

MEDICAL EDUCATION

CORRELATION OF MEDICINE AND PHYSIOLOGY*

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Probably nowhere else in the curriculum is there greater need for, or greater benefit obtainable by, proper correlation in the teaching of two subjects than in the case of medicine and physiology. Such correlation obtains to some degree, at least, in certain institutions, but in none, I believe, have the full possibilities been realized. In all too many faculties it is lamentably lacking. To endeavor to point out the reasons for this failure and the ways and means for its correction is the task assigned to the writer. Consideration of this problem may be inaugurated by the dogmatic statement that the object of teaching in any branch of the medical curriculum is the preparation for the practice of medicine or surgery. We can differ only in our opinions as to how this object can best be attained.

As the study of physiology must precede that of medicine, it would seem best first to consider the views which may be held in connection with its teaching. At one extreme stands the physiologist (a rare exception in my acquaintance) who boasts his ignorance of, and lack of interest in, medicine, and believes he will best serve his students by teaching his branch in such fashion that, while arousing their interest in and enthusiasm for this wonderful science, he imparts to them an adequate knowledge of its general principles and important facts, and trains their powers to observe and reason. One holding such views will make no effort to so select the material presented or to so modify its manner of presentation as to make his course more practically useful in the later studies and professional life of the student. Opposed to him is that fast disappearing type, the professor of medicine,

who, knowing little of physiology, insists that the physiological teaching should be mainly "practical" (whatever that means) and that the teacher of this branch should concentrate his efforts on those portions of his subject which have a bearing on the later clinical activities of the student.

Most of us will cordially disagree with either of these positions, believing that that teaching of physiology is best which, while seeking to give the student an adequate knowledge of the subject and to stimulate his interest and enthusiasm, will train him to observe and think. Thus will he be equipped with the methods and knowledge essential to acquire later the faculty of diagnosing his patients correctly and treating them successfully. The preponderating majority of the physiologists of my acquaintance share these views. That most of them realize this aspiration is doubtful, but for this they are only partly responsible.

In many (I believe in the majority) of our medical schools the work of the physiologist is hampered by the insufficient time allotted to the subject, the impossibility of obtaining a sufficiently large and properly qualified staff of teachers, and by an inadequate supply of experimental animals. The latter factor is often responsible for the fact that so much of the time in the laboratory is spent on muscle-nerve experiments. The deficiency in size and equipment of the teaching staffs is only in part a question of lack of money. Much of it is due to an unwillingness of departmental heads to utilize and an inability to interest young physicians in the teaching of physiology and in working out physiological problems. The inclusion in the physiology teaching staff of one or several keen young physicians or surgeons is most desirable and would do much to bring about a better correlation of this branch with the clinical subjects.

In many schools there is room for improvement in the allotment of the time devoted to the teaching of different portions of the subject. Students often appear to be more deficient than they should

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be in knowledge of the physiology of the circulation, respiration and the alimentary canal, and to know less than they should of secretion and metabolism, of the functions of the central and peripheral nervous systems and of the endocrine organs. Perhaps this is partly due to the fact that, while they have at the end of their courses in physiology possessed a fairly satisfactory knowledge of these things, there is no adequate provision made in the clinical years for keeping alive in the student's mind a remembrance of and interest in physiological facts and theories. It is in this lack that I find the chief explanation for the failure of the student to correlate his physiology and his medicine, and for this I believe the chairs of medicine are more to blame than those of physiology.

How can this situation be remedied? A first essential is that the physiological teaching staff shall never forget that its students are studying this subject as a preparation for later clinical activities. A second and even more urgent essential is that the teachers of clinical medicine be sufficiently conversant with and interested in physiology to keep before their students the importance of physiology in its bearing on clinical problems. Instead of concentrating their attention solely on enabling the student to make a correct diagnosis of the pathological lesions and their location and extent, and to recognize and familiarize himself with symptomatology, they should make from the commencement of their clinical courses an equal effort to have the student understand and recognize the alterations of function resulting from the lesions and pathological conditions which are present. The diagnosis of the anatomical and pathological conditions must be supplemented by an appreciation of the extent and character of the perversion of function resulting therefrom. Consideration of this phase of diagnosis is too often postponed until the fourth year and it is not emphasized as it should be in the first months of clinical instruction.

Although a special course in what is often called pathological physiology could do much to meet this want, space for it can scarcely be found in the overcrowded curriculum. Nor do I believe that such a separate and distinct course would best meet

the indication. Physiology in its bearing on the phenomena of internal diseases can be best taught as an integral part of the course in medicine. The chief difficulty in many institutions results from the medical man's lack of knowledge of and interest in the physiology of diseased individuals. However, there are signs everywhere that this undesirable state of affairs is rapidly changing. Such are seen in the placing of physiologists temporarily or permanently in charge of medical services, as has been done in at least two of our institutions, the inviting of members of the physiological staff to attendance at set times on medical rounds, and the tendency shown by many clinicians to call on the chair of physiology for advice and assistance in their attempts to solve clinical problems. This is the natural result of the progress which has resulted from the utilization in the sick room of physiological methods in the study of the phenomena of disease. Nothing is more certain than that there is an unmistakable trend of our younger generation of internists to think and work as physiologists, whose task it is to attempt to understand the various and manifold perversions of function resulting from disease. To such we can confidently look for a realization of the desired correlation of physiology and medicine. For them and their activities place should be made in our schools and hospitals.

To sum up, for the lack of correlation between physiology and medicine there have been in the past many and adequate reasons. However, these have largely disappeared in this era, in which the productive study of clinical problems is being conducted largely along physiological lines by the utilization of physiological methods. The duty of securing such correlation rests on both the physiologist and the clinician. The former can do his part only if he will interest himself in the latter's problems and is willing to aid in their solution. He must also be willing to confer with his clinical colleagues as to the ways and means by which students can be best equipped to think physiologically in the presence of disease. Only those clinicians can do their share in correlating these branches who will equip themselves, or

members of their staffs, with as extensive and exact a knowledge of physiology as is feasible, and who will continually, by precept and by practice, impress on students their conviction that a complete diagnosis and one which will best aid them correctly to treat a patient, includes a recognition and understanding of the physiology of the case, i. e., of the extent and fashion in which the disease has resulted in perversion of function.

CORRELATION OF MEDICINE AND BACTERIOLOGY*

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In the latter eighties, bacteriology was just emerging into a distinct teaching entity in the medical colleges of America. While something like a score of bacterial agents had been accepted by the scientific world as the specific causes of important infections, the lay press and a considerable portion of the profession received each new discovery with incredulous levity and sometimes with open ridicule. "The germ theory" was then discussed with amazing ignorance and intolerance.

During the period from 1880 to 1890 it is interesting to record the large number of microorganisms successfully isolated by research workers and established as the conclusive, if not the sole, etiological factor of our most prevalent and important diseases. The following may be mentioned: *B. typhosus* in 1880; the streptococcus in 1881; the *B. tuberculosis* and the *B. Friedlander* in 1882; the *B. diphtheriae* by Klebs in 1883; the *B. diphtheriae* by Loeffler in 1884; the *B. cholerae* and the diplococcus pneumoniae in 1884; the *B. tetani* in 1885; and the diplococcus intracellularis meningitidis in 1887.

Neisser had reported the gonococcus as the cause of specific urethritis in the year preceding this decade.

While these organisms, among others, were referred to in the medical lectures

and demonstrations in class rooms during the period, only four or five were emphasized in the bacteriological course. The writer now recalls but three that were thoroughly taught to students in their staining characteristics for daily use. These were: (a) the tubercle bacillus, announced a few years before by Koch and stained by the Ziel-Nielsen method; (b) the pneumococcus of Frankel, which disclosed to the astonished eyes of the students a capsule of different staining reaction; and (c) the gonococcus of Neisser, special stress being laid upon its biscuit shape and the intracellular location in conjugal or mass association.

The *B. typhosus* and *B. diphtheriae* required cultivation for certain recognition and were thus beyond the comprehension of ordinary students of medicine.

While since then the science has rapidly developed and added one triumph after another to the certainty of the etiology and pathogenesis of disease, the actual victories in prevention and cure have not materialized to the same degree.

A stupendous sensation was produced by the announcement of Koch's tuberculin as a curative treatment and disappointment was felt throughout the civilized world when it failed to meet expectations. Numerous other hopes suffered disillusionment in the same way. Recent advances, however, in immunology again serve to stimulate faith and further endeavor.

THE TEACHING

The differentiation of curricula and special courses of instruction in our medical educational institutions confessedly tend to a broadening of our knowledge, but do not increase our comprehension of medicine as a unit. Too often in actual experience it has provoked a tendency to go on splitting up general subjects into innumerable special subdivisions, favorable to the development of highly trained investigators and highly specialized teaching along advanced lines; but it is quite doubtful if a proper perspective and proportion have been maintained in undergraduate instruction. In other words, the swing of the pendulum from the meager instruction afforded students in the period above men-

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