A philosophical basis for medical education

Lessons from the ancient world

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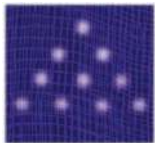
To a philosopher or historian of medical science, it must seem odd that there have been so many calls for reform of American medical education in recent years.[1] We have not yet reached the centenary of the major restructuring of education initiated early in the twentieth century, yet medical educators worldwide and patient advocacy groups in the United States are troubled that doctors do not seem to be acquiring the knowledge, skills, and attitudes needed for practice. What makes this puzzling is the spectacular success story of the early twentieth century paradigm shift. By grounding medical education in best available evidence and an understanding of the basic mechanisms of disease, the duration of life for the population has been extended, quality of life has been enhanced for millions of people, maternal and childhood morbidity and mortality have been lessened, and the demand by the population as a whole for access to technologically advanced services seems to be inexhaustible. Indeed, some medical school teachers have difficulty understanding the basis for dissatisfaction or the need for further reform of medical education, given such stunning advances in diagnosis and treatment.

In my view, the current dilemma in medical education is that the science-based curriculum has adopted the prevailing philosophy of science as the governing foundation for the curriculum, although the debate rarely is articulated in these terms. More commonly, it is asserted that the curriculum has become top-heavy in bioscience while deficient in the medical humanities, and steps are then taken to introduce into the curriculum what might be called a "remedial humanism." The narrowly focused biomedical course of study is thereby measurably transformed at many institutions into a biopsychosocial curriculum, and groups that certify competence for practice assess the salient attributes of candidates as humanistic physicians. Although certainly steps in the right direction, the more humanistic teaching program does little to remedy the shortcomings of the prevailing philosophy of science as the exclusive foundation for medical education.



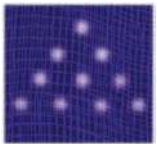
Philosophy of science vis-à-vis the art of medicine

Virtually all of contemporary philosophy of science, including that pertaining to medical science, has the principles of verifiability and falsifiability as its central concept.[2pp5–6] That is, to say that something is scientific, one must make an empirical statement with observational predictions that can be verified or falsified. Moreover, it is axiomatic in the modern philosophy of science that the only possible pathway to knowledge is the scientific method; what cannot be known by the methods of science cannot be known at all, and is therefore simply metaphysical speculation. For example, to declare that a certain medication may cause hyponatremia has "truth value," because this statement can, in principle, be verified or falsified. However, to proclaim that doctors should show respect for their patients, should demonstrate integrity in their personal and professional personas, and should seek partnerships with patients while eschewing authoritarian relationships, is (for philosophers of science) to make a series of statements that are moral imperatives, admonitions, or exhortations that can never be true or false. I argue that, since medical science is not coextensive with medical care, the principle of statement verifiability is insufficient in the process of delineating the core contents of the medical school curriculum.

To determine what can be done to broaden the philosophical foundation of medical education and care, it may be helpful to examine the education that students embraced in the ancient world, long before induction and the methods of modern science evolved. *A priori*, one would anticipate that the philosophical approach to medical education before modern times would have been patient-centered, since the education of doctors in antiquity contained little in the way of an evidence-based understanding of disease mechanism. Instead of empirical science, doctors were instructed in what has traditionally been called the art of medicine. An examination of the program of medical education devised in the ancient world to teach this art may provide helpful advice for medical educators who, at the present time, are struggling to sustain a balanced curriculum.

It is important to note at the outset that the "art" of medicine is a concept that we have inherited in a muddled manner,

and is often misunderstood.[3] In origin, the concept of an art was derived from the effort to classify the sorts of knowledge that humans possess. In the ancient world, a distinction was readily drawn between knowledge *that*, knowledge *what*, and knowledge *how*. Knowing *that* such and such is the case, or knowing *what* something is, *what* attributes something possesses, or *what* relationship something enjoys with other things, has long been ascribed to the knowledge domain of a scientist. On the other hand, knowing *how* to make the useful things of everyday life, like shoes and clothing, is the knowledge domain (know-how) of an artist. Usefulness is the essence of any art. I suggest that a philosophy of medical education based upon the concept of the doctor as an artist (in the traditional sense of this word) is no less relevant today than in the age of Hippocrates and Galen, and complements the philosophy of science admirably. Medical care is clearly both a science and an art, and students must be educated as scientists and artists.



The bequeathed education of doctors

Traditionally, how did one learn the doctor's art? In time-honored thought, the first step was the requirement to become generally educated before entrance into medicine. Unlike artisans who were trained by apprenticeship without prior preparation, young people who aspired to master the art of a learned profession such as medicine were expected first to study the liberal arts and thereafter philosophy as a prerequisite, enrolling in a program long known as *paideia* in Greek and, later, *humanitas* in Latin. (*Paideia* is a cognate familiar to us as the root of pediatrics, orthopedics, and encyclopedia.) The seven liberal arts are the *useful* tools of advanced learning and therefore arts, and among all arts they are called liberal because they are acquired by free men and women, not slaves. The basic course in the *humanitas* program, which later came to be called the *trivium*, included the three arts of grammar, rhetoric, and logic. Students then studied the four mathematical arts, the *quadrivium*, which included arithmetic, geometry, astronomy, and music. In modern thought, we do not think of music as a field of mathematical study, yet to do so underscores the idea that music is a "basic science" for the education of doctors (*vide infra*).

Once students mastered the liberal arts program, they were ready to study philosophy, another term differently understood in contemporary thinking and the Western tradition. In modern thought, we note a clear distinction between the sciences such as physics and the humanities such as metaphysics. Traditionally, however, the concept of philosophy included all of the sciences, empirical and speculative. Thus, physics and medicine were considered part of natural philosophy. Likewise, economics and law were branches of moral philosophy, while esthetics and metaphysics were branches of speculative philosophy. The premedical student, having completed the course in the liberal arts and philosophy, would then begin the study of medicine, which underscored the role of music and the place of each patient's harmonic mean in the maintenance and restoration of health.

Musical theory and medical education in antiquity

How did music become a basic science of medical education, and the study of harmony an essential component of the curriculum? Traditionally, this course was said to originate in the discovery, using two monochords (single-string instruments), that to make beautiful music each monochord must have strings of lengths such that their ratio is 2:1, 3:2, 4:3, or 5:4, intervals that musicians now call the octave (from C to C), the major fifth (from C to G), the major fourth (from C to F), and the major third (from C to E), respectively. The first three of these intervals can be seen in the figure of the so-called tetractys, honored in antiquity, which can be formed by grouping pebbles in the sand to create the first four "triangular" numbers (1,3,6,10), and represented as follows:

Philosophers and medical teachers found inspiration and rationality in the tetractys, the basis for which is not difficult to understand. Are there not 10 fingers and 10 toes? 10 is the fourth triangular number, yet has a "square" number (4) of pebbles on each side. Moreover, the capacity to play beautiful music by means of string length ratios of whole integers was thought to have explanatory relevance of the perceived order and predictability in the natural world. Over time, the hypothesis emerged that the cosmos itself and humans were organized proportionately, and therefore harmoniously, and the "music of the spheres" (*musica mundana*) and the "music of humans" (*musica humana*) were concepts widely held. Just as the major and minor musical scales with which we are familiar have seven different notes, so the seven heavenly bodies then known (sun, moon, and the five known planets) were thought to be arranged at distances from the earth (assumed to be at the center of the universe) and from each other such that they generate beautiful music as they circle the earth.[4]

The implications of these findings for medical education were clear. The concept of ubiquitous harmony suggests that it was the role of doctors to cooperate with nature by restoring each patient's body to its "harmonic mean." Although we are familiar in modern thought with arithmetic means and geometric means, the concept of the harmonic mean has faded. Put summarily, if ***b*** is the arithmetic mean between ***a*** and ***c***,

then ***a*** **–** ***b*** **=** ***b*** **–** ***c***, and if ***b*** is the geometric mean between ***a*** and ***c***, then ***a:b*** **=** ***b:c***. However, if ***b*** is the harmonic mean between ***a*** and ***c***, then ***a:c*** **=** ***(a*** **–** ***b):(b*** **–** ***c)***. To calculate a harmonic mean, "by whatever part of itself the first exceeds the second, the second exceeds the third by the same part of the third."[5p214] For example, 9 is the arithmetic mean between 12 and 6, 6 is the geometric mean between 12 and 3, and 8 is the harmonic mean between 12 and 6. The inherited idea of an harmonic mean in medical care is reflected in modern times by our stated goals to achieve homeostasis, to correct a chemical imbalance, or to restore the *milieu interieur* to its proper state of equilibrium. In antiquity, of course, the perceived disharmony among the four humours would need to be corrected (e.g., by blood letting).

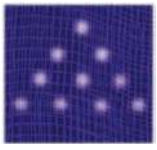
A liberal education in medicine

Given these lessons from the ancient world, what can medical schools do in the twenty-first century to develop and implement a balanced curriculum needed by all students as a generic preparation for the care of patients? I argue that schools must redress their overriding failure to provide a liberal education in human medicine, in addition to the specialized education in biomedicine needed as a background for postgraduate training. To declare that the goal of medical education is to foster professional competence and the quality of patient care is certainly correct, but is it adequate? Do not all doctors have a responsibility to pursue throughout life the sort of general learning that is conducive to the "examined life" worth living? If so, then one of the reforms of medical

education needed now is a program to prepare all students for a lifetime of general learning, distinct from the goal of preparation for a lifetime of self-directed learning in what might be called the vocational aspects of medical practice and patient care. Many educators seem to assume that medical students can acquire a completed liberal education before entrance into medicine, since very little liberal learning is included in the medical school curriculum (or for that matter in continuing medical education courses for practitioners), even though each of us knows from personal experience that this assumption is undoubtedly false.

It is really a question of introducing *humanitas* into the medical school curriculum, that is, a liberal education in human medicine in which the field is studied without reference to vocational knowledge and skills. At present, we find ourselves unsure how to proceed in this domain, yet before the twentieth century nobody doubted that the *modus operandi* consisted of diligent study of the venerated books (not textbooks) of our intellectual tradition—books thought to provide "the habitual vision of greatness." Has progress in science rendered the literary masterpieces of our intellectual predecessors irrelevant for medical education? Is the experimental method of the empirical sciences the one and only source of information and insight for medical education?

I have proposed previously that all students participate in dialectical biweekly great book seminars, to achieve a synthesis of what has been read with what the student has experienced, and to increase students' understanding of ideas, not facts.[6] Such seminars would highlight the works of our medical predecessors (Hippocrates, Harvey, Locke), celebrated authors who found in medicine paradigms for their methods (Descartes, Bacon), authors such as Montaigne, Ibsen, and Shaw who expressed their doubts about the value of medical care, and authors such as Planck, Dobzhansky, and James who have gone beyond the focused technicalities of their research to achieve an intellectual synthesis. As it is a fact of nature that there are more born poets than born teachers, medical schools will need to reward and promote mentors of such seminars appropriately. Although implementation of such a program of seminars is challenging, I suggest that the assimilation of *humanitas* into the medical school curriculum is an important step for needed reform of current medical education.



Deductions and inferences

Grounding medical education in an understanding of scientific mechanisms of disease has led to marked improvement of individual and public health. However, the philosophical principle of statement verifiability that underpins the empirical thought of scientists, and which has been adapted for medical education, is necessary but not sufficient to nurture a generic curriculum for doctors that prepares them to provide comprehensive and empathetic care. The time-honored concept that has guided our medical predecessors—the art of medicine—is complementary for learners, emphasizing knowledge of how (know-how) to adapt and to modify best available scientific evidence in specific medical care situations.

We have inherited a tradition that doctors and other artists, unlike artisans, must be generally educated before entrance into the study of medicine, through study of the liberal arts and thereafter philosophy, to acquire knowledge that is "encyclopedic" (literally, the great circle of general learning). Their subsequent medical curriculum was based upon the belief that we live in a world organized proportionately and harmoniously. That music, which is built upon the mathematics of harmony, can make humans romantic, tearful, or courageous, provides testimony to the *musica humana* that reflects our own harmonious nature. For each patient, doctors were taught to reckon the biological parallel of an harmonic mean, and to cooperate with nature in health promotion, disease prevention, and the restoration of health.

The philosophical principles of medical education inherited from the ancient world provide the conceptual foundation for teachers to supplement a science-based curriculum by nurturing *humanitas* seminars, to explore the important ideas of medicine as a field of liberal learning, and thereby to support a balanced program for medical education.

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