where and what to cut. Originally it was to cut open a deemed particular vein and drain putatively poisoned blood. It has obviously evolved since. In general, this routine of calling in the surgeon when medical treatments fail, continues to the present. At its beginnings, surgical practice was otherwise restricted to dealing with problems that could be easily observed: lacerations, boils and sores, broken bones, amputations of limbs that could not be saved, removal of foreign bodies, hernias and hemorrhoids and the like. But surgery, like medicine in general has become a science as knowledge and techniques in diagnosis and treatment have become progressively sophisticated. This evolution however, was slow and halting.

The development of modern surgery began first with the systematic study of human body with human dissection in the renaissance of the 16th C. which correction of ancient errors based on the anatomy of animals. With each generation, the

study of anatomy and physiology steadily progressed. For example, the role of the heart was established in the circulation of the blood in 1627. That the lungs functioned to oxygenate the blood was determined some 50 years later. Gastrointestinal and urinary physiology were worked out in the 19th Century. How the brain functions, a question first addressed experimentally only in the past 150 years remains to be fully deciphered.

The realization that the human body is a machine of sorts was and is difficult for some to accept. What is the soul and where is it located? What does the possibility of cloning mean? Complicated questions such as these surgeons deliberately ignore. We leave such questions and their implications to others. Our tasks are difficult enough in merely coming to grips, absorbing and applying the knowledge we have. That knowledge was often incomplete or erroneous. Historically, the fact that the blood circulates should have made discussions

moot as to where on the body phlebotomy or bleeding takes place. The rationale for bleeding remained vague but venesection continued as standard treatment for centuries. The acceptance of the germ theory of disease showed that it was useless only in the 1860's. Doctors neglected the microscope for 200 years until the significance of human blood cells was first appreciated. Blood pressure first measured in a horse in the 1720's was thought to be irrelevant until 1910! Although the use of x-rays was virtually immediate after Roentgen made his historic discovery in 1896, it took 5 or more years to incorporate them in the evaluation of the chest where they became standard in the diagnosis of lung disease. Modern imaging with CT an MRI were in use in industry years before medicine took them up.

Before medicine and surgery could effectively deal with disease and illness, the normal body required understanding. The nature of disease and its effects also had to be determined. This of

course is what we as medical students spent so much time on. The acquisition of this knowledge was a painfully slow process. It continues to be. It relies on the systematic study of diseased bodies and body tissue, which only began around 1750, facilitated by the invention of the achromatic microscope and the aniline dyes to effectively make the microscopic visible. Most recently, with gene studies, this continues as we learn more about the great influenza pandemic of 1918 by analyzing tissue of its long-dead victims. Progress in this, the basic sciences led to corresponding progress in the medical and surgical practice. Surgery, the skilled work with the hands continues to implement knowledge gained in the basic sciences. As medicine becomes more and more sophisticated, so does the work of the hands, which incidentally, is the translation of the ancient Greek, chirurgia, from which the word surgery is derived. Surgery remains dependent on carefully developed manual skills as it always has, though we are now in

an era of space age technology. We now employ lasers, endoscopy, stealth guidance, perform heart-lung by-pass, organ replacement and deep brain stimulation, procedures only dreamed of a few years ago gut the need for the surgeons' hands persists.

The apparently radical idea that human intervention could influence the course of disease and injury is not new. As disease and healing of the body were mysterious phenomena, so the first physicians were those who seemed to possess mysterious powers, knowledge beyond the norm. Those with experience could predict healing but it could never be satisfactorily explained. The hard working surgeon who bound up wounds or removed arrows and splinted the fractured did not try. They left it to non-surgeons to promulgate theories of illness and disease resulting futile attempts by physicians and priests to ward off and treat illness that cruelly swept through populations in the form of one plague or another. Half of the

population of Europe for example, perished with the Black Death in the 1340's. Surgeons had a much simpler job. Although there were feeble attempts at systematic evaluations of one treatment or another well into the 19 C. A glance at any country churchyard filled with entire families dying within a few weeks of one another testifies to the human helplessness in the face epidemic disease. There was no science on which to depend. Both medicine and surgery were no more than arts practiced in no systematic way, and one theory of disease was as good and as useless as another. Similarly one surgeon's wound salve was as useless as another. The first aphorism of Hippocrates, the ancient Greek physician, expressed it best: ars longa, vita breva; the art is long and life is short. And until the relatively recent era, without science, the most physicians and surgeons could offer their patients was their sympathy. This might create an emotional bond of between the patient and the doctor but did little else.

In the modern era as medicine and its handmaiden, surgery have become much more scientific and effective. Life expectancy of 45 in 1900 is now 75. Infectious disease has become little more than an annoyance. Heart attacks are no longer synonymous with mortality. More people are living with cancer than dying with it. With all of the science and resulting medical progress certain paradoxes have been created. The most significant, in my opinion is the loss of what sick patients perhaps, need most and what doctors over the centuries always did best, expressing concern, offering and giving attention, and sympathy. As we all know the modern standards of practice demand the utilization of more and more elaborate and expensive diagnostic and therapeutic procedures. The laying on of hands, which in a tangible way connects patient and physician, is de-emphasized and unfortunately made trivial. Patient expectations, conditioned by medicine's often-spectacular advances in diagnosis and treatment, are

often understandably unrealistic. A serious loss of the heretofore-intimate doctor patient relationship has occurred. Which has resulted in a serious medical liability litigation problem. This in itself has also adversely affected the traditional doctor-patient relationship. Third party payers do not compensate for any extra time to deal with patient concerns. Expressions of empathy are often misunderstood. At the same time, progressively reduced reimbursement results in less time for the physician to devote to the intangibles of caring, the reasons most physicians are attracted to medicine.

The other paradox has to do with anti-intellectualism. There was and still is a basic human suspicion of authority, whether it be political or intellectual. Often it is justified, most often it is not. In medicine one sees it in individuals and in institutions manifesting itself in resistance to almost every medical advance. Vaccination, anesthesia, blood transfusion,

contraception, stem cell research, the use of animals in research are examples. Moreover there is a dilemma, a basic conflict between medicine and religion which creates a tension that must be continually addressed: just what is the nature of evil in the form of illness and disease in human life and the proper role of the physician? If mankind is being punished for original or other sin, what business has man to interfere? Should a physician prolong life under every circumstance? How far should physician go to relieve pain? I have suggested that it was only as science began to significantly affect the practice of medicine and make it more effective, and as human life was being significantly affected, that moral and ethical dilemmas increasingly appear and become pertinent. To complicate matters further, third parties: insurance companies, government and religious groups, seek roles in determining what is appropriate health care. Though the public accepts the role of government in seeing to it that practitioners are

qualified, they do not, it seems to me, want medical decisions to be made by others. Particularly, the public and their physicians resent institutions which purport to protect us here and in the hereafter, which insist on trying to tell us what is appropriate care in perhaps the most profound aspects of our lives, health, life and death. We are sometimes expected to conform to rules that may defy common sense or any scientific rationale, based on some irrelevant more or prejudice. This is particularly apparent in the field of reproduction but it does not end there. The ridiculous posturing of politicians in the recent unfortunate Terri Schiavo case is particularly obvious.

Then there are also the third party payers, insurance companies, those that pay our often-exorbitant medical bills. Their decisions made by non-medical executives as to what to pay for, amount to a difficult to accept rationing system that one suspects is based on cost and and not medical need.

At the same time, there frequently remains a basic suspicion of medical authority. In spite of all our science the public is aware that the fields of medicine and surgery are rife with unproven theories, and often-dangerous medications, treatments and procedures. Hardly a month goes by without the recall of some medication or another. And it is not free of deceit. The example of the Korean investigator putting together false data in an attempt to prove human cloning is especially glaring. Based on erroneous theory that gunshot wounds were poisoned, for years, the wounded were further tortured by applications of boiling oil. Similarly, as I mentioned earlier, based on the idea that draining blood from the body is healthy, the majority of diseases were treated this way up through most of the 19th Century. No less a person than George Washington was essentially bled to death by his physicians attempting to treat a sore throat! Asafetida worn around the neck to ward off colds was common while medication toxic

with mercury, lead and arsenic and narcotics were standards.

A bit of doggerel verse satirized the practice of the famous Dr. Lettsom, a prominent and very successful London practitioner of the 1750's had it: "When any sick to me apply, I physics, bleeds and sweats 'em. If after that, they choose to die, why verily I lets 'em"!

The idea that medicine is more art than science dies hard. Physicians as well as others are very comfortable, often relying more on limited personal experience than on a published series with scientific validity. For example, I can only guess how many in this group have been prescribed a potent antibiotic for viral cold symptoms, a completely useless and counterproductive treatment, simply because of ignorance and habit. Another example of recently corrected error: elaborate and ingenious surgical techniques were developed and distinguished careers built over the years to deal with stomach ulcers. With the discovery of a heretofore-unknown antibiotic sensitive

bacterium, such surgery is now most often unnecessary. In the 1940's Hospitals were built and careers made to carry out frontal lobotomies on schizophrenics, dangerous surgery now discredited and abandoned in favor of modern psychotropic drugs. The list is a long one.

Beside sins of commission, I believe the most glaring sin of omission in my field of surgery was the reluctance of surgeons to embrace the germ theory of disease. In 1842 Dr. Oliver Wendell Holmes was severely condemned when he showed that physicians with unwashed hands could carry infection from one patient to another. Ignaz Semmelwies was driven mad with frustration as patients continued to die unnecessarily because his data was ignored which showed the same thing. While Pasteur established bacterial cause infection in the 1860's, 20 years later surgeons were still operating in frock coats, wiping their bone handled instruments on their blood-encrusted aprons and using dirty sponges on wounds. The first hospital to

be built with a dedicated operating room had to wait until 1891. My father recalled surgeons operating without rubber gloves as late as 1928. The use of anesthesia in surgery began in 1846 but there followed a tremendous outcry by many in the clergy against its use in childbirth as being against the bible and surgeons focused on its apparent dangers, somehow preferring the painful screams of their suffering patients. A reluctance of physicians in many areas combined with the activities of organized antivivisectionists has over the years significantly retarded scientific medical research. Prions, the cause of mad cow disease were discovered here at UC in San Francisco in the 1980's resulting in the award of the Nobel prize, but even today in spite of the very real concern over prion-caused mad cow disease there remains a significant reluctance to even accept their very existence.

With the recall of highly touted and highly profitable drugs and treatments now shown to be not only useless but possibly

dangerous it is understandable that the public is somewhat skeptical of what may be defined as medical science. As a result one can point out the frequent public preference for quackery and the massive section for chiropractors and naturopaths in the telephone yellow pages.

Along with natural skepticism of the public, physicians themselves have learned to be cautious. Over the years there have been too many disappointments in so-called miracle cures, drugs with unexpected and serious side effects, useless and dangerous operations and the like. Be not the first nor the last, is an old maxim that is as valid today as it was when I first heard it when I attended my first clinic a senior medical student.

But what about science? Why can't we always depend on it? Like any method, science in medicine may fail or may be incomplete. At its core, it will always depend on the validity of the information and the accuracy of non-biased observation.

That science in medicine and surgery has been successful is proven by the health and longevity in all of us. But it is not perfect. Data and interpretation and conclusions derived from that data can be suspect. I believe it was Disraeli who said: " There are lies, damned lies and then there are statistics!" It was true in 1870 and remains true today. Any accepted truth may and probably will ultimately fall to be replaced by another. This is a commonplace and is part of our consciousness.

The art of medicine is in dealing with these paradoxes and contradictory and conflicting forces that affect doctors and their patients. The battle against disease and illness has always been accompanied by a battle against ignorance. There is no reason to think this will change. In this paper I have attempted bring some of this out.

In the relief of the human condition the need for the art in medicine and surgery will continue. To cure sometimes, to