The discovery is usually very modest. Often it is a negative finding, the posting of a warning on a dead-end street. Yet it is a discovery, new knowledge, light into the darkness, a penetration beyond the frontier. Discovery, great or small, of what was never known before is an adventure to be cherished, an experience likely to colour a physician's entire outlook on his work. The physician who is imbued with the spirit of investigation, augmented by research experience, will be a little more persistent in his diagnostic searchings, in his therapeutic efforts, or in his self-evaluation.

Summary

Experience in research as a medical or graduate student may stimulate a continuation of some investigation throughout life. Even if the physician does no research after his formal education, his earlier experience in investigation will prove of tremendous value, because research sharpens the physician's judgments of the scientific pronouncements of others, it reveals the painful difficulty of discovery, it stimulates the pursuit of a scientific hobby. Research promotes an awareness of unobtrusive "accidental" phenomena which may be of great importance, it provides lessons in team-work, it fosters a respect for persistent routine.

Research acquaints the investigator and physician with one of the highways of discovery leading into the unknown.

THE VALUE OF PARTICIPATION IN RESEARCH IN THE CONTINUING EDUCATION OF THE PRACTISING DOCTOR*

BY

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Education is a continuing process which is dependent upon active studying. Without the critical application of one's mind to the subject, learning proceeds slowly and imperfectly and judgment is apt to be fallacious. The best of all study is when one applies one's energies to the elucidation of problems to which the answer is not known. This is usually called research. It is a broad field in which people with different types of talent may work successfully.

There are many ways in which research may be pursued. In all it is essential to know the background of the field of investigation, and in professional work this demands a sound knowledge of some aspects of one's field of practice and an awareness of the type of problems that may arise in it. It is always concerned with wondering, pondering, dreaming, and speculating about the subject. It always has to do with formulation of problems, sometimes in a broad philosophy, sometimes in a much narrower focus. The persistent endeavour to comprehend the background and the gropings to clarify the problem are all part of the search; and it is the searching that is important in education, not getting the answer. That some person may already have found the answer is not pertinent to the process of learning.

Medical people vary greatly in their essential interest in investigation. In some it is so keen that they are

impelled to spend their lives either in experimental research or in the intensive investigations of disturbances of body and mind in health and disease. These usually stay in university centres, and any practice undertaken is as an associated and minor interest. Others make their living in various fields of practice; it is with them that we are concerned in this discussion.

It is a great mistake, however, to think that the habit of inquiring and the genius for searching are limited to those who devote their lives to organized research work. It is equally wrong to expect the busy practitioner to unearth many new facts or make striking advances. His searching is of a different intensity, spread at first over the broad area of his practice. Should he work in a university centre, and especially if he restricts his practice to a special field, it is easier for him to focus his attention on a specific problem, and often to work in association with laboratory colleagues. In more general practice the field is broader, but many have a largeness of mind capable of embracing a wide field in an intelligent survey. They must at first look at a whole landscape, but the scrutiny may lead to observations that demand focal study, sometimes with the help of others.

Research on Practical Problems

The practising doctor has many opportunities to engage in useful research work, but his accomplishments are likely to be restricted by lack of time to think about his problems and formulate them clearly. The more general his practice the greater is this difficulty. It is of first importance, therefore, that he study in a field that he knows, and that his projects be concerned with some aspect of his regular work. Just as teaching and research should not be separated, so practice and study should go hand in hand. Active studying stimulates the teacher, clarifies his ideas, and helps him gain a clearer vision of fundamental principles, making him a better teacher; in a similar way it stimulates the practitioner, sharpens his powers of observation, and throws light on his daily problems, making him a better doctor. Good habits of thinking, observing, planning, discriminating, and judging well are engendered and nurtured by persistent searchings; and these habits of investigation come to be used in all that one does. Their development requires constant application; hence they must arise and grow from daily use, the research becoming a concentrated effort in problems met with in his ordinary work.

A research hobby outside one's regular work is seldom helpful in education. To devote all his spare time to an extrinsic subject, such, for instance, as the study of tissue culture, actually tends to reduce a practitioner's interest in his patients and their disorders. If he has great talent for more fundamental research, however, it may lead him from practice into full-time research work in the field of his interest and aptitude. Banting taught physiology as a side interest when he began to do general practice after the first world war; the idea of a search for insulin soon took possession of him and changed his life's work.

The Continued Study of Patients

The pursuit of research in practice is not and should not be a separate component of a doctor's life. It is not like a coat that he puts on in moments of freedom

*An address given to the Second World Conference on Medical Education, Chicago, 1959.

from strain. It does not usually begin as a conscious effort in one field. It never comes with ease, but only after long effort and disciplined thinking. Problems for study become apparent to those who put their hearts in their work and work for the joy of it, who pursue their profession with unrelenting diligence and with an inquiring mind, willing to question established principles that do not satisfy the challenge of experience. These problems arise chiefly out of one's own experience and thought, although reading, discussion with one's associates, and the encouragement of talented colleagues may provide the initial stimulus and give continuous support to the work. "Clinical research ranges from the making of observations which are incidental to, and inseparable from, good practice, to systematic investigations undertaken deliberately and often over long periods with the object of answering specific questions. The former has always been an activity of good practitioners and, apart from seeing that it receives appropriate support, requires no special organization."¹ Its practice may, however, lead to the formulation of specific questions and the prosecution of more systematic research.

The question is often asked, How should a practitioner begin his study? It may be answered, to paraphrase Peabody's² famous remark about care of patients, by saying that the secret of the study of patients lies in studying one's patients. To further the study, however, there are certain practices to be followed and habits to be formed which, if persisted in, always have a good educational effect and commonly lead to useful advances in knowledge.

One has to do with the keeping of good records. The constant practice of describing symptoms, signs, and other important factors in concise, clear, and exact language enhances one's ability to recognize important findings and place them in proper perspective. It focuses one's attention on the more significant observations and provides the data for later examination and study.

Another is concerned with the habit of thinking and pondering over interesting findings, difficult problems, and striking phenomena. "Real thinking is an acquired skill founded on practice and habit, like playing a piano, and how well we can think at any given time will depend on how much of it we have already done. Nor can we think at random; we can only add one more idea to the body of something we have already thought about."³ The process of thinking is facilitated by talking over our interests with competent, responsive colleagues and discussing our problems with them. The expression of our thoughts in conversation leads to clearer formulation of ideas in our own minds.

Such practices lead us to regard each difficult case as a problem which can be solved by data at hand or easily obtained, a practical research attitude which, if persisted in, will soon provide a rich background of knowledge. One begins to think and talk in terms of one's own experience, thus modifying knowledge based on reading and on the teaching of others. When one begins to describe his own results his methods of study are developing well.

The careful preparation of reports in clear appropriate terms is a necessary part of the discipline of research. It opens one's conceptions to exacting scrutiny and shows up the shortcomings and imperfections of observations and impressions. The

examination of data and formulation of opinions comprise a constructive effort from which ideas arise to prepare the ground for making significant new observations.

As thoughtful and intelligent doctors pursue their practices, interesting differences become apparent in them. They do not all see a given patient in the same light. Manifestations that interest one and call for, even demand, his study pass unnoticed or little regarded by colleagues of apparently equal understanding and experience. This wonderful quality of awareness soon distinguishes the man with genius for research. It is partly inherent, depending on powers of association, memory, imagination, sagacity, and insight, but it flourishes only in fields well cultivated by long periods of study. Discoveries ascribed to chance are usually, perhaps always, due to the possession of this happy faculty of recognizing important observations. Considering this phenomenon from a different point of view, Cardinal Newman⁴ spoke of the ability to make an instinctive just estimate of things as they pass before us as a quality "which sometimes indeed is a natural gift, but commonly is not gained without much effort and the exercise of years." It is a faculty which was exhibited with dramatic effect by Fleming when he recognized as important the inhibited zone around the colony of penicillium in the staphylococcus culture-plate. It has been demonstrated with less spectacular but still gratifying results by countless practitioners who have often gone on to pursue intensively the problems thus drawn to their attention.

Some Hindrances to Research

Perhaps the most deleterious of these influences is being too busy to have time to think, too weary and preoccupied to read or wonder. Being always in a rush and hurry tends to quench the sparks of imagination and inspiration, inhibit the powers of association, and dull the memory. The care of patients then becomes more and more a matter of routine, leaving little opportunity for learning. Actually it is easy under the best of circumstances to slip into mechanical procedures, for, as Ritchie⁵ has said, "it is a standing temptation of mankind to put routine, which calls for no thought and little effort, in place of judgment, which calls for both." Development of judgment is essential for all good studying.

Almost as bad is to have a false conception of research: to think it can be done easily; that it is a matter of accumulating data from a series of tests and not, as it must be, an active discriminating process in one's own mind. What is done easily will neither answer important questions nor promote one's education. The failure to realize the need for hard disciplined thinking and constant scrutiny of one's observations and deductions is almost an insurmountable handicap. Those who fail to appreciate the difficulties in the way become easily discouraged, like obese patients on low-calorie diets who expect early dividends in reduction of weight without commensurate effort and determination in sticking to the regimen.

Other retarding influences include the attempt to do so much that little can be accomplished because of failure to restrict the focus of one's studies; the deviation of one's efforts to make use of expensive equipment and recording devices in the belief that the

use of these instruments is more scientific than the direct pursuit of one's problems by simple appropriate methods; and the desire for the glamour and prestige of research rather than for the interest, pleasure, and satisfaction of searching.

Opportunities for the Practitioner

The practitioner can follow the natural course of disease and its modification by all manner of influences: a huge field of unending interest and challenge. He can study the efficacy and dangers of new remedies. Every effective measure opens new avenues for research into the fundamental nature of the disorder affected. Each great advance raises far more questions than it answers, and opens doors for useful investigation to practitioners who can see the opportunities. Any clinical field in which there is nearly universal acceptance of current ideas is ripe for critical questioning and productive research.

The exact observations of Trousseau in the middle of the last century led him to doubt the value of blood-letting and other current measures used in treatment of people with strokes, and he ceased to use these methods because, as he said, "experience has taught me that patients do better without them." William Pickles, during his years of general practice in Yorkshire, in addition to throwing much light on the epidemiology of common infections, was the first in England to report cases of Bornholm disease.⁶ Many similar examples of important contributions by practitioners of former and modern times could be cited did time permit.

But the great contribution of practitioners as a body cannot be cited in individual instances. They play a large if inconspicuous part in the advancement of medical knowledge. The accumulated good sense of a large number of thoughtful doctors has a wonderful influence: it dampens the excessive swings of medical fashion; buffers the over-enthusiastic claims for ill-founded methods of diagnosis and treatment; acts as the ultimate jury in clinical trials; and has a firm, strong educational influence.

The general principles of research methods and study are the same, no matter what the field. But techniques used vary greatly, and each must learn those appropriate to his problem. To produce much new knowledge requires virtually all the time of the investigator, allowing little opportunity for practice except in fields restricted to his special interests. But the critical research attitude of honest thinking and penetrating doubt on the part of the doctor in active practice is a catalyst which speeds up the learning process and gives new knowledge at a different but important level. It broadens his mind, increases his comprehension, and by its inherent discipline raises the standard of all aspects of his practice and of that of his closer associates.

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TREATMENT OF HAEMOLYTIC DISEASE OF THE NEWBORN DUE TO RH-IMMUNIZATION*

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In all cases where there are grounds for suspecting maternal Rh-immunization the first problem facing those responsible for the newborn infant is the prevention of death *in utero* or the birth of a child already gravely affected. At the present time it can be reduced to a decision whether or not to induce labour before term.

Induction of Labour before Term

We have adopted this term in place of "premature induction of labour," as the aim is in fact not to bring about the birth of a premature infant in the generally accepted sense of an infant weighing less than 2,500 g. It is well known that premature infants develop more severe and more prolonged hyperbilirubinaemia than do those born at term, and for this very reason are more exposed to the danger of kernicterus.

Except in cases of necessity, where obvious signs of foetal distress demand immediate intervention (which

*The pathogenic bases for the individual aspects of the treatment have been given in detail elsewhere (Jouvencaux *et al.*, 1958), together with the results of 330 cases. These results, to which those for 1958 have been added, are summarized in the present paper, making a total of 399 cases.

then becomes a heroic measure) we do not induce labour until everything has been done to establish that the infant weighs over 2,500 g. With this aim, we have made it a rule not to induce before the end of the eighth month. The stage of pregnancy, calculated from the last period, is, however, often misleading, and is by itself a quite inadequate criterion. An obstetric examination, carried out by a skilled obstetrician experienced in such cases, is essential, including a radiological examination, which we consider indispensable.

Another condition necessary if the induction of labour before term is to be harmless is the avoidance of other than purely mechanical methods—bougie or rupture of the membranes. Obviously, in cases where the obstetric condition does not appear suitable for intervention of this kind there must be no question of taking any risk; one should refrain from or at least postpone intervention, unless the urgency of delivering an infant clearly showing signs of distress, together with dystocia, makes caesarean section imperative.

As the efficacy of the treatment of haemolytic disease of the newborn is essentially preventive, it is important