When confronted by a known case of heart disease, an anaesthetist will often seek cardiological advice before deciding how he will handle the case. Difficulties arise, however, in cases of previously unsuspected heart disease and an anaesthetist must be able, at the preoperative examination, at least to recognise that heart disease is present.

The first clue to the presence of heart disease will commonly be elicited from the history. Enquiry should always be made about previous illnesses, of which rheumatic fever, chorea and recurrent tonsillitis are the most relevant. The family history is less helpful, in this context, although a strong family history of ischaemic heart disease should arouse suspicions. It is essential to enquire specifically for the common symptoms of heart disease; of these, dyspnoea and chest pain are the most important but a history of palpitations or of syncope must always be sought.

The dyspnoea of heart disease is due either to pulmonary venous hypertension causing impairment of pulmonary ventilation or to increased activity of the respiratory centre as a result of hypoxaemia or metabolic acidosis; the latter develops when tissue metabolism becomes anaerobic, usually as a consequence of a low cardiac output which fails to rise on exercise. Dyspnoea is thus an important index of the severity of heart disease but, nevertheless, a complaint of "breathlessness" should never be accepted uncritically. If such a complaint is accompanied by the comment that the patient often feels the need to take a deep breath, or if he is seen to sigh frequently, or if the severity of the dyspnoea fluctuates markedly from day to day, the symptom is probably functional in origin. If, on the other hand, dyspnoea is consistently provoked by exertion and has become progressively more severe over weeks or months, it is much more likely to be due to organic disease of the heart or lungs. If, in addition, dyspnoea on exertion is accompanied by orthopnoea or paroxysmal nocturnal dyspnoea, it is then very likely that it is due to pulmonary venous hypertension such as occurs in mitral stenosis and left ventricular failure.

In patients with dyspnoea as the dominant symptom of heart disease, physical signs will often be found to confirm the diagnosis. This is not the case in most patients with ischaemic heart disease whose main complaint is chest pain. It follows, therefore, that the diagnosis of myocardial ischaemia often stands or falls on the history alone. The pain of ischaemic heart disease is felt typically in the midline of the front of the chest and radiates bilaterally, sometimes passing down the inner aspects of the arms to the fingers; it may radiate also to the side of the neck, jaw and tongue and sometimes into the epigastrium. A more important feature is its relationship to exertion and any pain in or near the chest which is consistently provoked by effort and relieved within a minute or two by rest, is likely to be angina. Features such as the "gripping" quality of the pain and the fact that it is more easily provoked by exertion after meals or in cold weather may be helpful diagnostically, but are less significant than a consistent relationship with exertion.

A complaint of palpitations is common. The commonest cause is anxiety which tends to be perpetuated by the symptom itself. Among the organic causes of palpitations, thyrotoxicosis and other hyperkinetic circulatory states, and aortic incompetence, can be diagnosed on different evidence. In a patient about to undergo a surgical operation, however, the most significant cause of palpitations is a disorder of cardiac rhythm. Extrasystoles characteristically produce a momentary disturbance of the heart's action, felt by the patient as a transient discomfort at most. Longer episodes of palpitations, however, may well be due to paroxysmal tachycardia and can be often identified as such by their sudden onset and cessation. The patient should be questioned closely on these points.

Syncope can be defined as "transient loss of consciousness due to a reduction in cerebral blood flow". It is due nearly always to a fall in cardiac output which, in the great majority of cases, is secondary to a fall in venous return as in vasovagal attacks. The premonitory symptoms of such attacks,
which include nausea and a sense of uneasiness in the epigastrium, are well known; an important diagnostic feature is that the attacks occur only in the upright position. In this respect vasovagal attacks resemble postural hypotension due to sympathetic-blocking agents or autonomic neuropathy. The relevance of autonomic paralysis to general anaesthesia is obvious and, in such a situation, further valuable information can be obtained by studying the response of the patient's cardiovascular system to the Valsalva manoeuvre, as assessed by palpation of the pulse. An unvarying pulse rate during and after the period of strain, and absence of an "overshoot" in pulse volume in the recovery phase, are suggestive of autonomic paralysis although similar abnormalities are found in heart failure.

A history of syncope occurring in both the erect and recumbent positions should suggest a primary cardiac cause such as aortic or pulmonary stenosis or pulmonary hypertension. In a patient with such an obstructive lesion a history of syncope, often on exertion, is important evidence that the lesion is severe. The diagnosis of syncope due to Stokes-Adams attacks is easy if heart block is present at the time; this is not always the case, however, as the conduction defect may be transient. In all cases of brief loss of consciousness epilepsy must be excluded, of course, and this is usually possible if an eye-witness account of the attacks is available.

In practice, most patients with significant symptoms of heart disease will have already sought advice and the results of a previous assessment should often be available. In asymptomatic patients the search for heart disease resolves itself into a brief but careful physical examination. A detailed account of the examination of the cardiovascular system will not be given in this paper, but attention will be concentrated on those physical signs which indicate the presence of heart disease with more or less certainty; certain equivocal signs, which may cause confusion, will also be discussed.

Palpation of the arterial pulse is very informative, particularly in relation to the heart rate and rhythm. The changes in the character of the pulse produced, particularly, by aortic valve disease are of secondary importance as further diagnostic information is provided by auscultation in such cases. A pulse rate above 120 or below 50 per minute should always arouse suspicion; evidence for possible causes of such abnormalities of rate may be found from inspection of the venous pulse or from auscultation. It is wiser, however, to use electrocardiography for the exclusion of disorders of rhythm or conduction, in such a situation, than to rely on the interpretation of difficult physical signs. An irregular pulse also requires explanation. Sinus arrhythmia occasionally causes a gross irregularity, especially in children and adolescents, but can be recognized without difficulty if the relationship of the changes in rate to respiration is detected. Atrial fibrillation is a common arrhythmia and produces a totally irregular pulse. It is due almost always to organic disease and, if it is found, the remainder of the examination should be especially searching. Extrasystoles, too, are common; usually they occur infrequently, with several normal beats between, in which case the diagnosis presents little difficulty and usually they can be safely ignored. More frequent extrasystoles may be difficult to distinguish from atrial fibrillation, and in any case are more likely to be due to organic disease so that an electrocardiogram should be recorded to clarify the situation.

Analysis of the form of the jugular venous pulse is difficult, and errors therein are excusable. However, determination of the level of the jugular venous pressure is of the greatest importance. By far the commonest cause of a raised venous pressure is cardiac failure which is an absolute contraindication to elective surgery; hence the importance of this observation. To determine the jugular venous pressure the patient should be placed in the position in which the pulsation in the internal jugular vein can be most easily seen. The vertical height of the top of the pulsating blood column above the sternal angles does not normally exceed 2 or 3 cm.

Another most important observation which must never be omitted is the localization of the apex beat. The apex may be displaced to the left by right pleural effusion or pneumothorax, by fibrosis or collapse of part or the whole of the left lung, or by skeletal abnormalities such as kyphoscoliosis and sternal depression. If these conditions have been excluded, lateral displacement of the apex beat implies cardiac enlargement and thus is important evidence of heart disease. While palpating the apical impulse, it is worth noting its character; even in the absence of significant displacement, a thrusting impulse is evidence of left ventricular hypertrophy. Also, and during palpation of the remainder of the precordium, palpable heart sounds and thrills should be sought. A loud first heart sound, as in mitral stenosis, produces the characteristic tapping
apical impulse; this can be confirmed on auscultation, of course. A more important observation is a palpable atrial impulse, just preceding the main apical thrust. This is useful evidence of left atrial hypertension and implies severe left ventricular overload, as in aortic stenosis. The palpable atrial impulse is especially important as it may be more easily detected than the corresponding low-pitched atrial sound.

Auscultation is undoubtedly the most difficult part of the examination of the cardiovascular system. However, concentration on a few essential features will allow a sufficiently accurate diagnosis to be made. Throughout auscultation the carotid pulse should be felt to allow the certain identification of systole and diastole. The normal heart sounds should be studied first; the degree of splitting of the second sound is of interest but is not crucial in this context. It is more important to identify any added sounds. Of these an aortic ejection click is perhaps the commonest. This closely follows the first sound, at the apex and the aortic area, and gives the impression of a split first sound. Although an ejection click is heard in a number of cardiac conditions, its presence is certainly not evidence of significant heart disease. It must be distinguished, however, from the much more important atrial sound, just preceding the first sound which, like the corresponding impulse referred to above, is important evidence of serious left ventricular disease. An opening snap is also of some importance as it is almost pathognomonic of mitral valve disease. The third heart sound, heard shortly after the second sound, is a common finding, particularly in children and adolescents in whom it is quite normal as, in fact, an atrial sound may also be. A third sound is a feature of certain other conditions such as mitral incompetence but, in the context of ischaemic or hypertensive heart disease, it is an important sign of left ventricular failure and has a more serious prognostic significance than the atrial sound.

Any murmurs heard should be analysed. The whole praecordium should be explored and, on the slightest suspicion, mitral murmurs should be sought at the apex with the patient lying on his left side, or aortic diastolic murmurs at the left sternal border with the patient leaning forward and holding his breath in expiration. A diastolic murmur is unequivocal evidence of heart disease, but the significance of systolic murmurs may be more difficult to determine. If the murmur can be clearly identified as pansystolic, with no interval between the end of the murmur and the second heart sound, organic disease is likely. It is the mid-systolic, ejection, murmurs which present the greatest difficulty as not infrequently they are of no significance. The louder the murmur the more likely it is to be organic, and a murmur accompanied by a thrill is never innocent. Another feature which may be helpful is variation in the intensity of the murmur with posture which, if marked, suggests that the murmur is innocent. On the whole, soft mid-systolic murmurs at the base of the heart are usually innocent, especially in children, but there is no certain means of completely excluding minor valve lesions. However, it would be extremely rare for serious heart disease to be manifested solely by such a murmur.

The blood pressure should be measured, of course, and pulsus alternans may be noted as the pulse rate seems suddenly to double as the cuff is being deflated. This is an important, although rather rare, physical sign as it is unequivocal, and sometimes the only evidence of severe left ventricular disease.

Space does not permit a fuller discussion of the cardiovascular assessment for surgery, but readers may take comfort from the fact that serious heart disease almost always produces obvious symptoms and signs; heart disease which is difficult to detect is unlikely to cause difficulties during general anaesthesia.