Reprinted from THE ALABAMA JOURNAL OF MEDICAL SCIENCES
Volume 7, Number 4, October, 1970

Predictive Medicine: I. Definitions

E. Cheraskin, M.D., D.M.D. and W. M. Ringsdorf, Jr., D.M.D., M.S.***

Introduction

Some years ago in a stimulating, and at times irritating, book entitled "Apes, Men and Morons," anthropologist Earnest A. Hooton made the comment that it is a very short-visioned medical science which works backward from the autopsy table, rather than forward from the cradle. He sees no bright future for scientific achievement in the Healing Art by limiting its responsibility to repair work and curative procedures [Bortz, 1960].

For practical purposes and as an immediate working hypothesis, *predictive medicine* may be defined as the clinical discipline designed to *anticipate* disease in man. The intent, by such an approach, is to *foretell* illness before it erupts in its classical form. Thus, predictive medicine allows for *primary* prevention [prevention of occurrence]. This philosophy immediately sets *predictive medicine* apart from *conventional medicine* where the cardinal theme, by act if not by word, is the *identification* of existing disease with subsequent treatment and, at best, *secondary* prevention [prevention of recurrence].

Historical Considerations

Predictive medicine is not new [Draper et al., 1944]. Hippocrates recognized that, in the female, there was a striking positive parallelism between obesity, menstrual aberrations, and sterility. Since that time and right up to the present, there are scores of publication designed to underline the prognosticative worth of many and diverse clinical, biochemical, social, psychologic, and economic parameters with regard to different disease states.

All of these studies possess one common denominator. Namely, they all seek variables *within* man to explain why he succumbs to disease. A study of the historical course of health concepts brings this point into sharp focus.

Before the Germ Theory: In the beginning, health and disease were acknowledged to be God-given. When man sinned, he was cursed with ill health. When he behaved, he was permitted to remain unscathed. This dogma was understandable since life and death, even in those times, was so inextricably linked with religion.

However, the explanation for the causes for health and disease slowly changed. Increasingly, more attention was directed *within* the body as the root of problems. In other words, the body was viewed as the *soil* in which disease grows. While much of the ancient theories has now been discredited, the denominator which has persisted, even to this day as we shall learn, is that the internal milieu of man is intimately associated with the medical problems which beset him.

The Germ Theory: For approximately twenty-five hundred years, medicine has been probing for the roots of illness. Until the advent of bacteriology, as we have just learned, disease was ascribed to a turbulence in man's inner world. Then came Pasteur and his colleagues and the birth of the germ theory. This neat and relatively simple concept suggested that germs are *seeds* which, when implanted, beget disease. The proposition, like any new hy-

University of Alabama Medical Center, Birmingham, Alabama.
*Professor and Chairman, Department of Oral Medicine, University of Alabama Medical Center, Birmingham, Alabama.
**Associate Professor, Department of Oral Medicine, University of Alabama Medical Center, Birmingham, Alabama.

pothesis, had its difficulties in acceptance. But it won because it was simple, convincing, and most important, comfortable. Now man could blame the cosmos and so regard his infirmities as part of his uncontrolled destiny.

Beyond the Germ Theory: There is no question but that germs are *involved* in many illnesses. However, microbial involvement does not willy-nilly argue that the germ is the mainspring. Moreover, the germ theory does not resolve the many seeming contradictions which are so frequently encountered in nature. Why, for example, can two seemingly similar souls breathe the very same germs at precisely the same time and yet only one "catches a cold"? Hence, there are penetrating and perturbing paradoxes in the field of so-called microbial disease where it is abundantly clear that microbes are *involved* and thought to be the single *cause.* But, even more importantly, how does one explain the rising and insolvable problems of chronic disease where microbiology plays less of a role? What is the cause of arteriosclerosis, cancer, rheumatoid arthritis, glaucoma, multiple sclerosis?

These and many other engimas now have brought science to a theory of health and disease beyond the germ hypothesis. As a matter of fact, the modern interpretation of the genesis of health and disease is a marriage of the before-the-germ-theory and the germ-theory. It recognizes that disease, gauged by symptoms and signs, is the end-result of an environmental challenge. The peripheral threat, the seed, may be microbial, but it is also likely to be physical or chemical. In this connection, the new philosophy concedes the importance of the external milieu but enlarges upon the scope of the challenges. At the same time, the modern theory of illness appreciates the fact that the capacity of man to withstand the external bombardment is an equally vital ingredient. This latter element is cloaked in such terms as *host resistance, host susceptibility, tissue tolerance, constitution,* or *predisposition.*

The name of Pasteur is definitely linked with the germ theory. What is not generally known is that Pasteur recognized the importance of host resistance and susceptibility. Repeatedly, Pasteur and his colleagues expressed the conviction that the *terrain,* as he chose to call it, of the infected organism often determines the course of the infectious process. In one sense, he anticipated the statement by George Bernard Shaw that the characteristic microbe of a disease is more likely to be a symptom and not the cause of the problem.

The New Terminology

Thus, as we have learned, *predictive medicine* is not new [Cheraskin and Ringsdorf, 1969a; Cheraskin and Ringsdorf, 1969b; Cheraskin et al., 1969c; Cheraskin et al., 1968a; Cheraskin et al., 1968b; Cheraskin et al, 1967a; Cheraskin et al., 1967b; Cheraskin et al., 1967c; Cheraskin et al., 1967d; Dorn, 1959; Galdston, 1954; Levy et al., 1946; Marks, 1960; Sadusk and Robbins, 1968; Setyaadmadja et al., 1969; Symposium, 1957; Ungerleider, 1962; Vecchio, 1966; Williams and Siegel, 1961]. It is cloaked under diverse terms such as *preventative, prognostic, anticipatory, social medicine,* and *propetology.* All of these labels are perfectly respectable, valid and useful. One might then question the need for generating new nomenclature such as *predictive medicine.* Five explanations are offered. First, from a purely etymologic standpoint, *predictive medicine* is the most precise term since the Latin derivative for prediction means to foretell. Hence, the term *predictive medicine* spells out unequivocally the unique anticipatory characteristic of this philosophy of medicine. Second, unlike the apt term *propetology* which means leaning toward, *predictive medicine* is a simple and self-explanatory term. Third, *predictive medicine,* as a relatively new label, is not shrouded with historic misconceptions and semantic overtones. For example, present-day preventative medicine is largely concerned with the acute infectious diseases and embraces relatively few prognostic connotations relating to the common chronic killing and crip-

pling disorders [e.g. ischemic heart disease, cancer, rheumatoid arthritis]. Fourth, predictive medicine is a unique discipline which encompasses concepts and instrumentation from many and diverse well-established specialties [e.g. epidemiology, biostatistics, clinical pathology, clinical medicine, psychology, ecology, nutrition, physical education, and stomatology] but not currently utilized in packaged form in any other single discipline. Finally, the record shows that, in its present form and under existing nomenclature, predictive medicine has not played as significant a role in the control of disease as one would anticipate.

Health versus Disease Detection

There are presently in operation several score allegedly *health* programs. A number of examples come to mind to underline the fundamental distinction between the practice of *predictive medicine* versus existing *health evaluation systems*. For example, there is no question regarding the desirability of a periodic vaginal Papanicolaou smear for the detection of gynecologic cancer. The hope, always, is that the smear will prove to be negative. Obviously, this testing technique is to be applauded, and women should be encouraged to undergo this periodic checkup. In the event that the results are negative, the patient is requested to return at a later date [usually in six to twelve months depending upon age] for another *health,* as it is usually phrased, checkup. There is no question but that periodic reexamination is desirable. At each revisit the hope continues, for both the patient and the doctor, that the smear will continue to prove negative. This is also admittedly a commendable goal. Unfortunately, sooner or later, the smear is positive. Hence, it becomes necessary to institute surgery and/or irradiation. This, again, is desirable since all will concur that early detection and treatment prove more successful and yield a better prognosis than cancer recognition and therapy in later stages.

There is, in the sequence just outlined, one serious semantic trap with significant practical overtones. While all that has been described is to be applauded as a demonstration of therapeutic medicine, the one point overlooked is that the procedure is *not* a *health* examination but rather a *disease* detection program.

Ideally, a true health examination commences with a patient's showing a negative smear. Additionally, this evaluation should allow the opportunity to point out to the patient her degree of cancer proneness. Finally, a true health appraisal should include proper counsel so that the patient is provided with whatever information is available to *reduce* the risk of cancer. Hence, it is clear that the traditional *health* examination is, in fact, a *disease* detection program. There is an obvious need for such a system in present-day medicine. However, there is also a crying need for a *true health evaluation and maintenance program.* This, in simple terms, is the purpose of this series of reports.

Summary

Since the time of Hippocrates, it has been known that different types of people display different illnesses. More recently, information has been compiled to indicate that there are different sorts of individuals. Now, medicine is beginning to learn to identify the different kinds of maladies which beset different kinds of people. Hence, there is developing a body of facts which makes it possible to *anticipate* disease. A report to follow [Cheraskin, in press] will underscore this point with a demonstration of already available, experimental models.

REFERENCES

Bortz, E. L. 1960. The dual nature of aging. J. Amer. Geriat. Soc. 8:753-761.

Cheraskin, E. and Ringsdorf, W. M., Jr. 1969a. The health of the dentist and his wife: a predictive health program. J. South. California Dent. Assn. 37:271-276.

Cheraskin, E. and Ringsdorf, W. M., Jr. 1969b. The health of the dentist and his wife: present findings in a predictive health program. J. South. California Dent. Assn. 37:413-421.

Cheraskin, E., Ringsdorf, W. M., Jr. and Aspray, D. W. 1969c. Cancer proneness profile: a study in ponderal index and blood glucose. Geriatrics 24:121-125.

Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H., Barrett, R. A., Aspray, D. W. and Curry, S. 1968a. Cancer proneness profile: a study in weight and blood glucose. Geriatrics 23:134-137.

Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H., Barrett, R. A., Sibley, G. T. and Reid, R. W.

1968b. Environmental factors in blood glucose regulation. J. Amer. Geriat. Soc. 16:823-825.
Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H. and Barrett, R. A. 1967a. Biochemical profile in predictive medicine. In Poyer, J., Herrick, J. and Weber, T. B. Biomedical sciences instrumentation. Instrument Society of America, Pittsburgh. pp. 3-15.
Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H. and Barrett, R. A. 1967b. Clinical chemistry and predictive medicine. J. Med. Assn. St. Alabama. 36:1337-1340.
Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H. and Barrett, R. A. 1967c. Coronary proneness and carbohydrate metabolism: glucose effect on dextrinization time. Geriatrics 22:122-126.
Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H. and Barrett, R. A. 1967d. Predictive dentistry: the Cornell Medical Index Health Questionnaire [general responses] and dental findings. New York J. Dent. 37: 104-107.
Cheraskin, E. and Ringsdorf, W. M., Jr. [in press]. Predictive medicine: II. Experimental models. J. Amer. Geriat. Soc.
Dorn, H. F. 1959. Tobacco consumption and mortality from cancer and other diseases. Pub. Health Rep. 74: 581-585.
Draper, G., Dupertuis, C. W. and Caughey, J. Y., Jr. 1944. Human constitution in clinical medicine. Paul B. Hoeber, New York.
Galdston, I. 1954. The meaning of social medicine. Harvard University Press, Cambridge.
Levy, R. L., White, P. D., Stroud, W. P. and Hillman, C. C. 1946. Overweight: its prognostic significance. J. A. M. A. 131:951-953.
Marks, H. H. 1960. Influence of obesity on morbidity and mortality. Bull. New York Acad. Med. 36:296-312.
Sadusk, J. F. and Robbins, L. C. 1968. Proposal for health-hazard appraisal in comprehensive health care. J. A. M. A. 203:1108-1112.
Setyaadmadja, A. T. S. H., Cheraskin, E., Ringsdorf, W. M., Jr. and Barrett, R. A. 1969. Predictive prosthodontics. I. General health status and endentulousness. J. Prosthet. Dent. 21:475-479.
Symposium: Measuring the risk of coronary heart disease in adult population groups. 1957. Amer. J. Pub. Health 47: Suppl. No. 4.
Ungerleider, H. E. 1962. The prognostic implications of the electrocardiogram. In Higgins, E. V., Jacklin, H., Tanner, E. and Ungerleider, H. E. Annals of Life Insurance Medicine, Berlin.
Vecchio, T. J. 1966. Predictive value of a single diagnostic test in unselected populations. New England J. Med. 274:1171-1173.
Williams, R. J. and Siegel, F. L. 1961. Editorial: "Propetology," a new branch of medical science. Amer. J. Med. 31:325-327.

Printed in U.S.A. by Oxmoor Press.