hopelessness of life and means that each day is made more bearable, and that something akin to happiness is put in place of a dull and colorless existence.

THE TEACHING OF APPLIED THERAPEUTICS AT TUFTS MEDICAL SCHOOL.

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THE teaching of therapeutics, one of the most important subjects in the medical curriculum, is one of the weak points in American medical schools. The fundamentals of drug treatment are taught by lectures and laboratory exercises in the department of pharmacology, and the actual details of treatment incidental to the instruction in clinical medicine; but no systematic instruction is usually given in the general principles of therapeutics as an independent subject. During the past year an attempt has been made to strengthen the teaching of therapeutics at Tufts Medical School by giving, in addition to such instruction as is usually given, a course which shall bridge over the gap between pharmacology, physiology, chemistry, and the other fundamental sciences upon which treatment is based, on the one hand, and the actual details of handling patients from day to day, on the other hand; and shall serve as an introduction to the general principles of applied therapeutics. Though the course is still in an embryonic stage, various expressions of interest on the part of the students, colleagues, and others have influenced me to make a statement concerning its purposes, scope, and methods in the hope that such a statement might stimulate helpful criticism.

It is, of course, true that the forms which any one disease may take,—depending on the severity of the disease and on the fact that different patients react so differently to disease with difference in age, sex, constitutional characteristics, and other factors,—show so many different clinical pictures in different patients, and change so much from day to day in any one patient, that the treatment of every new patient is a new problem, and that, therefore, the actual details of treating sick patients can properly be learned only by long continued bedside observation of many patients under treatment, by the inductive experimental methods now used in teaching the subject in the departments of clinical medicine. We treat individuals rather than diseases. And this is especially true in the case of chronic diseases where the exact details of treatment depend largely on the severity of the disease, on the extent to which function is disturbed, on the condition of the patient as a whole, factors concerning which good judgment is gained,—since exact measurements play but a

very small part,—only by long, clinical experience with cases of all grades of severity. But there are, nevertheless, certain general principles relating to the purpose and methods back of the many details which cannot well be taught incidental to the other instruction in clinical medicine and which deserve and need treatment as a separate subject.

Pharmacology deals with some of these principles of treatment but not all, for this is not the province of pharmacology. Pharmacology deals with the action of chemical compounds in the body, with the physiological action of substances quite independently of their therapeutic effect; it deals with the action, not only of those substances which are useful in therapeutics, but also those like muscarin, curarin, and saponin, which are not useful in therapeutics and whose action is chiefly harmful; furthermore, in the case of useful drugs, pharmacology deals not only with those activities which are of therapeutic significance, but also those which are not. Although until very recently this was not strictly true, and pharmacology could hardly be said to exist as a science independent of practical therapeutics, it has now developed to such an extent that it is pursued as an independent science without reference to the practical needs of medicine in the same way, and with the same justification, that chemistry, and physiology,—both of them once a part of practical medicine,—are now pursued as independent sciences. In actual practice, drug treatment is nearly always combined with other forms of treatment; agents such as heat, cold, baths, rest, exercise, posture, diet, massage, electricity, x-rays, high altitude, and sunlight are very extensively used in therapeutics. An intelligent application of these other agents depends upon a knowledge of physiology, physics, chemistry, psychology, and other factors, as well as pharmacology, and the other factors,—even such a one as the personality of the physician,—are, in certain instances, of more importance than the strictly pharmacological knowledge. A knowledge of pathology and clinical medicine, especially, though not necessary for the pharmacologist, is an absolutely necessary pre-requisite for the study of therapeutics; the therapeutically important questions relating to the effect of pathological conditions in altering the action of drugs,—we now have abundant evidence showing that drugs may have a different effect in pathological conditions from what they have in health,—and to when and how to use drugs in disease is outside the province of pharmacology; furthermore, questions relating to diagnosis and prognosis which have to be taken into consideration in therapeutics, and good judgment in estimating the effect of treatment on the clinical condition require a knowledge of clinical medicine. A knowledge of pharmacology alone, then, is not a sufficient basis for the treatment of diseased patients.

There is, therefore, a deficiency in the usual medical curriculum and an urgent need for a

course dealing with the general principles of applied therapeutics, a course which shall bridge over the gap between pharmacology and the other fundamental sciences upon which treatment is based and the actual details of treatment themselves. It is such a course that has been added to the medical curriculum at Tufts. *Since students take up the study of medicine for the purpose of learning to treat sick patients, this course covers the most important department of medicine; the practical purpose of pathology, physiology, diagnosis, and other fundamental branches is to help us treat the patient; the details of therapeutics as demonstrated in the subsequent clinics are shown as illustrations of the practical application of these principles of therapeutics.*

The first question taken up is that of the purpose of treatment. This question, not such a simple one as it may seem at first, and one often lost sight of in actual practice, is very fundamental, since upon the point of view adopted toward it depends the whole character of the course in applied therapeutics. When the surgeon treats a broken bone or removes a diseased appendix he aims at ridding the patient of all evidence of disease, but when the physician uses digitalis, diuretics, and other agents in cases of heart disease his purpose is neither to remove a diseased valve nor to make it whole, but to improve cardiac function. In both cases, however, the aim is,—and this is the fundamental purpose of all treatment,—*to improve the functional efficiency of the patient.* How we go about improving the functional efficiency of a sick person depends upon the nature of the disease, the principles of treatment in acute and chronic diseases, for example, showing certain distinct differences.

The ideal of treatment in acute disease is complete removal of disease, diseased material, or the causes of disease,—the antitoxin treatment of diphtheria, and the removal of a diseased appendix are examples. In treating those acute diseases for which there is as yet no known specific cure the principle of treatment is very simple; in the hope of increasing the resistance of the patient to the disease, we support his strength, promote his comfort, give him in its broadest sense the best hygienic environment possible. It is clear that such methods are aimed not directly, but only very indirectly, at the disease itself; the disease itself is left to run its course under conditions which, so far as our knowledge goes, and so far as we can influence the conditions, we believe to be most favorable for the patient. Though we hope and believe that under such treatment the patient's chances of succumbing are decreased, it is, nevertheless, often questionable how much such methods shorten the course of the disease, or influence it in other ways. The therapeutics of acute disease are, therefore, largely a matter of detail; the general principles of treatment are comparatively simple.

In chronic disease the ideal is somewhat dif-

ferent. When the heart, for example, is so far diseased that the amount of work which it can do is less than the amount of work required of it,—when compensation fails,—the leaky valve or other anatomical change responsible for the condition cannot be removed or made whole. This is not necessary; the patient with heart disease often knows nothing of the anatomical changes responsible for his condition; he wants the symptoms alleviated so that he will be more comfortable and able to do his work. In other words, it is not *anatomical integrity*,—about which he may know nothing,—which interests the patient, but his *functional efficiency*. On account of the very great reserve powers,—the high factor of safety,—of all our organs, an organ may be the seat of disease and yet be functionally efficient; it has been calculated that the normal heart, for example, can do six times the work ordinarily required of it; and we know that the factor of safety of certain double organs, like the lungs and kidneys,—since one of the pair can be entirely removed without danger to the patient,—must be at least one hundred per cent.; but with severe disease, there comes a time when the affected organ cannot perform the amount of work ordinarily required of it, and the physician is called in to restore equilibrium between the work required of the organ and the work which it can do. Two general groups of methods are utilized to restore equilibrium: (1) methods which decrease the work required of the organ, (2) methods which stimulate the power of the organ to do work. We have long recognized that drugs cannot qualitatively change function, but can only increase or decrease function; the same thing is true of other forms of treatment; under their influence, function may be increased or decreased but not qualitatively changed. A knowledge of therapeutics, especially the therapeutics of chronic disease, consists largely of a knowledge of (1) methods of stimulating organs or functions, (2) methods of resting organs or functions, (3) knowledge of when and how to apply such methods. Though the diseased organ may never become normal as the result of treatment, it may, nevertheless, be made functionally efficient, that is, competent to its tasks.

Every opportunity is given the student to observe methods of treating acute disease, but since,—as the considerations which follow will, I think, show,—training in the treatment of chronic disease is the only training that can lay the foundation for a rational knowledge of therapeutics, stress is laid particularly on the principles of treatment of chronic disease. The details of treatment in chronic disease depend on the *severity* of the disease, on the *degree* to which functional efficiency is impaired. Since we have made scarcely a beginning in our methods for the exact measurement of functional efficiency, all estimates of the severity of the impairment of function and of the degree of change, either for better or worse, in the severity

of the disease depend on the judgment of the physician. Judgment concerning the degree of disturbance of a function like circulation, for example, depends on estimates of the severity of the dyspnea, cyanosis, weakness on exertion, and other more subtle changes, none of them capable of very exact measurement, and a comparison of these changes with those seen in many other cases. To this kind of judgment must be added, as the basis for the treatment of each new case, experimental observation of the effect of treatment in influencing the severity of the disease. Such knowledge and judgment is acquired only as the result of long experience combined with proper training and some natural ability and aptitude for this kind of work. In other words, in contrast with the standardized, simple, exact, and easily learned treatment of acute disease, the treatment of chronic disease requires long clinical experience, good training, and special talent in observation and comparison. In acute disease, furthermore, but a small proportion of the population suffers at any one time, and the illness lasts but a short time,—in the course of a few weeks the patient is either well or dead: the most important feature of the treatment belongs to the field of preventive medicine. With chronic disease the case is quite different. A large proportion of persons who have reached middle life suffer from some weakness of function, some handicap based on a physical defect,—in its widest sense, some form of chronic disease,—this is not over in a few weeks; the patients may live a long time and must adjust themselves to their handicapped condition. In such cases it is the province of the physician to help them adjust themselves; the length of time they live, their general efficiency and comfort depend very largely on treatment; almost everything, in fact, depends on the physician. Furthermore, in the treatment of chronic disease, a broader view of all the circumstances of the case must be taken than in the treatment of acute disease; facts concerning the nature of the patient's occupation and the state of his family and financial affairs must be taken into consideration. In acute disease these factors enter very little; for the few days during which they are sick, no matter what may be their family or financial responsibilities, all patients with such diseases as pneumonia or typhoid fever usually succeed in having the same excellent treatment carried out.

Great emphasis is laid on the hopefulness gained by this point of view, that in chronic disease, the aim of treatment is improvement in function. Not only students, but also eminent practitioners as well, often show a lamentable tendency to direct all their attention to the anatomical basis of the disturbance to the exclusion of treatment; their whole aim seems to be only to determine as accurately as possible the exact anatomical nature of the lesion present, and, partly because of considering nothing but the anatomical-structural changes, and, realizing

the difficulty, if not impossibility, of influencing these changes, they have shown a tendency to skepticism in their attitude toward the treatment of chronic disease. Another mistake associated with this one is the tendency, not only of the laity but also of many well trained physicians, to consider the so-called "chronic and incurable diseases," as conditions having an inherent downward tendency, and, from the standpoint of therapeutics, hopeless. This point of view is a wrong one; most chronic diseases do not have an inherent downward tendency; they result in a weakness of function and, if the functional activity of the patient is adapted to his functional capacity, the *status quo* may often be maintained. It is a mistake to associate the words "chronic" and "incurable," as they often are, together. The dictionaries (Century, Webster) define "incurable" as "beyond the power or skill of medicine," and give "hopeless" as a synonym. If this definition is correct, we should reserve the term "incurable" for such diseases as the acute infectious diseases, not susceptible of specific treatment, whose course it is "beyond the power or skill of medicine" to directly influence, and not use these expressions with reference to such conditions as heart disease, Bright's disease, diabetes, and many other chronic diseases, the anatomical changes of which we are, indeed, unable to influence, but whose course is most decidedly amenable to treatment, often, indeed, very largely determined by it. The term "incurable" implies that the physician is powerless in the face of the condition. Since the physician is often unable to directly influence their course, we may, therefore, properly use this term with reference to many of the acute infectious diseases, but not with reference to most chronic diseases, for in such conditions he is far from powerless. A wrong point of view regarding the purpose of treatment is responsible for both of these mistakes. To counteract this attitude toward disease, great emphasis is laid on the correct point of view, namely, that in the treatment of chronic disease we try to influence not so much structure as function. A patient whose leg had been amputated would not be sent away with the statement that, since it is impossible for him to grow a new leg, nothing can be done for him; by the use of an artificial leg such a patient can be made nearly as efficient as a normal man. The same attitude should be taken toward patients with incurable lesions of internal organs; these patients, too, can often be made functionally efficient. In examining patients, attention is directed chiefly to the nature and degree of the disturbance of function; in heart disease, for example, it is emphasized that we do not treat murmurs, that in some of the worst cases of cardiac decompensation murmurs are absent, and that, therefore, it is a mistake to pay more attention to murmurs than to the degree of circulatory decompensation as evidenced by the history of the patient. A correct point of view in this respect is of the greatest importance

since it makes for a very great gain in hopefulness,

Since it is only through feeling confident of obtaining good results that the physician,—in the face, often, of great difficulties,—can carry out his treatment with enthusiasm, I believe that it is very important to strongly impress students early in their medical career with an optimistic and hopeful attitude toward the results of treatment. That chronic disease is amenable to treatment and has a hopeful outlook is capable of demonstration, and is one of the things we try to show students. Our optimism regarding the effect of treatment at the hospital where the instruction is given (The Robert Bent Brigham Hospital) is probably much influenced by the fact that we see the results of treatment *with the treatment properly carried out*; the less optimistic point of view of many physicians is often due not to the poor results of treatment but to discouragement at the *difficulties of having treatment intelligently carried out* in private practice; and this distinction we try to bring home to the student. The object of the course is, then, not alone to show how to treat sick patients, but also to demonstrate how much treatment can do, especially for patients with chronic disease.

On account of the fact that it is usually not the anatomical lesion which we treat, but the disturbance of function, and that, in diagnosis, so much attention is devoted to the nature and degree of this disturbance of function, we try, as far as possible, to base our therapeutics on a rational knowledge of the functions of the various organs and methods of influencing these functions, and, therefore, discuss very thoroughly the pathological physiology of the various diseases and our methods of measuring functional activity. Active scientific investigation is going on at the hospital where the instruction is given, and the students are introduced to the problems of scientific investigation so far as these problems relate to treatment. It is pointed out that, whereas the most important practical objects of research in acute medicine are the development of methods of exact diagnosis, the discovery of direct, specific methods of treatment, and the development and establishment of schemes of preventive medicine; in chronic medicine, on the other hand, one of the most important objects of research concerns itself with the development of methods of more exact measurement of functional efficiency, in order that the results of treatment may be more quickly and accurately gauged,—methods that may replace or supplement the less exact guesses of the clinician,—guesses in which the personal equation enters to such a large extent. Notable success in the measurement of functional efficiency has been reached in the case of diabetes; improvement in function,—and, therefore, the effectiveness of treatment in diabetes,—is quickly and accurately determined by measurement of the power of the body to metabolize carbohydrate. A good start

has already been made in kidney disease; the physician is no longer satisfied with the knowledge that the urine contains granular casts, blood cells, and albumin,—as a matter of fact, in some of the worst cases of chronic nephritis it may be nearly impossible to demonstrate either albumin or casts, and mild cases of nephritis may show much albumin in the urine,—but measured amounts of water, sodium chloride, and dyestuffs are administered, and the amount excreted in a definite time compared with the normal as a measure of the efficiency of the glomeruli and of the tubules in excreting waste products. Possibly the recent studies of the relation of purin metabolism to gout may fulfill a similar function for this disease. At present more attention is being directed to the question of the accurate measurement of functional efficiency, and on account of its bearing on therapeutics this phase of research is emphasized to the students.

The facilities for teaching are excellent. The course is given in a large modern hospital of about 150 beds, well equipped for diagnosis, treatment, pathological studies, and scientific laboratory investigation and with abundant and varied clinical material. While the hospital is one for chronic disease, nevertheless, as a result of intercurrent infection, acute exacerbation, or other reason, many patients with acute conditions come under observation, so that all the common acute diseases such as pneumonia, typhoid fever, the acute stages of rheumatism, appendicitis, gall-stones, gastric ulcer, and tonsillitis are seen during the course of the year. Among chronic diseases, the variety is very great; cases of all the common, and many of the uncommon, diseases of the heart, kidneys, vessels, blood, lungs, joints, bones, nervous system, skin, gastro-intestinal tract and general metabolism are seen at all times. Not only medical methods of treatment, but also, by coöperation of members of the staff, surgical, orthopedic, and other special forms of treatment are demonstrated. Much attention is devoted to the so-called imponderable remedies,—massage, exercise, hydrotherapy, posture, and diet, and the students have an opportunity of observing these methods carried out under the direction of experts.

In the discussion of treatment the plan is to take up first the treatment of diseases of the heart, then, in succession diseases of the kidneys, the vessels, diseases of respiration, the blood, the gastro-intestinal tract, and last, diseases of metabolism. This seems a rational order of discussion: the heart has but one function, that of maintaining the circulation, and, in the treatment of heart disease, there is but one function to be influenced; though the details of treatment may be modified by the nature of the lesion, the general principles of treatment are practically the same, whether the endocardium or the myocardium is the seat of disease, whether the lesion is one of the mitral or of the aortic valve, that is to say, the exact nature of the anatomical

lesion is of far less significance, so far as treatment is concerned, than the question of the severity of the disturbance of function, as evidenced by the amount of venous congestion, edema, dyspnea, or other symptoms of impaired circulation. In the treatment of diseases of the gastro-intestinal tract a new complication is introduced: the gastro-intestinal tract is made up of a number of distinct organs, and each of these organs has several distinct functions; the same general principles,—stimulation of function, and rest of function,—are used, and the degree of disturbance of function is of the utmost importance, but we must first recognize which part of the gastro-intestinal tract is diseased, and which particular function,—motor, digestive or absorptive,—is disturbed before applying treatment. Diseases of the kidney occupy a position intermediate between diseases of the heart and diseases of the intestine. At the present time the treatment can be discussed with the same degree of simplicity as that of heart disease; it depends chiefly on the severity of the disease, on the extent to which waste products are accumulating in the body. There is, however, some difference in function between the glomeruli and the tubules, and a case is occasionally found in which it is chiefly the tubules or chiefly the glomeruli which are imperfectly functioning; in other words, a case in which the exact distribution of the lesion is significant for treatment. In diseases of the general metabolism the disturbance of function often cannot be related to any particular organ, sometimes, perhaps, simply because we do not know which organ is diseased; in other cases, perhaps, because the cells of the body as a whole are involved. In discussing diseases of the different organs, the functions of the organs are very briefly reviewed and then are taken up, in turn, the nature of the disturbances of function which pathological changes in the organ can lead to, methods of influencing these disturbances of function, and, finally, the clinical forms of disease of the organ; the facts are then illustrated by demonstration of patients in the wards.

Instruction is given to small sections of both third and fourth year students. Each exercise lasts one hour; the first half hour is devoted usually to a talk on the general principles of treating diseases of some one organ, the last half hour to an exhibition of patients under treatment. The work would be better carried out, I believe, by having the students first read up methods of treatment on the outside and then having the important features impressed upon them and the methods of treatment illustrated by bedside quizzes; but there is at present neither a text-book nor a syllabus that treats the subject in a suitable manner, and, furthermore, the extensive use of the quiz method of instruction in the subject would mean slower progress in covering the ground than the time at present allotted to the course warrants. New forms of disease are successively taken up and new pa-

tients shown, but the patients already seen are followed from day to day to show the effect of treatment and the necessity for changes in treatment. Emphasis is laid throughout on the *general principles* of treatment; and it is pointed out that whereas the details of treatment,—the particular drug used, the size of the dose, and often even more important features,—may differ with different physicians, yet the general principles of treatment are essentially the same with different physicians, and one physician can, as I do, use the treatment charts of other physicians as good examples of methods of treatment. Many of the patients are seen again by the student under colleagues giving other courses at the school, so that the student is able to complete his picture of the cases by other points of view.

THE WORKMEN'S COMPENSATION ACT AND THE PHYSICIAN.

BY HERBERT J. CRONIN, M.D., CAMBRIDGE, MASS.

THAT the medical fees in workmen's compensation cases must be reasonable and should be based on an industrial basis rather than what the traffic can bear; that efficiency of physicians in returning their patients to work at the earliest possible time is now demanded; that adequate treatment be urged for the employees who may be treated in public hospitals; and that the possibilities of state socialism in respect to medicine can be avoided only by the proper co-operation of the physicians with the insurance companies, are some of the points of interest in a consideration of the present problems in relation to the workmen's compensation act in Massachusetts.

"The policy of the Industrial Accident Board is to treat the medical fraternity as a profession," says Dr. Francis D. Donoghue, medical advisor to the Board. "We are straining every effort to make this law what its framers intended it to be. There are constant problems arising which the Board is called upon to interpret; but that is to be expected of all new legislation. So far the law has been an entire success and we hope to see its provisions extended to take in all classes of employees and the benefits larger for all concerned. A clear understanding of the law by physicians will be a great help in avoiding misunderstandings."

The question of fees is still the most important point to the practicing physician. There is no standard schedule of fees. The law in this respect states:—

"During the first two weeks after the injury, and, if the employee is not immediately incapacitated thereby from earning full wages, then from the time of such incapacity, and in unusual cases, in the discretion of the Board, for a longer period, the association shall furnish *reasonable*