THE CARDIOVASCULAR SYSTEM IN PROGNOSIS.

WITH SPECIAL REFERENCE TO LIFE INSURANCE EXAMINATIONS.

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Longevity is a vascular question, which has been well expressed in the axiom that "a man is only as old as his arteries." To a majority of men death comes primarily or secondarily through this portal.—OSLER.

Not only is cardiovascular disease the determining factor in a majority of deaths, but it is becoming a more and more important factor. Improved social conditions, the advances in modern medical science, particularly preventive medicine, are steadily lowering the general mortality from the infectious diseases, leaving a larger number to endure the effects of later wear and tear which are accentuated by the extraordinary stress under which the average American is living. This trend is a matter of common clinical knowledge, and statistical evidence on the point is most convincing.

A glance at the summarized table of the last census report¹ shows in recent years a practically steady increase in the cardiovascular diseases, and a notable decrease in the infectious diseases. This abstract shows increase and decrease for three main headings during the past six years. The + sign indicates increase, the — sign decrease. It is calculated for deaths per 100,000 of population.

General diseases (including epidemic, tubercular, typhoid, etc)	—52.6
Diseases of circulatory system	+25.1
Diseases of genitourinary system	+11.

The mortality statistics of the State of Massachusetts are the most reliable available, and are even more striking. The death rate per 10,000 population from typhoid and tuberculosis taken together, in decades from 1865 to 1905, is shown in the first column. In the second column is the percentage of deaths from heart disease, and in the third column from genitourinary disease.

	Typhoid and Tuberculosis.	Heart Disease.	Genitourinary Disease.
1875.....	41.1	8.06	3.08
1880.....	35.7	9.68	3.91
1885.....	34.6	11.97	5.60
1890.....	29.6	15.58	5.69
1895.....	24.6	15.01	7.43
1900.....	20.7	13.99	8.05
1905.....	17.5	18.45	8.53

Notice that the first decreases steadily from 41.1 to 17.5; the second increases from 8.06 to 18.45; and the third increases from 3.08 to 8.53.

When this tendency toward a diminution in infectious diseases and an increase in cardiovascular disease is so definite in general population statistics, we can be sure that it will be even more pronounced among lives selected for ordinary insurance.

The beneficial effects of modern sanitation and prophylaxis are particularly felt in this select class, which consists of our best social elements. Tuberculosis, typhoid, primary pneumonia, venereal disease, puerperal septicemia, violence, etc., largely spare these higher, more intelligent classes, to reap their richest harvest among the poor, the ignorant, and the vicious. Unfortunately, as regards cardiovascular diseases, the converse is true, namely, that these diseases have their strongest hold among the classes which feel the extraordinary strain of modern life most strongly.

Too often members of these classes avoid the dangers from infectious diseases only to encounter undue cares and responsibilities which overstrain the heart and blood vessels of brain and kidney.

It is well-known that the increase in vitality among insured lives is during the younger years, at which period infectious diseases are chiefly operative.²

It is not necessary to dwell longer on the increasing incidence of cardiovascular disease, for statistical evidence and clinical experience leave this indisputable. But it does seem highly important to emphasize the necessity for greater efforts in determining the presence of cardiovascular impairment in life insurance examinations. A large majority of rejections for cardiovascular disease are for endocarditis with acute articular rheumatism as the causative factor, and few are the notations of such impairments as arterial thickening and sclerosis, increased tension, cardiac hypertrophy without valvular disease, accentuated second sound, etc., often the only evidences of insidious trouble which may eventuate in apoplexy, acute cardiac dilatation, or nephritis.

Examiners apparently are too often satisfied regarding the cardiovascular system when there is no heart murmur and no irregularity or increase in rate of the pulse. A large proportion of the candidates for fatal cardiovascular disease within the next ten years do not at present show these gross symptoms, nor any albumin in the urine, yet a thorough, more detailed examination would reveal an unfavorable cardiovascular condition in the majority.

It may be proper here to define more exactly the broader sense in which the term cardiovascular disease is used in this article. Cardiovascular impairment is essentially protean in its manifestations, and the term "heart diseases," as returned in death certificates would include but a small proportion of diseases primarily cardiovascular in character. Especially in examining applicants for life insurance must we bear in mind the relation of cardiovascular impairment in the following diseases, and search for its evidence. Apoplexy is as much a cardiovascular disease as mitral insufficiency, and although the cerebral arteries are not available for examination, other portions of the vascular system are. A large number of chronic interstitial nephritis cases—probably a majority—are vascular in origin. Aneurism, arteriosclerosis, softening of the brain, chronic passive pulmonary and systemic congestion, dropsies, abnormally high tension, and lastly—probably the largest heading—the terminal infectious diseases in which an impaired, overworked cardiovascular system has created a condition of lowered resistance eagerly embraced by pneumonia, erysipelas, etc. How many of the deaths returned as pneumonia are primarily due to cardiovascular disease it would be impossible to estimate, but most clinicians would give a high figure.

The effects of an impaired cardiovascular system are operative in surgical cases also. Etherization, Trendelenburg's position, prolonged manipulation, are but poorly tolerated in the presence of impaired heart muscle, sclerotic vessels, or undue arterial tension. No general practitioner need have the difference in prognosis pointed out for the infectious diseases, such as typhoid, with or without cardiovascular impairment.

Longevity is indeed a vascular question. As therefore a sound unimpaired vascular system is a prime requisite for a normal life expectancy, we may profitably review

1. Mortality Statistics, 1903, p. 28.

2. Buchanan: Tr. Faculty Actuaries, iv, part 3, No. 37.

the points bearing on the abnormalities which may be developed by an insurance examination. That these abnormalities can be revealed by a proper, careful examination in a considerable number of cases, I think there can be no question, and the elimination of the worst of these applicants would produce a large saving in mortality under the primarily cardiovascular headings outlined above.

The careless general endorsement of applicants who have no coarse râles at the apices, no cardiac murmurs, and no albumin, is an undue expense to all life insurance companies. The statistics of one of our largest insurance companies show how indifferent the cardiovascular examination often is. For example: 7.26 per cent. of the total first-year mortality was from heart disease; 10.97 per cent. was from apoplexy, softening of brain, etc.; 3.55 per cent. from Bright's disease; or a total of 21.78 per cent. of first-year mortality was due to heart disease, apoplexy and nephritis; so that taking into consideration the chronicity of these diseases, it is not excessive to say that nearly one-fifth of the first-year mortality could be saved by a thorough examination. The mortality for typhoid, which could not be foreseen, is only 8.71 per cent. for the first year. The proportion of cardiovascular diseases is even a little higher for the second and third years. In the older entrants the mortality for vascular diseases is as great in the first year as in later years. It must be a very exceptional case for a man to be perfectly sound at the time of examination and die within the year of apoplexy, heart disease, or nephritis; yet experience shows that doomed men are passed constantly by medical examiners.

Competent examinations should practically exclude heart and arterial diseases, apoplexy, and nephritis from the first year's mortality, and should largely eliminate them from at least the first three years.

In the large cities, where competition for the position of examiner is more keen among well-trained reliable men, it is possible to have examinations which are more than such a superficial inspection, and good painstaking work is often obtained in smaller towns, but not so frequently. But in town and city a more rigorous search for cardiovascular impairment with a full account of all features in the case, would greatly enhance the value of the medical examination.

In the medical examination, cardiovascular impairment should be searched for along three main lines.

I. PERSONAL HISTORY.

First, the personal history of the applicant often lends a clue; a previous life of hard physical labor, undue mental worry, excessive use of tobacco, dissipation, gout, work in lead, that is, as painter, glass-worker, etc., all predispose to cardiovascular impairment, and should induce a more rigorous examination. The undue strain to which common laborers are subjected, taken in conjunction with their frequent unsanitary surroundings, have made them a prohibited class for ordinary insurance with most old-line companies. A heavy mortality is experienced among the successful business men past middle life, the financiers, the men who apply for the large policies. Too often financial success has been purchased at the cost of physical impairment, which most often takes the form of cardiovascular deterioration. This extra hazard is well recognized, and usually an alternate examination is required, frequently by a specialist in internal medicine, in an effort to detect these early

changes. A report from such an internist of an accentuated second sound, an increased tension, a thickened radial, would bring a prompt rejection. Typhoid fever (Thayer), acute articular rheumatism, syphilis, and possibly other infectious diseases are important. A past history of chronic dyspepsia or indigestion should receive careful attention. There are definite cases of cardiovascular disease in which no etiologic factor is apparent other than the opportunity for intoxication from an unhealthy digestive tract. Furthermore, the beginning of serious trouble in heart or kidney may first be manifested by gastric disorder. Indigestion and dyspepsia are not as trifling as many apparently believe. In young entrants this weakness opens the door to infection, and in later life may be the signal of deeper trouble.

II. FAMILY HISTORY.

The tendency to early cardiovascular degeneration may undoubtedly to a certain extent be inherited. When several members of the immediate family have died before 65 of Bright's disease, apoplexy, or heart disease, we must think of the probable existence of such a tendency, and the applicant, especially if over 40, must be held under grave suspicion until the existence of cardiovascular disease has been eliminated.

III. PHYSICAL CONDITION.

While the personal and the family history give valuable suggestions to the examiner, the most important element in the examination is the present physical condition, which may reveal conditions totally at variance with a favorable history, or may lend valuable accessory evidence to a suggestive history, or, finally, may establish proper evidence of insurability in spite of a poor family or personal history. A comprehensive judgment as to the existence of cardiovascular disease is possible only if the medical examiner keeps this disease constantly in mind as a possibility in applicants over 35, first, with the prospective furnished by family and personal history, and then by a rigorous attention to the details of the physical examination, the general outlines of which, bearing on cardiovascular disease, I will briefly review.

Sex.—Males are much more subject to the various vascular diseases than females, as one would expect *a priori*. The more strenuous the life, the higher the tension, mental or physical, the rougher the usage, the sooner will wear become apparent. Any dangers that may be associated with the climacteric in the female are more than offset by the much graver dangers that may portend in the male between 40 and 50. Referring to the classical article by Brandreth Symonds,³ it is seen that although the mortality at nearly every age is more favorable among females than males, yet the difference is most striking between 46 and 56, when the male mortality is nearly double that of the female. This is the decade when premature vascular changes become active.

Age.—At younger ages than 35 it is rare to find these degenerative changes, except the forms of infective endocarditis and the lesions of syphilis. The most frequent age of discoverable onset is between 40 and 65.

General Appearance.—This, though often deceptive, may lend a clue to the experienced. There is a facies which often seems to warn in these cases, less marked than in definite Bright's or aortic disease, and yet suggestive of some impairment—a strained look, perhaps

3. Am. Jour. Med. Sc., March, 1894.

best termed haggard, premature lining of the face, shadows under the eyes, a mixture of pallor and sallowness. A progressive loss of weight is particularly serious. Often, however, there is no indication in general appearance—the color may be good, the eye alert, expression vigorous. A subnormal temperature, that is, below 97.8, should be noted, as it is frequently associated with these degenerative changes.

Weight.—This is usually at normal or somewhat above, unless there has been a loss, which would in itself be a serious symptom. It may be that thin, more delicate men are unable to keep up the pace that kills, so that if they escape the infectious diseases in early adult life they are apt to outlive their more vigorous contemporaries. The racing proverb, "A lean horse for a long race," is often not inappropriately applied to delicate men who take proper care of themselves. Cases of extreme overweight are generally excluded from ordinary insurance, so they need not be considered.

Pulse and Arteries.—The pulse should be counted for a full minute, and care taken to note any tendency to intermission. An intermission, even though only occasional, in an applicant over 40, is important, and should be noted. It may be the only indication of myocardial disease. A rapid pulse, that is, over 90, may indicate muscular weakness. A very slow pulse, below 60, may indicate an abnormally high tension. A knowledge of incipient changes in the arterial wall is most important; as Dr. Osler has said of these cases: "The subsequent history is extraordinarily diverse, depending on the vascular territory in which the sclerosis is most advanced, or on the accidents which are so liable to happen; and the symptoms may be cardiac, cerebral, renal." The radial and temporal arteries should be carefully palpated to discover thickening or sclerosis. Ordinarily the radial is accessible, but in stout individuals the temporal affords a more favorable opportunity for palpation. Two or three fingers should be used, and an effort made to roll the artery under them. When the artery can be thus felt as a definite cord after the blood has been blocked, there is some change in the wall. Inspection of the pulse is often valuable. A visible pulse beat in the radial, unless the subject is very thin, should lead to careful investigation. Visible pulsation in the brachials or carotids is even more suspicious. It may indicate a thickened artery or a high-tension pulse, often both. A tortuous artery is always abnormal. At the same time an effort should be made to estimate the tension, though usually one's confidence in his ability to gauge tension is in indirect proportion to the frequency with which he has controlled his tactile measurements by the sphygmomanometer. Palpation judgments of tension are certainly most deceptive, and as this is the most important single sign indicated by the pulse, I do not hesitate to say that no cardiovascular examination in an applicant over 40 can be considered complete without a knowledge of the blood pressure as obtained by the sphygmomanometer. An observation can be obtained quickly and accurately, and should be a routine in applicants over 40. No physician can treat heart or kidney cases intelligently without the aid of a sphygmomanometer, and an examiner should be in a position to furnish blood-pressure readings as readily as the pulse-rate. It is far more important. A tension above 140 mm. Hg with a four-inch arm-piece is suspicious; over 150, most serious. Examiners are beginning to appreciate that a "strong pulse" is not always

a recommendation. Such a "fine, strong pulse" may shortly successfully rebel at normal arterial restrictions.*

Heart.—Every cardiac examination should begin with a careful inspection, and the apex beat should be located, if visible. A presumptive diagnosis of cardiac hypertrophy can frequently be made by inspection alone. A diffuse, heaving impulse should be noted as differing from the usual localized beat. A thoracic aneurism can be easily missed if inspection without the shirt be neglected. Palpation establishes or confirms the location of the apex-beat, and the possibility of hypertrophy must always be entertained unless this is well within the nipple line. At the same time the presence of a thrill can be detected. An examiner who does not define by percussion, at least the left border of the heart, is certainly derelict. No more important evidence can be obtained from the examination than the correct knowledge of the extent of cardiac dulness. Cardiac dilatation and hypertrophy are by no means infrequent in older applicants, and are most serious conditions, constantly overlooked in hurried examinations. In the absence of a murmur, the most valuable evidence afforded by auscultation is an accentuated second sound over the base of the heart, particularly over the aortic area. This indicates increased tension in systemic arteries, and can be confirmed by the sphygmomanometer. The position of the apex can be confirmed by noting the point where sounds are heard loudest. It should be noted that sounds are not weakened or blurred, and especially that there is no roughening of the first aortic sound. The recognition of the ordinary murmurs of endocarditis are too elementary to need repetition.

Urine.—The relation between the circulatory system and renal secretion is an interesting one, and a careful urinary examination may give the clue to vascular disease. For example, with an increased quantity of urine of low specific gravity in a male over 50, there may be expected high tension, cardiac hypertrophy, thickened arteries, etc. A man over 50 who rises to urinate at night probably has prostatic hypertrophy, beginning interstitial nephritis, or cardiac hypertrophy, perhaps all three. The association of albuminuria and cardiovascular disease is a matter of common knowledge, and need only be mentioned in relation to substandard insurance, as in ordinary insurance the presence of albumin alone would dispose of the case; but in issuing a substandard policy to a man passing albumin, a knowledge of the condition of the heart, arteries, and blood pressure is of prime importance. Albuminuria without cardiovascular disease and with normal blood pressure is compatible with health for many years. With an equal amount of albumin associated with cardiac hypertrophy and a blood pressure of 200 mm. the case may eventuate at any time in apoplexy or acute dilatation.

SUMMARY.

The combined cardiovascular diseases constitute the largest element in general mortality, and are even more important elements in insured mortality.

The evidences of incipient cardiovascular disease are discoverable in many cases by careful attention to the details of the examination.

Greater care and thoroughness in this particular would produce a large saving in insurance mortality, especially during the first five years.

* I have always used and found most satisfactory the instrument known by my name and first described in THE JOURNAL A. M. A., 1903, xl, 1199.