

Medical Science and the Longer Life

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AMONG THE MOST PRESSING ISSUES of the time are social security and proper provision for old age. Births are fewer, but lives are longer than in past generations, and, in our country, at least, increasing emphasis is laid upon the safety and the future of the individual.

This stress upon individual welfare is not due entirely to an awakened and enlightened social consciousness. It is in large measure the result of advances in the medical sciences which have saved life and made it more productive. The average length of life is greater than in all past generations, and every opportunity exists to make it much richer.

Most classes of society have profited by the improvement. The physician has been as fortunate as anyone. His expectation of further life at the age of graduation, if we accept 25 as that age, has increased in the last 40 years from 38 to 44 years. Professional men and all others have gained, moreover, not only in longer life but in freedom from crippling disability. For all these benefits they should give thanks to discoveries in the medical and other technical sciences and to the rise in standards of living made possible by these discoveries.

Graduates in the medical sciences today, looking forward to their lengthened professional life, will find much inspiration in examining the achievements of the years to which students of their age looked forward 50 years ago.

The closing years of the 19th Century ended an epoch marked by the discovery of most of the bacteria causing specific disease. A few were still to be found, including the trypanosome of sleeping sickness, the spirochete of syphilis, the bacillus of whooping cough, and that of tularemia. But brilliant medical progress continued in the infant science of immunology, which grew rapidly in the opening years of the 20th Century, with the discovery of the complement fixation reaction, a tremendous variety of applications of the precipitin reaction, the identification of serum sickness and anaphylaxis, the classification of the allergies, the development of the Schick and tuberculin tests, and other diagnostic procedures based on specific immunological reactions.

The bacteriological epoch was not yet over when

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exact knowledge of the submicroscopic filterable viruses began, commencing with the discovery of the virus of the well-known mosaic disease of tobacco in 1892. Since then, our knowledge of filterable viruses has increased tremendously, and in a most practical way for preventive medicine, through the discovery of the vectors concerned in their transmission, such as the mosquitoes carrying yellow fever virus in man and the virus of encephalomyelitis in horses.

Somewhat later came the discovery of a group of infectious agents midway in size between bacteria and viruses—the minute bodies known from the name of their discoverer as rickettsiae; these include the etiological agents of typhus fever, Rocky Mountain spotted fever, and certain diseases of animals, which are carried by lice, mites, and other small insects.

With the introduction of salvarsan for syphilis in 1910 an old, empirical science, chemotherapy, acquired a new precision which culminated in the war years in the highly successful use of the “sulfa” drugs and penicillin, the latter giving great impetus to a new field of much promise—“antibiotic” therapy.

In the medical advances of the last 50 years special note should be made of the discovery and isolation of hormones and vitamins. The former are the specific products of certain glands of the body concerned with the regulation of vital processes. Insulin, isolated in 1921, the substance that revolutionized the treatment of diabetes, is the best-known example. In the same group of remedial substances is liver extract, shown in 1925 and 1926 to have a profound effect in combating anemia.

The vitamins are comprised in the well-known alphabetical list. Several of them have been synthesized in pure form suitable for exact medication. The discovery that one of them, vitamin D, is the equivalent of sunlight in curing rickets was one of the surprises of research.

During the last 50 years preventive medicine grew as rapidly as did curative medicine. Much of it was mediated through sanitary engineering and veterinary science. The filtration and chlorination of water, the pasteurization of milk, and the inspection and proper handling of meat and other food products enormously reduced the incidence of typhoid fever and food poisoning, eliminated the hazard of bovine tuberculosis in children, and went far to prevent the milk-borne diseases, brucellosis and septic sore throat. Veteri-

nary medicine eradicated, or brought under control, Texas fever and foot-and-mouth disease in cattle, hog cholera in swine, and glanders in horses—outstanding achievements in the livestock industry.

An old discovery, recalled through the necessities of military operation in the late war, brought back dichlorodiphenyltrichlorethane (DDT), which has proved one of the most effective agents ever devised for the suppression of disease. It is a powerful substance, which, by destroying the insect vectors of the virus and rickettsial diseases mentioned, as well as the mosquito that transmits malaria and other dangerous insects, has made life infinitely safer in large sections of the earth and may be a factor in opening up new tropical areas of huge economic importance.

With the modern public health movement, an aroused public opinion insisted upon safe childbirth and proper care for the newborn and led to a dramatic decrease in maternal and infant mortality.

Advances in other sciences steadily provided new tools and methods for medicine. Chemistry and physics were particularly helpful, the one furnishing a heightened understanding of the composition of living matter, as well as practical methods for routine medical procedures, while from the other issued the sub-science of radiation physics, which began 50 years ago with the discovery of X-rays and which has now reached the earth-shaking stage of nuclear fission, with as yet undreamt possibilities for medicine—feebly forecast, perhaps, by the X-ray and radium treatment of cancer.

In these years there has been only one major setback in health, but that one terrifying—the influenza pandemic of 1918, a catastrophe like the plagues of old which showed how helpless the most enlightened medicine can be in the face of the unknown. Fortunately, recent research on its etiology and prevention offers hope against its recurrence.

The leading causes of death are quite different from what they were 50 years ago. The passing of typhoid fever, virtually wiped out by sanitary engineering and prophylactic vaccination, was one of the great medical triumphs of the last half-century. A similar fate appears to be in store for tuberculosis, which was until 1910, and for all historic time before that, the leading killer of all diseases. Ceaseless application of all known methods of treating and preventing it is winning the long fight. *Pneumococcus pneumonia*, the lobar pneumonia of the pathologist, appears to be a vanishing disease. Specific therapy, and other factors still unknown, have greatly reduced its incidence.

There is reason to expect a continuous decline in incidence of all the infectious diseases if public health practice is maintained, but in these days of strain let us soberly realize that the wreckage and devasta-

tion of war and military occupation could undo all recent progress, and the horrible but not inconceivable employment of bacterial warfare, using the agents of some of the diseases cited, could set the sanitary clock back by centuries.

A glance at the five leading causes of death in 1900, 1910, and 1945, years representing in some measure the early and late practice of physicians still active, shows a significant trend. In 1900 these causes were (1) tuberculosis, (2) pneumonia, (3) enteritis, typhoid fever, and other acute intestinal diseases, (4) heart diseases, and (5) cerebral hemorrhage and thrombosis. Ten years later the only change was that heart disease had moved from fourth to first place, tuberculosis now being second, and pneumonia third. In 1945, however, the list had changed profoundly. Heart diseases were far out in front; cancer, which had come up from eighth place, was second; and cerebral hemorrhage and thrombosis, third. Fatal accidents, which had been well down the list, were now fourth, and nephritis was fifth. All of these are, of course, composites rather than single diseases, and it is significant that, except for accidents, they are characteristic of the advanced rather than the early or middle years of life.

Preventive medicine and sanitary practice had effected a phenomenal change in the mortality from the former leading diseases and, at the same time, a great increase in expectable longevity. During these years the average life had progressively lengthened by more than 16 years (16 years in white males, 18 in white females, and 24 in colored males and females). The life expectancy of a white boy at birth had reached 64 and that of a white girl 69 years.

The saving of life in the early and middle years has led to an accumulation of life in its final decades. Within the last 40 years the proportion of people over 60 years of age in the population has doubled. It is now more than 10%, and it is expected to double again in the next generation. The increase in average life span, however, has not been accompanied as yet by a significant increase in the maximum life span. Although the proportion of persons over 60 years of age is rapidly increasing, the average man at 60 has approximately the same life expectancy (about 14 years for white males) as he would have had in 1900. The lives saved from extinction by the infectious diseases in the early and middle years are still lost at an age not far from the traditional one of the past from the vascular degenerations and cellular aberrations of old age. With further reduction in preventable disease in the older age groups, the average life may extend to 75 years. Optimists believe that it should reach 100. Whether it will or will not remains to be seen, but it is unlikely that it will ever

pass that figure, for all past experience indicates that 100 is the approximate maximum age that man can ever attain.

The greater average length of life means a greater number of years lived. It might be interesting to calculate to what savings the increase is principally due. The disease tuberculosis furnishes one of the best examples. In 1900 it was easily the leading cause of death. The mortality rate was 195 per 100,000 population. Forty-six years later, in 1946, the total number of deaths from the disease during the year was about 50,000, and the rate had dropped to 36. Had the 1900 rate still held, the number of deaths would have been 273,000. The saving of life in that year was therefore 223,000. For the total 46-year period it has been calculated that approximately 5,000,000 lives were saved. Allowing for increasing population, decreasing death rate, and average ages at death from tuberculosis and all causes, it is clear that between 1900 and 1946 many millions of years were lived that would not have been lived had the mortality rate for tuberculosis in 1900 been maintained.

The saving of life is not the only saving to consider. For every person who dies of tuberculosis in any one year, about four are alive and seriously ill with it. Using the same figures as before, and subtracting the calculated cases from the total that would have existed in 1946 had the 1900 rate prevailed, we find a saving in that year alone of 892,000 serious cases. Quite comparable calculations could be made for other diseases.

The saving of life in the middle years is no great gain, however, if life is to be burdened with discomfort and made unproductive by disability in the late years. Fortunately, the medical sciences are making continuous strides in the mitigation, if not the elimination, of the ailments of advancing age. No longer should old people be toothless, half blind, and stone deaf. Early and expert care, modern root therapy, and the elimination of oral sepsis have saved countless teeth, and ingenuity in the manufacture of dentures has gone a long way in the functional replacement of teeth that could not be saved. At the same time the removal of foci of chronic infection through proper treatment or extraction of infected teeth has reduced the incidence of those systemic infections believed due to mouth sepsis. The most disabling of chronic illnesses, crippling arthritis, may yet yield to advance in this field.

Progress in the care of the eyes has prolonged man's efficiency and productivity. Superior lens manufacture is now widely available. A striking example of extension in its availability was accurate lens grinding in the front lines in the late war. Studies on the nature of vision have led to an understand-

ing of proper illumination, and an appreciation of the significance of nutrition in vision has brought about improved adaptation when adequate illumination is lacking. Outstanding progress has been made in the prevention of blindness due to infectious diseases, and improved methods of extraction of cataracts have prevented much of the blindness of old age.

Prompt treatment of middle-ear infections has prevented much deafness, and modern electrical amplifying appliances, taking advantage of every residual of auditory capacity in the hard of hearing, have kept in productive occupations many who would otherwise have been unable to work. Gains in social satisfaction and economic production from prevention of incapacity in sight and hearing are incalculable.

Old age suffers from a variety of annoying untoward developments, such as hernias, hypertrophies, and skin derangements, many of which can be corrected surgically. Wider acceptance of care for these defects has added much to the comfort and safety of the later years.

Increase in the length of life has led inevitably to a relative increase in the incidence of mental disease. Much, unfortunately, seems irremediable, but relief from the less serious disabilities is one of the triumphs of modern medicine. Advance has been made particularly in the field of psychoneurosis. The late war showed how prevalent it is, and further progress has brought a realization that the organic fixations induced by tensions, anxieties, and frustrations, however distressing in their simulation of genuine organic disease, are rather readily amenable to psychiatric treatment.

These comments on relief from the disabilities that gather with advancing age are introduced only to support the statement that, in saving and extending life, medical research and discovery have also increased its comfort and productive capacity. They represent but a short extract from the new and expanding science of geriatrics. The disabilities of the late years, comprehended within that science, will command increasing attention from physicians. The now popular questionnaire type of research has demonstrated conclusively that a steadily growing percentage of the average physician's time is devoted to practice on persons in the late years of life.

Today's increasing interest in the diseases of later years, as reflected in the allocation of life insurance funds for the study of heart and vascular diseases and the appropriation by Congress of funds for the investigation of cancer, forecasts the emphasis in future medical research as well as practice.

There is every reason to believe that the next 50 years will be at least as fruitful in the medical sciences as the last 50. Probably they will be much more so.