TRENDS IN MEDICAL AND PREMEDICAL TRAINING

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I. WAR-TIME EXPERIMENTS IN EDUCATION

Educational experiments involving thousands of students preparing for a variety of activities related to the war are being conducted in many fields and at all levels. Educators face the serious responsibility of determining which features of the several war-time programs will warrant permanent incorporation into our educational systems.

The acceleration of the training is the most important of these experiments. The desirability of accelerating premedical and medical education, consistent with quality, is apparent from the fact that the average age of graduation from medical school has been between 26 and 27 years.[1] Before the graduate has completed hospital training and is able to support himself and a wife, he is upward of 30 or more years of age. A system which delays marriage to this extent is undesirable and any efforts which can be made to diminish the period of training are well worth permanent retention. The acceleration in medical schools seems most likely to justify retention after the war, perhaps in modified form, since acceleration in the medical schools involves no basic change in the curriculum or weekly work assignments but is effected by the elimination of the long summer vacations. It is very doubtful whether there is any adequate justification for compelling the student to devote one fourth of his time in medical school or in premedical college to non-academic activity.

It should be possible to reduce by at least two years the training period between the beginning of grammar school and the receiving of the M.D. degree. The elimination of long vacations would do much toward this end. Annual vacation periods of four or five weeks would seem adequate for students in college and medical school. Throughout the rest of life, particularly in the practice of medicine after graduation, vacations longer than this will be rare. There is no apparent justification for the traditional long college vacations.

The major obstacle to accelerated programs is economic. Acceleration would have been impossible in medical schools had not financial provisions been made to aid students who had formerly depended upon summer work to earn part of their expenses. Before the induction of medical students into the Army and Navy, loan funds were provided to assist needy students. In the year

[1] J.A.M.A., 109: 672 (Aug. 28) 1937.

ending June 30, 1943, $1,063,573 were lent to medical students by the federal government. This sum was supplemented by $977,700 from the Kellogg Foundation, making a total of about $2,000,000 for the year.

In a country which is spending—not loaning — this amount every quarter-hour of the day for war, the financial costs of any worth-while educational program must not be a deterrent. Loan funds are preferable to scholarships since the practice of medicine is among the reasonably remunerative professions and students preparing for this field should be willing to undertake a financial obligation in obtaining education for that profession.

Another kind of acceleration is involved in the premedical and other college-level training programs of the Army and Navy. In these, acceleration includes considerable increases in the daily and weekly work assignments of students. In some cases the assigned load is probably too excessive for a mastery of the material. Likewise the amount of time for elective work and the pursuit of special interests is too limited under such plans.

Another experiment which we should assess is the early selection of students for entrance into medical school. Under the Army Specialized Training Program selection for premedical studies and earmarking for subsequent entrance into a medical school are made early in the student's college career. Allowance is made for the loss of some men by academic failure before completion of the pre-professional program. In contrast to this, twelve to fifteen thousand students satisfactorily completed their premedical requirements each year before the war. Many hundreds of these were manifestly unfit for the study and practice of medicine, yet they were allowed to work toward this goal for two or three or four years expecting or hoping to gain admission to a medical school. More than half of the premedical students never entered a medical school since there are places in freshman medical classes for only about 6,000 students. Annually thousands of disappointed students were forced to readjust their life plans. Many solved the problem by entering unaccredited medical schools or professions related to medicine. Too many became teachers—sometimes of premedical or even medical students.

It will be important to know whether such early selection will be successful. Efforts and attempts should be made to retain the plan in modified form if possible with sufficient flexibility to provide for competent students who may make up their minds to study medicine relatively late in their academic careers. Much academic waste would be eliminated by such a program. It may be argued that a student who completes the premedical course and yet fails to obtain admission to a medical school has nevertheless had a valuable educational experience and may graduate from college with a reasonably good general education. True, the proper teaching of the natural sciences should occupy an important place in the general education of everyone, no matter what the subsequent field of activity may be. On the other hand undue harm may result from the psychological trauma attendant upon failure to gain admission to a medical school.

Another experiment is being conducted which may prove to be even more far reaching in its consequences than those already mentioned. The Army and Navy programs entirely eliminate the economic requirement

for the study of medicine. This irrelevant qualification—the ability to pay for college and professional training—has always been a limiting factor in the selection of students. Relatively few applicants to medical schools state that they will need financial assistance at the time of application, yet every dean knows that many students require such assistance after entering the medical school. Furthermore an unknown number of qualified and perhaps superior individuals never reach the stage of applying for admission to a medical school. They have never been able to start college or even finish high school for economic reasons. The theory that everyone intellectually qualified for higher education has a chance to obtain it in state or municipal colleges with low tuition rates or through loan and scholarship funds is only a theory without convincing supporting evidence.

Under the Army and Navy programs ability to pay for an education has nothing to do with those to be educated. A serious study should be made of this obvious but revolutionary principle to determine whether an entirely new source of highly qualified students is being tapped. It has been the experience of several medical school deans' selection committees that a large proportion of men being screened for assignment to medical school would be unable to attend were it necessary for them to provide their own funds. Everyone knows that some of our best students have earned much of their way, especially at the premedical level. This is to be commended and doubtless has permitted many with limited financial resources to obtain an education. However, it is questionable whether this is not a waste of time and energy. Would not the same effort devoted to more intensive, scholarly pursuits on the part of the superior student in question return greater dividends to the student and to society than laboring in a factory or mill while carrying the college work.

There are certain features of some of the military educational programs which we may at once dismiss as undesirable. The Army program allows for no selection of a specific school by the student assigned to medicine and permits no selection of specific students by a given school. This plan may be justifiable administratively but is educationally indefensible. The standardization of the premedical curriculum found in the military programs may again be desirable for administrative reasons but can find little educational justification. At the premedical level also schools differ in many other ways than in excellence of instruction, and schools equipped to emphasize one or another of the fields in premedical education should be free to do so, exploiting local resources to the fullest extent.

II. Integration of the Training in Premedicine and Medicine

It may be convenient to delimit chronological or academic periods in the training of a doctor and refer to the premedical period, the preclinical years, the clinical years and the internship. If these divisions are more than convenient concepts and actually describe successive and segregated stages of education, they are highly undesirable. Fortunately, the lines of demarcation are gradually being erased at some points. The transition between the clinical training in the junior and the senior year of the medical student and the internship is no longer as marked as it has been. In his clinical training the

medical student is responsible for patients. He takes histories, examines the patients and performs the laboratory and other tests much as he would later do as an intern. He must report his case to the attending physicians and is responsible for following the progress of the case. A patient assigned to him is as truly his patient as if he were a practicing physician, except that he is carefully supervised and his case load is not as great as it is during the internship or in practice. Some selected and superior senior students may even serve internships temporarily in medical school hospitals with considerable profit.

The line of demarcation between the preclinical and the clinical years is also no longer as sharply drawn as formerly. In years past a student pursued laboratory courses in his first two years of medicine and worked in hospitals or clinics or attended ward rounds in his last two years of medical school, and there was relatively little integration of the two phases of his training. At the present time a great deal of clinical material is being introduced into the first two years of the medical course. In aim and spirit this must be done, not to make clinicians of students prematurely, but to strengthen and vitalize the training in premedical subjects. Presentation of a case of infantile paralysis in an anatomy course need not emphasize the nature of infantile paralysis as a disease or include therapeutic procedures. The case can be entirely an anatomical study in which the student is shown the action of certain muscle groups which he is dissecting in the laboratory by demonstrating which movements are abolished or weakened when given muscle groups are paralyzed. Similarly in physiology the introduction of electrocardiographic material need not seek to make the student adept in the diagnosis of cardiac abnormalities. Such material can be invaluable in teaching the student the normal physiology of the heart and the action of the cardiac pacemakers and conducting systems.

There is also an increasing tendency toward the introduction of more basic science material into the clinical years. Free time for review and advanced studies in the basic sciences is being provided during the later stages of the medical training, and instructors in basic science fields are contributing to the conferences held for juniors and seniors dealing with teaching cases in the hospitals. This tendency to view the medical curriculum as a four-year continuum instead of as two separate units has been one important factor in the present tendency for schools of basic medical sciences to expand into full four-year medical schools. There are other factors involved in this development, but the recognition of the inadequacy of basic science instruction in the absence of any clinical contacts is one of the major influences. Two of the schools of basic medical sciences whose students formerly had to transfer to four-year schools for the junior and senior work have now expanded to four-year medical schools and two others are well on their way toward completion of the arrangements for such a change. Nearly all of the ten schools of basic medical sciences in the United States are exploring all possibilities in connection with similar expansions.

These developments in medical education suggest the desirability of a similar less marked transition from the premedical to the medical. Perhaps this will be more difficult to achieve since it will probably remain true for a long time that very many

medical students will take their premedical training at schools and universities having no medical school. However, a measure of change in the desired direction can be effected through premedical instructors familiarizing themselves to a greater extent than they have in the past with the basic medical science curriculum.

The instructor in physics who is alive to the important electrical changes that occur in active tissues and who knows something about the electrical nature of the nerve impulse can give material in electricity which will more effectively correlate that premedical subject matter with the medical work to follow. There is no intention that a course in physics or in any other premedical subject should be considered merely a tool course which will provide the student with information technics and procedures which he may later use in his medical studies. Physics should remain a scientific experience for the student. However, the electrical changes which occur in the beating heart and which make the heart a true battery with shifting positive and negative poles are as truly physical phenomena as those occurring in a battery. Similarly, in chemistry, such phenomena as osmosis and filtration can as well be related to living systems as non-living systems. At many points similar adjustments could be made which would in nowise debase the natural sciences but would correlate them more closely with biological phenomena and would add much in the way of student interest, even on the part of such students as may not be aiming at the subsequent study of medicine.

It is doubtful whether it is desirable to present special courses in premedical sciences for premedical students segregated from students with other ultimate educational aims. The biological aspects of chemistry and physics are as suitable in many instances for the teaching of these sciences to any student as are examples from engineering or industry.

There is room not only for a better integration of this kind, bridging successive stages in a student's education, but also for far more integration of related material which a student is taking at a given time. I have participated in the presentation of biology to college freshmen and sophomores in a collaborative enterprise in which lectures, discussions and laboratory exercises are given by twenty men from ten different university and medical school departments. The departmental affiliation and special interests of each instructor are subordinate to the subject matter of the year's course. Constant discussion and criticism of each other by participants in the course have led to the presentation of biology at this level which is far more economical and effective than is possible without such close collaboration.

The success of such plans in college teaching is stimulating medical educators to think along similar lines in which the anatomist, the physiologist and the pathologist do not give separate courses in their respective fields but collaborate in presenting an integrated picture of the body in health and disease in which accidental repetition is eliminated and planned repetition incorporated when required. For example, the joint presentation of the nervous system might employ an interdepartmental syllabus of topics, readings, references and laboratory instructions covering the gross and microscopic structure, the normal physiology and the derangements of that system

with the sequence of daily topics being determined by an interdepartmental committee of instructors.

III. BREADTH OF TRAINING

Since doctors have a larger responsibility in society than the immediate care of their patients, it is necessary that the premedical student obtain a broad, general education. It is as unsound to limit premedical training or sharply restrict it to the laboratory sciences as it is to permit a non-science student to complete college without working in the laboratory sciences. Experience in the humanities and the social sciences should supplement premedical scientific training just as work in the physical and biological sciences should be included in the general education of any student.

It is becoming increasingly evident that the doctor may not isolate himself from the broader affairs of mankind and live a narrow, professional life. The doctor increasingly realizes that he must have an understanding of sociology, politics and economics. Problems relating to the equitable distribution of doctors and the provision of adequate medical care and hospital facilities in all parts of the country including rural communities are as important to the doctor as those relating more specifically to illness in a given patient. The doctor should be equipped through education and habits of thought to deal with such problems as objectively as he deals with scientific questions which confront him. Such terms as prepayment plans, costs of medical care, hospital insurance, compulsory medical insurance, group practice and many others are terms as vital to doctors, medical students and premedical students as the terms dealt with in the fields of science. Even in their premedical studies, students should become acquainted with the many experimental plans for medical care now in operation under the auspices of railroads, industry, insurance companies, hospitals, clinics and county and state medical societies. We are graduating our students with equipment to practice good medicine but without adequate knowledge and understanding to cope with the problems of relating that practice to new social conditions in a rapidly changing world.

When the student arrives in medical school and begins his basic science instruction it is very common, if not universally true, for the biochemist to state that the student's training in chemistry was inadequate. The physiologist states that the student knows no physics and the anatomist that he is innocent of all knowledge of biology. This may be related not only to the kind of training the student has obtained in his premedical studies but equally well to the kind of training the medical school instructor imposes upon the student at that later time. The chemistry instructor crams his course with as much factual material as he possibly can within the time limits and if possible obtains more time to stuff with further irrelevant detail. This the student struggles to retain until examination time. He manages to keep but little of it by the time he studies biochemistry. The biochemist expects him to have retained everything he learned in chemistry and proceeds to repeat the previous chemistry experience by again capturing as many hours of the curriculum as possible and filling them with the maximum of material. Left to himself the instructor tends to over-emphasize the role of his field in the total picture and similarly has an exaggerated opinion of the importance of all the details within

his field. One of the most salutary influences I have ever observed in correcting this very general educational evil is the collaborative presentation of courses in which the instructor must justify to critical colleagues in other fields the inclusion of the material of his course in the curriculum. This does not mean that the anatomist will tell the biochemist what to teach or that the physicist will be the judge of what is to be taught in biology. It does mean that an earnest discussion of the curriculum content by several men will inevitably lead to each man evaluating far more carefully not only the subject matter of his course but also the manner in which it is presented.

Too often stress is laid on factual material with too little emphasis upon general principles and habits of thought. Fully as important as the facts of sciences is the principle that "facts" do not necessarily continue to be true but are temporary generalizations based upon limited knowledge. Facts must be constantly modified as our knowledge increases. No matter how well versed a student is in the current facts of a given science, unless all his thinking is colored with this viewpoint he is not well trained in the science. This atmosphere in which nothing is permanently settled and in which learning must be a continual process of revision is not nearly as comfortable as that in which a fact is learned and that is the end of the matter.

We have no greater obligation than that of guiding the student into scientific habits of thought. There is no better way of effecting this in the case of at least the superior student than to have the student himself engage in some investigation involving laboratory procedures. In the physiology department at the University of Chicago, in which undergraduate students as well as medical students and graduate students may work, it was possible for a student to take his Bachelor's degree with his major emphasis in the field of physiology. Every such candidate for the degree was required to devote approximately one-third of his time for a six months' period to laboratory investigation. In most instances this involved the student assisting a staff member in some research problem under way by that instructor. In the case of many students the assistance was minor. Those students who showed themselves capable of greater responsibilities were assigned larger places in research teams and a few superior students were able themselves to carry out minor problems in laboratory investigation. Rarely were very significant contributions made by the student to the major research problem involved, but the educational returns to the student were greater than could be obtained in learning more factual material from textbooks, lectures or routine laboratory work in the special courses in physiology. Such work gives the student first-hand knowledge of how science grows and the source of the material which he studies in his other courses in science. He cannot obtain this feel toward science entirely by reading about experiments done by others. Except by participating in an experimental attack upon an unsolved problem, it is not possible to appreciate the great labor and patience and persistence which is necessary in the solution of even a very minor problem in the field of science.

It goes without saying that this direct instruction in the scientific method and in research cannot be given by instructors who themselves are not stimulated to seek answers to some questions, however minor

they may be, that remain unanswered in the great realm of the unknown in science. The student who goes through his premedical and medical courses learning all the material at his disposal without becoming especially interested in one of the many unknowns he encounters in his studies has missed something fundamental to his education and vital to his later practice of medicine. The instructor who teaches what is known, however excellently, is remiss as a teacher unless he arouses an impelling curiosity in his students regarding the unknown. This he can scarcely do unless he himself has been sufficiently stimulated to attempt to solve some problem at which he has worked earnestly during some of the time remaining after the responsibilities of the classroom, the laboratory or the clinic have been met.