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Summary.
Introduction.

In choosing a dissertation to be submitted as a Thesis for the Degree of Doctor of Medicine, not only is it desirable to select a subject which is engaging the minds of many of the masters of medicine at the present day, but also it is expedient that the writer shall have had first-hand experience, which he can bring to bear on the matter under discussion. Such considerations, then, have influenced me to undertake the analysis of fifty cases of cardiac affections, which have come under my observation.

Problems connected with the circulation of the blood and the cardio-vascular system are of perennial interest; from the earliest times, they have given food for thought, observation and experiment. Yet success and progress have attended the investigator only when he has employed these faculties in conjunction: for example, during the Middle Ages, no material contribution was made to medical science; the Scholastics reasoned in abundance, but their conclusions were based not on the fruits of their own observation and experiment, but on premises culled from the writings of Aristotle; needless to say,
This entire neglect of the faculty of reasoning by induction led to many an absurd opinion which had all the more weight, since it was grounded on the authority of tradition.

The first gleam of hope came with the Renaissance—to Vesalius and to Harvey was reserved the glory of bearing the torch of true learning into the thick darkness, which overshadowed the very groundwork of that department of medicine which is the present subject of consideration. For a period of two thousand years, men's minds had been chained to the belief that the diastole is the active part of the heart's beat; but Harvey had the courage to regard the matter from a new angle, - he saw and proved that the active movement of the heart is the contraction during systole. During the three succeeding centuries, great advances were made by clinicians and by pathologists—physical signs as determined by the cardinal methods of inspection, palpation, percussion and auscultation, received full and just attention, and morbied anatomy and bacteriology became sciences. This was followed by a period, not yet ended, in which much weight was attached to what may be termed mechanical aids to diagnosis, for example, the sphygmograph, the sphygmomanometer, the electrocardiograph and the polygraph. These devices, in the hands of those who realise the limitations of such instruments, are of the greatest service in the clinical investigation of disease. Nevertheless, in many cases, they are non-vessential, as is
admitted by the inventor of the polygraph.

The present generation has the privilege of surveying the
question of cardio-vascular disease, as a whole;—although the
prospect is dim and cloudy in not a few directions, the veil of
mist is slowly but surely rising. In this pioneer work of criticism
and re-grouping, former students of the University of Edinburgh have
played no mean part: the names of Gibson and Russell occupy
places of the highest rank in this department of medicine,—a
position they have justly merited by accurately observing physical
signs and by giving many of these the correct and true interpretation;
a younger generation, represented by Ritchie and Price, have
contributed many valuable monographs; and our Alma Mater
is proud that she can count Sir James Mackenzie amongst
her alumni, for, apart from his brilliant powers of reasoning and
his ability to take a comprehensive view, the patience and diligence
expended on his many original and laborious investigations
are worthy of the emulation of all ages.

The question of heart disease is not one of mere academic
interest. From a consideration of the Eightieth Annual Report
of the Registrar General for England and Wales, it is apparent that
the malady exacts a levy of lives greater than that claimed by
phthisis pulmonalis, and moreover that death as a rule occurs
at a later age-period in heart disease. Such a conclusion
gives rise to many serious thoughts. Both these diseases are
firmly established in our midst and contribute not only to death,
which are often untimely, but also to much suffering and die:
:ablement, thereby inflicting substantial losses on the community.
Nevertheless, our outlook with regard to each is vastly different; for,
whereas it is preached from the house tops that tuberculosis is a
curable, nay a preventible disease, too often it is taken for granted
with the other that neither is it possible to prevent it nor is a cure
or retardation to be contemplated, once the malady has become
established on a footing however slight. Now, such a view as
this is comparable with the fatalistic acceptance of the evils of
tuberculosis half a century ago; for, as at that time, men were ignorant
of or rather did not realise fully the value of the preventive, diagnostic
and therapeutic agents at their disposal, so now it is imperfectly
recognised that it is not impossible for an enlightened public to
adopt adequate prophylactic measures, with regard to heart disease,
and that the medical practitioner may cure it in its early stages,
or may limit its ravages, when once it has obtained a footing.

Just as a thorough appreciation of the potentialities of the
Bacillus Tuberculosis led to a new era with regard to the
prevention of phthisis pulmonary and other tuberculous lesions,
in like manner much may be expected when full deference and
respect have been shown towards the Micrococcus Rheumaticus
(and other kinds) Streptococci) and the Spirochaete Pallida.

While it may be said that the conscience of
the state demands a full and thorough enquiry into the
prevention of disease, and the application of the results of such
an inquiry, so with the individual prognosis is of paramount importance. Patients demand that their physician be endowed with the gift of prophecy and on that standard alone, the latter is often judged. Nevertheless, in heart disease, an accurate prognosis is frequently extremely difficult and so a guarded prognosis is offered—in other words, we attempt to placate our patient by a wary or oracular statement, which must frequently convey an impression of professional ignorance. In this essay, it is hoped to elucidate, in a humble fashion, the question of prognosis in heart disease.

It has been mentioned that personal contact with the type of case under consideration is requisite. Since graduating Bachelor of Medicine, my opportunities for studying this form of disease have been ample. At first, as Resident Physician to Dr. R. A. Kinmont in the wards of the Royal Infirmary, Edinburgh, I acquired a thoroughly up-to-date knowledge of and practice in the scientific side of medicine amidst a great wealth of clinical material. Whilst holding a commission in His Majesty's forces, I was assigned for a considerable period the duties of Medical Officer in charge of the Depot of the Royal Army Medical Corps, which enabled me to observe large numbers of recruits, some of them on the threshold of disease. Now as Principal Medical Officer at Craiglockhart Hospital, with its five hundred beds, the more advanced and chronic stages are
available for study.

In this paper, resort to medical literature has been reduced to a minimum, in order that the conclusions which are drawn may be coloured as little as possible by any traditional views.

I desire to thank Dr. R. A. Fleming for permission to use records of cases taken in his wards, and also to express a debt of gratitude to Professor Meakins for encouragement.
Thesis.

I. Sex.

It is generally taken for granted that women bear heart-disease better than men, since they lead a more sheltered life and do not, apart from pregnancy and labour, undergo physical strain. While this may be true, it is not borne out by this record of cases, comprising twenty-six males and twenty-four females: the women were affected earlier in life; the duration of the disease tended to be shorter; the average age of the men at death was fifty-two, of the women forty-two.

Sex is an unimportant factor in prognosis; the more strenuous life and intercurrent affections, such as pneumonia, which is most common in men, being balanced by the strain experienced during pregnancy and labour.

II. Age.

Of the fifty cases studied, twenty-six are forty-five years and over; of these, thirteen are over sixty years of age and three are over seventy; the oldest being seventy-eight and still alive. Fully fifty per cent, therefore, are well-advanced in middle life. There is a widespread impression amongst
the belief that if a person suffers from a cardiac affection he is in danger of an early and sudden death, this of course is untrue. Nevertheless, many medical men take quite an unnecessarily gloomy view of the condition of such a patient. This will be borne out still better when we deal with the duration of the affection.

### III. Duration of Valvular Affections.

An attempt has been made to keep in touch with all the cases, where death was not observed. Patients who were under the care of Dr. R. A. Fleming five years ago, were corresponded with; the replies I received were on the whole satisfactory, and in some cases, I have been able to examine the patient and to estimate his or her condition. Twenty-two cases are dead; nineteen are still under observation; and the remaining nine cannot be traced.

It is interesting to see comparatively little change in some patients during these years, both as regards symptoms and physical signs, ray, even a definite improvement may be noticed.

H, a male patient, aged 63 (case No. 39) experienced two attacks of shortness of breath and hoarseness in 1915. Dr. Logan Turner found his larynx healthy; the only physical signs of importance were an indefinite dull note over the upper part of the sternum and a doubtful diastolic bruit in the aortic area. An X-ray report stated that he had a "very much
broadened aortic shadow." It was treated with potassium iodide and went home feeling well. Examining him recently, I found a double aortic murmur and the same suspicious note over the sternum, but he told me, "Speaking confidential, I have been clear of all my troubles since I left the Infirmary and that he was able at the moment, only because unemployment was prevalent out at Belmont.

Again, a history of symptoms extending over periods of ten, seventeen, twenty-three, thirty or forty-seven years is by no means uncommon.

B. (Case No. 60) contracted syphilis in 1870. Wassermann reaction now ++. Three years later he fell through a glass window in a fight and from that time he was short of breath when he hurried. It gave no thought to this condition, however, and it was not until the year 1885 that, whilst ill with influenza, he chanced to be examined by Sir Thomas Graham Stewart, to whom his father was coachman, and that prominent physician enjoined him to take life as easily as possible and not to hurry. He admits, however, that he took no heed to his way and yet enjoyed good health. In 1916, he had a satisfactory recovery from labor pneumonia and it was not until August, 1919, that, on account of increased shortness of breath and weakness, that he sought parish relief and entered (alcoholism) Poorhouse. To-day, there are intimal systolic and double aortic murmurs, but very slight extension of the normal cardiac dulness; he is able to go about with ease and performs light duties.

B., a woman (Case No. 27) complains chiefly of palpitations,
following on growing pains in 1893 and rheumatic fever in 1903. She has a well-marked mitral systolic murmur and an accentuated second sound in the pulmonary area. I have satisfied myself that the condition is not functional. Though her symptoms date back for seventeen years and have been slightly accentuated during the last four years, she is perfectly able to carry on her work as a charwoman, without any call for medical advice. During this time, she has had four children; the labours have not presented any abnormal difficulty, nor has she found herself very weak during the puerperia.

Again, a woman T. (Case No. 32), now over 50 years of age, came to the Royal Infirmary, Edinburgh in 1914, complaining of shortness of breath and swelling of the legs. The cardiac dullness was slightly increased to the right, and on auscultation, the sounds were regular, but a well-marked rough aortic systolic murmur was present. Before transfer to the gynaecological wards for an operation, the cardiac dilatation had disappeared and the patient felt well. Today, she replies, “Since I was a patient of yours, I have not suffered from shortness of breath or swelling of the legs, and am pleased to say that I am keeping in good health at present.”

There can be no doubt, then, that in many instances, individuals are going about their ordinary duties of life with well-marked heart affections and that these heart affections may remain stationary in a favourable — may, even, in an unfavourable — environment for a much longer time than we are accustomed to picture. This has been
readily recognised by physicians, who examined recruits for the Forces during the late European War.

We acknowledge, then, that there exist persistent affections of the valves of the heart, which may remain quiescent during severe illnesses: further, that they are in themselves of questionable value in prognosis, for as valvular disease does not cause death, its presence may influence but not determine prognosis. The myocardium is the all important factor upon which life depends and on the presence or absence of myocardial change, prognosis must take its stand.

IV. Occupation.

In some text-books, considerable stress is laid on the question of occupation. One is exalted, other things being equal, to give a good prognosis to the man who pursues a light occupation and to anticipate a bad outlook for him who persists in returning to a strenuous life. In other words, a careful conservation of energy is regarded as a necessary factor in a favourable prognosis of a heart affection. Such counsel has certain limitations and should not be interpreted too literally.

In this series of cases, practically all the male cases follow or have followed laborious occupations, such as mining, carpentry, gamekeeping, seafaring and
ordinary labouring: the women are hawtiers, charwomen, etc., but for the most part housewives, who have generally no easy time at home. Yet I cannot say that, even in this class of patient, a laborious occupation is an unfavourable factor in prognosis. True, if any of the cases attributed their condition to their usual employment and the ripe age which many of them have reached indicates that their ordinary work was not a source of danger.

B. act 51 (Case No.44) was admitted to Craiglockhart Hospital suffering from ulcers of the legs - Wasserman Reaction, twice negative, - and on routine examination I found the following murmurs, mitral systolic, preceded by a rumbling, and an aortic diastolic; he had no cardiac dilatation. The cardiac lesions caused him no inconvenience, although his occupation involved ten hours of hard manual labour per day and his habits were strongly alcoholic. As he appeared to be in the best of health and had no symptoms, I did not advise him to change his occupation, but only cautioned him to avoid excessive.

On the other hand, any unaccustomed strain is apt to precipitate heart failure.

C. act 61 (Case No.83) contracted syphilis when he was sixteen, but pursued his occupation as a dock-labourer without discomfort, until five years ago. In 1915, he enlisted, without medical examination, in the Army Service Corps, and was sent
to unload ships at Durance; for a period, he was obliged to work day and night, with the result that dyspnea quickly became so troublesome that he had to stop work and was discharged from the army forthwith. Since then he has spent gradually shortening periods at South dock, doing light work, alternating with lengthening visits to Craigmillar Hospital. Under my observation, he has gone steadily downhill with increasing cardiac dilatation, auricular fibrillation and uremic symptoms.

La. act 53 (Case No. 37) gives the duration of his symptoms, pre-eclamptic pain, shortness of breath and cough, as three weeks. His work as a ship-sinker has involved heavy muscular labour and his habits, regarding alcohol, have been far from exemplary. On admission to Craigmillar Hospital, he was found to be suffering from well-marked physical signs of acute inanition and paresis, exhibiting jumping carotids, a Corrigan pulse at the wrist and on the dorsum of the foot, a forcible apex-beat in the 6th interspace in the mid-clavicular line and a double aortic murmur. Having ascertained that his blood gave a +++ Wassermann Reaction, it was easy to date back the vascular involvement some thirty years. It attributes his illness to working in an extremely damp and cold niche in unserviceable old skins, and in my opinion such an unwonted hardship precipitated the attack.

The prognostic factor, then, in these two cases lies not so much in the strenuousness of their lives, as in the sudden
change to excessive labour and to unfortunate and unfavourable surroundings. It is not an ordinary day's work which falls against the individual, but any unwonted stress or strain.

Observations made on soldiers confirm this opinion. A fair number of cases of heart disease as distinct from valvular affections became manifest during the war. In many instances, the primary damage must have occurred years before in civil life. Latent disease became apparent through the strain of active service at the front, notwithstanding the fact that training in England was successfully accomplished.

In like manner, any extra worry or responsibility of professional or business life may account for the onset of symptoms; and amongst those who do not toil, a morbid introspection and depression may produce a similar effect.

Prognosis, then, is favourable even in manual labourers, who have valvular affections; but once the myocardium becomes definitely involved from extension of the infection due to excesses or any other cause, the outlook assumes an unfavourable aspect.
V. Causal Factor.

I give below a summary of the etiology of my cases.

<table>
<thead>
<tr>
<th></th>
<th>No of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syphilis</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Acute Rheumatism</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>(incl. gonorrhea)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarlet Fever</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Influenza</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Puerperal Infection</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>&quot;Functional&quot;</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Congenital</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Undetermined</td>
<td>13</td>
<td>26</td>
</tr>
</tbody>
</table>

The well-known fact that the Spirochaete Pallida and the Diplococcus Rheumaticus (and other kindred Streptococci) predominate in the etiology of cardio-vascular disease is borne out by this table and I feel sure that had the Wassermann Reaction been used with greater frequency, a larger percentage of cases would have come under the first heading.

More and more frequently one asks oneself the question, "Can this heart condition be due to syphilis?" If a pathological laboratory is available, an answer is frequently given in the affirmative. I found that a fair percentage of cases denied syphilis and yet a
positive Wassermann Reaction was reported; armed with this knowledge, I was in a position to seek in a tactful manner further information, as to the date of infection etc.

Can any inference in prognosis be drawn from pathological factors as such? Let us consider two cases which have arisen from syphilitic infection.

W. act 63, (Case No. 38) contracted a hard chancre when twenty-three years of age. She received treatment for three weeks and always considered herself cured. At the age of thirty-four, he was astonished at being refused acceptance by an insurance company, on account of "weak heart". He experienced no discomfort until he reached thirty-nine years, when he noticed that the presence of his watch, — a high rest pocket just over the base of the heart was used for it, — caused him actual pain. When the watch was removed, the pain ceased. He continued free from symptoms until a very gradual shortness of breath came on twenty-five years after the primary sores. He was able, however, to perform his regular work as a ledger binder for thirteen years longer and then applied for admission to the Poorhouse. I did not see him at that time, but he improved markedly with rest in bed. Today, he has no cardiac dilatation; there is no arrhythmia; a loud musical mitral systolic murmur, preceded by a presystolic murmur and an aortic diastolic bruit are heard. The Wassermann Reaction is ++.
For the sake of contrast, the following case will suffice.

K. No. 38 (Case No. 82) was infected in India, when twenty-five years old. He, too, received treatment and states that thereafter he kept moderately well — yet the scars on his legs and thighs and about the region of his knees indicate that the organisms were by no means latent in his soft tissues. Two years later he had, without any definite cause, a more or less sudden breakdown, with shortness of breath and dropy and since then he had lived for the most part in hospital, responding unsatisfactorily to treatment. To-day, his auricle is fibrillating: a heavy but unsteady apex-beat is felt in the sixth interspace 1/4" beyond the mid-clavicular line and there is proportionate dullness to the right of the sternum. A prominent, but comparatively unimportant, sign is a long mitral systolic murmur. The Wassermann Reaction is ++.

These two cases indicate the futility of trying to prognosticate on a basis of etiology: one man, if perchance the disease has confined itself to the valves of the heart, may be practically unimpaired in health and may live a span of useful days, whereas another victim of cardio-vascular syphilis may be crippled at a comparatively early date after infection, owing to irreparable damage to the
Heart-muscle caused either by the invasion and colonisation of its arteries and tissues by spiracles or by actual gummata. The degree of involvement of the myocardium dominates the whole picture.

Likewise, in rheumatic cases, a similar contrast may be drawn.

Case 17 (Case No. 13) came to the Royal Infirmary on the 13th November 1914, complaining of palpitations and shortness of breath for four years, general debility and malaise for two months and a faint feeling for one month. Fully a year before the first symptom appeared, she suffered from growing pains, which were allowed to go untreated. There was evidence of grave injury to the myocardium - the right and left sides of the heart were enlarged. The heart was markedly irregular and rapid, so that it was difficult, on admission, to recognise any particular fault. A large percentage of the contractions of the cardiac muscle were not appreciated at the wrist and the pulse was feeble and disordered. She was afflicted with orthopnoea and was very cyanosed. Under digitalis, she improved on this and on three succeeding admissions to hospital; but, on the fifth occasion, she continued to be very ill and despite treatment suitable for her condition, died on the 25th February 1916.

The above case is a good instance of the downward progress of an adolescent due to early
myocardial involvement. Doubtless the valvular affection was extensive and crippling, but even granting this fact, I have no doubt that the seriousness of G's condition depended not on a mechanical balancing between a damaged valve and the driving power of the ventricle, but on an early and progressive infection the heart muscle.

On the other hand, a rheumatic infection may lead to a valvular affection, with little or no myocardial damage; the disease comes to a termination, the heart muscle is undamaged and the individual continues in or regains his usual good health.

Mrs. L. act. 26 (Case No. 25) gave a definite rheumatic history—Growing Pains in 1898, Rheumatic Fever in 1908; from the latter date she experienced slight shortness of breath on moderately great exertion, and even with an accentuation of this symptom for a year previous to admission, she felt able for her work. She came to the Royal Infirmary for a gynecological condition, but it was deemed expedient for her to have a course of medical treatment before operation. There was no cardiac dilatation, no irregularity of pulse or of heart-beat, but a loud systolic in the mitral area, preceded by an indefinite roughening, was propagated almost as far as the
axilla. She remained in the ward for about a fortnight, having no complaints during that period and returned to Ward 36 for the operation. I learn that she has been perfectly well for the last five years.

Recent rheumatic histories, however, always demand a guarded prognosis owing to a liability to recurrence of the infection. The prognosis improves to some extent with the age of the patient; children are very prone to re-infection, adults, less so. The danger of septic endocarditis, too, requires no comment.

Particulars of the patients whose ailments date back to Scarlet Fever, Influenza, Preoperative Infection or whose illness comes under the term "Functional" are given in the Appendix and the prognosis of each case with reasons is noted there.

Under "Undetermined" are included cases in which I was unable to trace an etiological factor. Granting that syphilis accounts for a percentage of these, some remain who are probably best regarded as instances of chronic infection or intoxication of obscure origin.

Looking at heart disease, then, from
This aspect of acute and chronic infection, adequate prophylaxis may protect the individual; while, if the organisms obtain a footing, early and rigorous treatment, - for example, prolonged rest in bed in rheumatic cases or conscientious anti-syphilitic treatment in leucitic patients, must be a decisive factor in prognosis.

Since 1914, I have observed three males, who suffered from congenital heart-disease, and in each instance, I considered the prognosis favourable, owing to the absence of or mildness of the symptoms, in particular cyanosis and dyspnoea. In them, murmurs were heard for excellence, and they serve to demonstrate how little the stethoscope avails in arriving at a prognosis.

W. aged 35 (Case No. 50), whom I have not seen for five years, states in a letter, "I offered to sell my heart to a doctor a year or two ago, but he would not come to terms, as he was afraid I would outlast him."

VI. Family History.

It is interesting to note that a number of the patients stated that near relatives died from heart-disease. Even allowing for the accuracy of this information, I cannot say that I have found it to
afford any help in prognosis.

**VII. Subjective Phenomena.**

From what has been said in the preceding paragraphs, it is evident that prognosis in heart-disease must rest on an estimate of the functional power of the cardiac muscle. The trend of modern opinion is to discard prognostic conclusions arrived at by physical methods of examination; such methods are of most value in diagnosis than prognosis and while they are necessary factors in arriving at an accurate diagnosis, they do not, apart from a few exceptions, give any material assistance in forming an opinion of the capacity of the heart-muscle for performing its work. Subjective symptoms, on the other hand, offer very reliable information concerning the efficiency of the myocardium.

An individual may afford an interesting clinique and present unusual phenomena.

H. acc. 6 (Case No. 43) had no pain nor symptoms of any disease; in particular, he had no cyanosis or dyspnoea. He had been at
school for over a year and his habits were those of other boys of
the same age. The special feature of his case lay in the fact that
on auscultation, he presented two systolic murmurs, perfectly distinct-
the one, a mitral propagated into the axilla and the other a tricuspid,
looser, partly obscured the second sound of the heart in that area
and not propagated in any particular direction. Diagnosis—
conotruncal heart disease. ? Lesion.

Yet in such a case, if the patient is
able for the daily round of duties and does not experi-
ence shortness of breath, praecordial pain or
ghiness and cyanosis and oedema are absent,
there is no reason why he should not live a
length of happy days; for as long as he feels
perfectly well, the prognosis is excellent.

Let us consider two important subjective
symptoms.

BREATHELESSNESS.

This symptom, if present in an affection
of the heart, indicates some impairment of
the cardiac muscle. How may an estimate
of the gravity of the condition be formed, in
any particular case. Not so much by
the duration or constancy of the
breathlessness as by its progressiveness
and the ease with which it is produced.

Maet 37 (Case No. 31) had an attack of Rheumatic Fever in 1898, and ever since that illness suffered from breathlessness on exertion and occasional fainting fits, yet not to such an extent as to interfere with the performance of her household duties. Although there was definite but slight dyspnea, she considered herself moderately healthy until 1912, when she began to experience breathlessness, even on going upstairs and noticed that her ankles were swollen. Not until 1914, however, did the dyspnea become so easily produced and so troublesome that she sought admission to the Royal Infirmary.

In this case, up to the attack in 1912, that is, for eighteen years, the prognosis was certainly good, but at that date the complexion altered, as she had a definite attack of heart-failure, probably associated with auricular fibrillation, the index of the failure being the ease with which the breathlessness was produced.

The all-important question to ask such a patient is "How much can you do without feeling breathless?" or "What exertion, e.g., walking upon a level road, makes you breathless?"; and the prognosis will be good or bad in proportion to the difficulty or ease with which dyspnea is produced.
But while, as far as my experience serves me, the degree of this symptom as ascertained by leading questions or by actual experiment, — that is judging how the patient responds to exercise tests, — is the most valuable of all single factors in determining a prognosis in a very large percentage of cases of heart-disease, yet corroborative evidence can be obtained by a careful definition of the cardiac outline by palpation and percussion, — particular note being made of increased dullness to the right of the sternum. The relationship between the intensity of the dyspnea and the dimensions of the cardiac area, as defined by firm percussion, is very frequently an intimate one. A glance at the Appendix bears out this contention and in particular, I would refer to

K. act 65 (Case No. 2), who had a two year history of the gradual development of the classical symptoms of heart-failure and who, during that period was five times in hospital. The diagrams on the next page indicate how he gradually became more seriously ill.
In other instances where evidence obtained by percussion is doubtful, for example, in an emphysematous chest, a well-defined radiogram of the thorax will supply reliable data.

It should be recollected in this context that advanced myocardial disease may be present, for example, in pernicious anaemia, without any definite increase of the cardiac dullness; in such a case, however, breathlessness will probably be
"produced on the most trifling exertion or emotion." (Addison.)

We are all familiar with the advanced stages of heart disease, which were observed in the majority of my cases which ended fatally — the patient sitting propped up in bed, cyanosed, edematous and so dyspnoeic, that the effect of being moved or attended to is to make him pant for breath or almost collapse, — in these, comment is unnecessary, except to note that Chronic Interstitial Myocarditis was an invariable finding at the section (injuries).

**PRAECORDIAL PAIN**.

I have been unable to arrive at any conclusion concerning the prognostic value of praeordial discomfort or the minor types of pain which are felt in the region of the heart. A certain proportion were attributable to flatulence or other disturbance of the alimentary tract.

True angina pectoris, on the other hand, for long has been regarded as a treacherous and fatal disorder. With this view, my limited experience agrees.

S. No. 29 (Case No. 18) came to Hospital, complaining of severe pains in the chest and a mild shortness of breath.
Two months previously, he felt pain in the chest in the region of
the pericardia. It came on in the morning on waking, and
radiated down the left arm. Just before admission, the pain
had been experienced more frequently and occurred during the
day, so that he had to give up work. It gripped him suddenly
and he had to stand perfectly still for a few minutes, when it
gradually died away; breathlessness did not increase
correspondingly. There was little to note on physical
examination, except that the radial arteries were thickened
for a man of his years. The Wassermann reaction was + +.
During the ten days he was an in-patient, he had attacks
each morning; these attacks were experienced on a waking
and if he dozed off again, he had another attack. One day,
he started awake with his usual pain; amyl nitrite
was given and the pain departed; he had breakfast; then
suddenly he took a very violent pain with cyanosis and
convulsions and died in spite of amyl nitrite and
strychnine.

The Post Mortem findings were as follows: The heart
was not enlarged; firm; contained very little blood clot.
The muscularity was healthy, although the inner part of the
wall and the papillary muscles were a trifle pale.
All the cusps of the Aortic Valve were thickened; water drained
through the valve very slowly. The Aorta, in its first part,
showed well-marked syphilitic tortuosis. The orifices of the
Coronary Arteries were stenosed, especially the left which was very minute.

The interest of this section lies in the fact that the cardiac muscle was found intact in a patient who suffered but little from shortness of breath, and in whom this symptom was not progressive. Indeed, it seems that death may be attributed to a rapid syphilitic obliteration of the orifices of the coronary arteries, leading to an acute starvation of the myocardium; and that the pain was due, as Professor Wyllie used to say, to the cry of the heart for more blood.

About five years ago, I observed a patient on whose case I have the following notes.

McA. (Case Notes). In 1906, he had an attack of rheumatic fever and was confined to bed for eight weeks. He made what he considered a good recovery but nine months later, while playing football, he suddenly collapsed with a severe stabbing pain in the region of the heart, accompanied by a tight feeling across his chest. The pain shot up to his left shoulder and was accompanied by giddiness and considerable shortness of breath. He did not faint, but had to be assisted home.
and lay in bed for about a fortnight. His physician was unable to detect any definite cause for the attack. He gave up football and spared himself as much as possible, with the result that he had only one other attack, until he joined the army. In 1914, he was practicing in a tug-of-war team, and this brought on an extremely bad attack of precordial pain; he lay for six weeks in Stothill Hospital. He was then boarded for "Home Defence." A few months later, after a hurried march from the King's Park to the Waverley Station, he was suddenly seized with an attack of pain, which on this and on former occasions radiated up to his left shoulder, and was so severe that he fainted.

Physical examination did not reveal anything abnormal, but guided by the severity of his symptoms a medical board discharged this man as "Medically Unfit," cause "Angina Pectoris." I regret that a Wassermann Reaction was not done. In March of this year he wrote from the country, "I may say that I have still the same attacks of pain, giddiness and shortness of breath when exert myself a lot. The last one I had was on the 14th December 1919 and I was off work till the 5th January 1920."

Granting that this case was one of true angina pectoris and contrasting it with that of G., I conclude that the gravity
of the condition is materially increased by
the shortness of the period elapsing between
the attacks and by the ease with which these
attacks are produced. Further, these
two instances show that no reliable confir-
matory evidence in prognosis can be obtained
from a definition of the area of cardiac
dullness; — the section on G. revealed a heart
which was "not enlarged" — nor from other
common methods of physical examination.
Is there any sign which may be utilised?
From a survey of my notes, I find none.
However, I suggest that a careful obser-
vation of the cutaneous areas of
hyperalgaesia on the chest, neck and
left arm may prove of value in arriving
at a prognosis.

VIII.
VIII. Objective Phenomena.

In this paragraph, I first wish to draw attention to the occurrence of jaundice as a terminal sign in fatal cases. Seven patients out of twenty-two or thirty-two percent exhibited jaundice from some few days before death. It was easily recognised, even in patients who were deeply cyanosed. I consider that jaundice is of value as indicating a speedy demise.

Another terminal phenomenon, as far as my experience goes, is gangrene.

Mrs. G., age 59 (Case No. 9), came to hospital complaining of shortness of breath (15 years), cough (12 years), swelling of the legs (5 weeks) and breathlessness on the slightest exertion (4 weeks). She discovered commencing dry gangrene on the outer two toes of her left foot. She died 4 days later. Autopsy revealed a thrombus in the lower part of the left anterior Tibial Artery, the smaller branches of which showed "well-marked areas of atrophy."

In other words, in some cases of heart-failure, prognosis depends upon the degree and type of arterial degeneration.
It is natural to regard Abnormal Edema:osity as an unfavourable factor in cardiac disease; but symptoms of cardiac embarrassment may persist for long periods in such a case as this:

J. aged 45 (Case No. 15) entered the Royal Infirmary in December 1914, suffering from shortness of breath (15 years); but, although off work at times, he was never confined to bed until shortly before admission. He had always been a stout man, but the obesity had become very marked from 1906, so that, when I saw him, he weighed 23 stone and the girth at the level of the umbilicus was 60 inches. His father and mother had been very fat—the latter weighed over 20 stone. Further, he had been a heavy drinker of beer and whiskey for many years. His face, body, and limbs presented a bloated appearance; he was slightly jaundiced and very cyanosed; he was propped up in bed in a semi-sitting posture, and had dyspnoea of such a degree that he spoke with difficulty. He died on the third day after admission.

On the other hand, in a few fatal cases, I have observed considerable Emaciation and I consider it an unfavourable sign, especially in female patients.
IX. Disorders of Cardiac Rhythm.

These irregularities are considered under a separate heading, for, while they are mainly objective, they may also be appreciated subjectively.

They may have but little prognostic import or they may be portents of impending disaster.

I have encountered three definite types—extrasystoles, auricular fibrillation and heart-block. I intend to consider them in this their order of gravity.

EXTRASYSTOLES.

This condition is well-illustrated by S. aged 78, farmer (Case No. 123), who has been known to me all my life. One of his pet amusements consisted in asking me, an undergraduate, to feel his pulse. A beat was missed once in every 7, 11 or 15 beats; less frequently, I used to notice every 30th beat to be apparent; exactly absent; sometimes his pulse was perfectly regular, and I can remember that a three or four mile walk did not affect his pulse in any special way. He had known of his peculiarity for over 50 years—not from experience in any way; but from feeling his own radial artery, and was indeed proud of his pulse. The
latter had served a useful purpose in that thereby he used to obtain a certain amount of sympathy from his wife, who was what is generally known as a 'hard' woman. He is alive and well; but the last time I examined him about five years ago, I was struck by the sclerotics of his radial and brachial arteries. Extra-systoles, then, can be present all through a busy and active life, and they must be clearly differentiated from the cardiac irregularities.

**AURICULAR FIBRILLATION.**

This irregularity is no important as it is common. I found it present in fifteen cases out of twenty-two, which terminated fatally—i.e., sixty-eight per cent. The remaining twenty-eight cases gave a percentage of eighteen.

I recognised this condition in both acute and chronic cardiac affections and once recognised, I have never known it to disappear before death: and I therefore consider it as a danger signal in any form of heart disease, an indication of myocardial fatigue.

In a fair number of patients, I was satisfied that this irregularity had existed for at least two or three years before death. Sometimes, however, the cardiac failure is more
M. act 47 (Case No. 29), in whom I noted this sign in 1915, and who complained of a moderate degree of breathlessness at that time, replies "I am quite well and able to do work." I only wish that she had been in Edinburgh in order that I might have satisfied myself that what she writes is correct, and unfortunately I have no plethysmographic tracing or electrocardiogram to prove that my observation was correct. While she was in hospital, her response to digitalis was immediate and well sustained, and I understand that she has been given this drug at various times since then.

Now, then, is prognosis to be influenced by this irregular and, as a rule, rapid pulse?

Due weight should be accorded to the degree of symptoms present; especially the ease with which breathlessness is produced — this is very important; in close relation to dyspnoea, the increase of cardiac dullness to the right of the sternum should be considered; and these signs — the degree of cyanosis, especially if associated with jaundice, the amount of engorgement of the veins of the neck, and any impairment of the secretion of urine — while of less significance, should be regarded as valuable factors in
arriving at a prognosis. But, in this context, it is most essential of all to consider the response of the heart muscle to digitalis or strophanthus: no prognosis should be hazarded until either or both of these drugs have been given a fair and conscientious trial.

Case 39 (Case No. 3.) came to the Royal Infirmary complaining of shortness of breath, precordial pain and palpitations (1 year), oedema of the ankles (1 month). On admission, she was extremely ill: she was so breathless and cyanosed that everyone who saw her expected her death within a few hours. The right border of the heart extended 2" from the mid-sternal line in the 3rd interspace.

She responded almost immediately to strophanthus given intravenously. After a course of digitalis for 9 days, standing over 3 months, her symptoms cleared up more or less and she deflected home. I hear from her husband that she died 6 months later but as far as I can gather, digitalis had not been continued.

Again, the downward track of a "failing compensation" may be observed from the daily pulse records, taken while the patient was under treatment with digitalis, during various admissions to
hospital.

L. (Case No. 8.) had a 4 years illness resulting from a rheumatic infection: in the last year and a half of her life, she was three times in hospital, when she died.

1st Admission.

2nd Admission.

3rd Admission.
I grant that more accurate scientific data may be obtained from polygraphic or from sphygmographic tracings, for they record not only the rate, but also the degree of irregularity. But for purposes of prognosis these simple records frequently suffice.

Apart from these instances where, as the patient's health gradually fails and as the auricular fibrillation becomes more and more established, the prognosis becomes worse and worse, there is always an element of doubt owing to the chance of sudden death. I have no notes of such a mishap, but remember seeing one or two fatal cases of this type. I suppose death was due to ventricular fibrillation, the onset of which cannot be predicted with any degree of certainty.

**HEART-BLOCK.**

H. aged 73 (Case No. 19) came to Hospital complaining of a gradual but progressive shortness of breath (1 year), precordial pain (5 months), swelling of the legs (2 months), oedema (1 week). On examination, he was obviously very ill, but lived for a few weeks after admission. During this period his pulse was very slow, 30 per minute,
seldom 40 and reaching 60 only on two occasions; at times it was distinctly irregular. Occasionally he suffered from complete heart block. The post-mortem report states: “The muscle of the right ventricle is hypertrophied, the left most so; in the latter are some grey streaks of fibrous tissue. At the posterior end of the pars membranacea septi is a calcified nodule the size of a pea in the heart muscle, while at the anterior end there is felt a minute calcified nodule in the muscle. There is considerable atheroma of the coronary and the aorta.”

I cannot speak with authority on Stokes-Adams disease, as this is the only case which I have noticed. Doubtless the degree of heart block is a very important sign in determining a prognosis, yet I consider that the gravity of the condition may also be accurately assessed in terms of the intensity of the symptoms.
Summary.

I. In my experience, prognoses in cardiac affections is much better, both as regards longevity and capacity for work, than is usually recognised.

II. The outlook in heart-disease will improve still further when we fully appreciate its infective nature; adequate prophylactic measures will prevent the onset of the disease; early and rigorous treatment will stay its ravages.

III. In formulating a prognosis, a distinction must be drawn between a valvular and a myocardial affection. So long as the affection is purely valvular, the prognosis is very good; slight myocardial involvement means a fairly good prognosis; whereas, an extensive damage to the heart-muscle warrants a bad outlook.

IV. In estimating this myocardial damage, subjective symptoms are of the greatest value.

V. In the ordinary case of heart-
failure, dyspnoea experienced on moderate exertion or while at rest is the main factor on which prognosis rests. As a rule, an increase of cardiac dullness (especially to the right of the sternum) as ascertained by percussion or by a radiogram should be used as additional evidence.

VI. Prognosis in Angina Pectoris is best assessed by the symptom of pain,—in particular, its frequency and the rest with which it is produced.

VII. Auricular Fibrillation indicates a permanent disability of the cardiac muscle: if improvement sets in and is maintained under treatment with digitalis, prognosis is temporarily good: if there is no definite response to digitalis or a kindred drug, prognosis is bad.

VIII. Jaundice and Gangrene are terminal phenomena.

IX. While a definite prognosis should be given on the lines indicated, it must be remembered that we are dealing, not with a machine, but with a delicate and complex organism, and that, therefore, accidents in the shape of sudden and unexpected deaths may occur.
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**Remarks**:
- Treated: Treatment was applied. No symptoms present.
- No treatment: No treatment applied. Symptoms persist.
- Treated with medication: Treatment with specific medication applied.
- Treated with surgery: Treatment involved surgery.
- Treated with other methods: Treatment involved methods other than medication or surgery.