If I Were Dean:

A Challenge to New Medical Students

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Abstract

If I were Dean I would welcome new students by explaining that they will be trained to become humane, compassionate scientists, and that our medical sciences are based on classical Greek science and medicine, with its first aphorism "Life is short, but art and skill are long." Science involves the conception and construction of refutable hypotheses, and their testing by repeatable experiments, followed by publication of the results. Thus, science is uncertain, tentative, probabilistic and universal. Our students will learn compassion both from our bioethicists and from faculty role models. I would warn the students that, unfortunately, much of the general public has little understanding of science, does not accept our medical model, and is increasingly seeking alternative, pre-scientific, non-scientific and even pseudo-scientific models of care, not necessarily from lack of intelligence, but perhaps more from scientific illiteracy and innumeracy. And the public fruitlessly demands safe and effective drugs, free from side effects, for all ailments, but they often fail to take drugs when prescribed, and/or take alternative medicines instead.

Key Words: Medical students, science, pseudo-science, compassion.

WELCOME TO OUR SCHOOL OF MEDICINE. After three and a half years you will all, or almost all, become physicians qualified for lifelong careers (which includes lifelong learning).

You have been chosen carefully, from thousands of applicants, for your intellect, conscientiousness, pertinacity, poise, self-confidence, work experience, and extracurricular interests and achievements. Deans often proclaim the ambitions of their curricula. Instead, for my subject, I have chosen a simple definition: A physician is a humane, compassionate scientist. I shall start with science, and its definition.

You may be surprised to learn that the medical sciences we shall teach you are, in origin, Greek science and Greek medicine. In the ancient world, medicine was based on the belief that diseases were sent by the gods, from whom relief should be sought. But about two and a half thousand years ago, the Greeks began to believe that diseases were not divine in origin, so that their causes must be sought in the natural world. And they began to believe that physicians should be taught to reason and experiment, and perhaps above all that sequence was not proof of consequence. Dissection of animals and humans laid the foundation for anatomy, and experimentation led to physiology. Greek medicine spread both west to the Roman Empire and east to India and beyond. After the fall of Rome, the loss of Greek texts was fortunately alleviated by translations into Arabic, Hebrew and Latin by Muslim, Jewish and Christian scholars, who together helped lay the groundwork for Renaissance medicine and science – and ultimately, modern medicine.

Here is the oldest and most famous aphorism of medicine and medical education (1): Ὁ βιος βραχυς, ἡ δε τεχνη μακρη: (*Ho bios brachys, hē de technē makrē*): "Life is short, art is long." The saying has implications for you as medical students. You will begin studies here that, hopefully, you will continue far into the future. At the same time, we may need to re-

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strain the enthusiasm of your instructors to teach you "everything" in their fields – for that would be unrealistic and impossible in four years.

Without doubt these next four years will be as difficult and demanding as they were in Glasgow in 1786 (2): "While we admit that experience and observation are the surest guides in the practice of medicine, it must be granted at the same time, that to make judicious experiments from what we observe, not to confound the effects of one cause with those of another, and to apply our experience and observations to the best purpose, is not easy, nor so common a thing as is usually believed."

What Is Science?

As a young man, I understood science to be the acquisition of knowledge of the universe by experiment, and also accepted Kelvin's definition, "Science is measurement," i.e. biometry and statistics. I don't recall being taught then that scientific theories or laws were based on the testing of hypotheses. I was not aware until the 1980s that conceptual precision and observational testability might also require *falsifiability* (3), and only recently did I learn that predictive *verification* may be just as important as *falsification* in the production of scientific knowledge (4).

I would now say that science is "the conception and construction of refutable hypotheses, their testing by repeatable experiments, followed by publication of the results." The corollary is that scientific hypotheses can never be totally proved or disproved. "Theories are not verifiable but they can be corroborated…. Every scientific statement must remain *tentative forever*" (3). "Science proceeds when earlier hypotheses are refuted by data, and awareness of this history of 'conjecture and refutation' is what stimulates new hypotheses" (5). Charles Darwin put it even more simply in 1861: "How odd it is that anyone should not see that all observation must be for or against some view if it is to be any service" (6). "Science is truth-seeking, it is uncertain and is subject to constant revision…. Causation in science is probabilistic and universal" (7).

I tried to plan research, both my own and that which I supervised, by such a scheme. However, I found that my graduate students did not recall being taught anything about the nature of science. I therefore performed pilot studies both in England and in the U.S. I asked those questioned to write, anonymously, in one sentence, what they understood by the term "science." Almost every answer expressed acquisition of knowledge of the universe, so that when scoring, I searched for the terms "hypothesis," "theory" and "experiment." (No one mentioned either "corroboration" or "falsification.") Of 25 final year medical students in London, only five used "experiment," only one "theory" and none "hypothesis" (8). Of 18 undergraduate science students in the U.S. only three used any of these terms. Of schoolgirls, ages 16–18, at an independent English school, none of the 11 studying sciences mentioned any of these terms; two of the seven studying liberal arts mentioned "experiment," but none used "hypothesis" or "theory." Two thousand upper secondary students in the U.K. in 1992 confused science with technology, and 46% held that science could rest on the assumption of an intervening deity (9).

Humanity and Compassion

I assume that you will learn genuine science here. My next question is whether humanity and compassion can be taught. Virtue-based ethics applied to medicine seeks to produce a physician with such virtues as benevolence, compassion, courage, fidelity, honesty and truthfulness (10). How these aims are best achieved, by teaching or by practice, has been discussed ever since Socrates. Actually, both are important. Here, the theory will be taught well by our bioethicists. You will observe the practice of our faculty, and I trust that you will find some of them helpful role models for your own future practice, and for your own skills, which you will pass on to future medical students.

You will forgive me, I hope, if I raise the issue of behavior in the hospital, especially with patients. Medical students are young and full of life, and for centuries it has been a challenge to rein in their boisterousness. In 1778, the municipal government of Edinburgh required that its medical students display "a composed and decent carriage [i.e. social behavior]," because levity, "almost the inseparable characteristic of youth in any profession [would prevent the students] from paying compassionate attention to the patients…. The majority of young gentlemen who walk our different hospitals are little under the dominion of the humane power of sympathy…. Thus [physicians and teachers should] recommend by precept and enforce by example the humane attention here

recommended [because] humanity will always stamp a dignity on the profession" (11). Here at Mount Sinai, New York's first neurologist "stressed the importance of the doctor looking neat, being scrupulously clean, using good English, and articulating distinctly" (12). Clear communication is always a valuable tool for the physician.

The Medical Model and the Public

I have now explained how you can become a humane, compassionate scientist and a skilled physician, and you may feel that all I need do is wish you well. Not so.

Given the widespread lack of scientific understanding, you will not be shocked to learn that much or even most of the public does not accept our medical model and seeks alternative, pre-scientific, non-scientific and pseudo-scientific models of care (13). Between 1990 and 1997 the number of Americans using complementary and alternative medicine (CAM) rose from 25% to 42%, with an increase of 50% in expenditure on alternative therapies. In primary care there were 386 million visits to physicians and 629 million visits to CAM practitioners (14). The use of herbal remedies increased fourfold, so that half of all adult Americans now take dietary supplements, and in 2001 they spent $4.2 billion on herbs and other botanical remedies (15). Greek physicians faced the same problem 2500 years ago, and in Saxony in 1900 there were 2,029 legally qualified physicians and 1,578 known illegal practitioners (16).

Why do so many people seem to prefer alternatives to science? Is it a question of intelligence? There may be an "intelligence gap" of sorts between physicians and the general public. However, those seeking alternative medicine or science are drawn from the least to the most intelligent in the land. The wife of one recent President consulted an astrologer to plan the timing of her husband's trips; another held imaginary conversations with a dead predecessor, Eleanor Roosevelt. It is reported that the wife of a certain prime minister had toxins scrubbed out of her body in a shower, wore inflatable trousers to combat leg bloat, and had "stress-fighting" acupuncture earrings and a bioelectrical shield to ward off radiation from personal computers. She also consulted, in person or by fax, a psychic on spiritual questions and had a "rebirthing ceremony" with her husband, in which they shouted and smeared mud and fruit pulp on each other (17).

If lack of intelligence is not the problem, then do patients simply not trust physicians? No. Surveys show that doctors are among the most trusted sources of advice, followed by teachers, whereas our principal critics – journalists and politicians – are considered the least trustworthy.

As I suggested earlier, the problem may be one of scientific illiteracy and innumeracy. Of 1,574 adult Americans surveyed recently, 66% were quite interested in new discoveries in medicine and 50% in science, but only 57% had some idea of probability, only 43% were familiar with the nature of experiments, and only one-third could explain what it means to study something scientifically (13). Only 22% could define a molecule, 48% believed that the earliest humans lived at the same time as the dinosaurs, and 49% thought that antibiotics kill viruses.

What causes this lack of scientific knowledge? Americans learn about science mostly from TV (44%), compared to newspapers (16%), magazines (16%), the internet (9%), radio (3%), friends (3%) and books (2%). In 1999, only 41% of Americans read a newspaper (1990: 57%), but 63% watched one or more hours of news each day on TV. Adults spend more than 1000 hours a year watching TV, of which they spend 408 hours watching news, which includes 81 hours of science news. That might be informative, but we do not know how closely TV news is watched, because many American families watch TV at the same time that they eat dinner (18).

Whatever the cause, pseudo-science reigns. Two-thirds of Britons read their horoscope daily, and one-fifth believe in its predictions for them. In the U.S., 41% believe astrology is at least somewhat scientific, and 60% claim that some people possess psychic powers or extrasensory perception (ESP). Half the American population believe God made humans in the last 10,000 years. Two-thirds of Americans believe creatures somewhere else in the universe have recently been in touch with humans, and half of this majority believe that aliens have abducted humans. Some 80% of Americans believe that their government knows more about unidentified flying objects (UFO's) than it admits.

Another possible reason for the popularity of alternative medicine is that medical practitioners may not communicate effectively with their patients. How could you remedy this defect? First you should look at your patient's stance and gait, and above all at the face to

learn to recognize anger, disgust, embarrassment, fear, sadness, surprise and pain (19). Knowing your patient's mood is a vital first step in communicating what he or she is willing and able to hear. You should then open your ears and keep your mouth closed for at least two minutes, an amount of time that was sufficient for nearly 80% of Swiss patients to express all their volunteered symptoms. In America a patient is given an average of only 22 seconds of uninterrupted time by the doctor (20). Thus, alternative practitioners are sought because they give patients the satisfaction of being listened to for a half or a whole hour. Such practitioners soon recognize when there is no organic disease, and can then safely predict that trivial, self-limited ailments will resolve rapidly, coinciding with the taking of harmless remedies.

"Drug Problems"

The public demand medications to cure all ailments, and each drug must be completely effective and completely safe. There is little understanding that their demands are impossible because all drugs are only partially effective and only relatively safe. I was once asked to go to Washington to recommend the approval of a drug that was already licensed in Europe. The firm wanted to know how I would reply to the question, "Does this drug have side-effects?" I said I would reply, "Certainly! I would never use a drug without side-effects, because it would be therapeutically inert." The firm decided not to let me testify on their behalf.

A related problem that patients have with medications is an unwillingness to take them. One major triumph of clinical medicine is the treatment of high blood pressure with daily tablets to prevent heart disease and strokes. Yet half the patients with hypertension do not take these tablets when they have been prescribed (21). And, conversely, half the patients who do take maintenance treatment for their illness also take alternative medicines, but do not tell their physicians about them (22). Thus, many patients seem to believe that physicians prescribe drugs too readily, that drugs are best avoided as unnatural and unsafe, and above all that taking drugs for the rest of one's life means that one is ill. Being labeled "ill" is the dreaded fear of all patients, because it reminds them daily that "life is short," upsetting news that patients and even physicians like to suppress, in particular the unmentionable fact that all our patients die eventually.

You may believe that noncompliance with therapeutic advice would not be a problem for university students. Yet it is. Although physicians discourage, and would like to ban, tanning lamps because they are carcinogenic, they are used by 25 million Americans, especially young adults. A 1999 survey at a large U.S. university found that 47% of the students, especially the women, were currently using such lamps, and an additional 15% had in the past. Yet 90% of users were aware that skin cancer and premature aging were possible complications (23).

Similarly, sunbathing for a "healthy tan" is common in Cornwall, England, in spite of the fact that more than 90% of the sunbathers (24) and 94% of Britons generally (25) know the risk of skin damage and cancer. How could you persuade your patients to do what is clearly in their own self-interest when they don't wish to? Oxford epidemiologists suggested a novel approach to discourage British teens from smoking: Tell them that for every thousand young people who smoke cigarettes, one would be murdered, six would be killed in traffic accidents, and 250 would die prematurely from smoking (26).

Mount Sinai's Situation

Your curriculum here will be similar to that of other medical schools. But you should find it especially stimulating here, because this center is not only set in the greatest city in the world, but also adjoins two neighborhoods noted for sharply contrasting levels of income and prosperity. Here and in our associated hospitals, you will meet a variety of cultures, languages and religions, and people in nearly every type of profession. This variety is perhaps New York's greatest strength. You will also be faced with human dysfunction, not only among the poor, who may lack decent education, health care and homes, but also among the ultra-rich, who may worry about whether a million dollar donation might help their child's admission to a favored nursery school, then a private school, and eventually an ivy league college (27). Both rich and poor include some who suffer from alcohol or drug abuse, or sexually transmitted diseases, or physical or emotional abuse of children or spouses.

Our library is first class, and you are only two blocks away from the New York Academy of Medicine with an excellent medical library of its own. But you must not study all the time.

New medical students at Oxford in 1933 were advised to "keep an hour or two now and then for the cultivation of at least one hobby…completely divorced from your professional studies…to preserve your mental elasticity and to provide you with a handy and welcome respite from the strain of your life's work" (28). Across Fifth Avenue you have one of the finest urban parks in the world. The 92nd Street Y has a wide range of distractions. There is a public lending library on 96th Street, and the superb research library at 42nd Street. Within a few blocks are the Jewish Museum and the Museum of the City of New York, both free with your ID. Nearby is the Guggenheim and the great Metropolitan Museum. Our Recreation Office offers free or inexpensive tickets for opera, ballet, musicals, plays and baseball games. All of these are for you.

Postscript

When a former chief of medicine gave our 2002 commencement address, he admitted that he could not "remember a single word of the commencement address when [he] graduated from medical school, or even who gave the address" (29). In wishing you well in your time here and your future careers, I do not expect you to remember my name either. But perhaps you will remember that you are heirs to an ancient tradition of science tempered with compassion and humanity. My best wishes to you.

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