GLOSSARY OF TERMS & DEFINITIONS

A

AAI(R) *pacemaker* – single chamber *pacemaker* with a single lead implanted in the atrium. If present, the "R" indicates *rate-adaptive* ability.

ACC/AHA – American College of Cardiology and American Heart Association. This group provides policy statements on accepted standards of practice in the USA; these are often used in the UK.

Aberrant electrical pathway – remnant of heart tissue connecting atrium and ventricle and producing a short circuit within the heart which will support tachycardia.

Ablation – intentional destruction of small volume of cardiac tissue to permanently isolate, interrupt or destroy tachycardia focus or circuit.

Abnormal movements – a wide variety of abnormal movements are associated with *epilepsy*, but also occur in other forms of T-LOC. *Epilepsy* may give rise to *Tonic-clonic movements, Myoclonic movements*, and complex forms with purposeful or semi-purposeful movements. These may all occur with *reflex syncope.*

ACC – American College of Cardiology

Accessory pathway – see aberrant pathway above

ACE inhibitors – Angiotensin Converting Enzyme Inhibitors which are used to treat heart failure and high blood pressure.

Action potential – electrical signal generated by heart muscle cells when they are activated.

Adenosine – a very short-acting, naturally-occurring drug that causes block in the *AV node*, and is very valuable for terminating *SVT* that uses the *AV* node in the circuit.

Adhesive patches – sticky patches for recording electrical signals, for shocking the heart through the skin or "band-aids"

Adjunctive – an additional treatment designed to work with another treatment

Adrenogenital syndrome – a rare condition of the glands determining sex differentiation into male and female.

Aetiology – factor or condition which causes disease.

AF – Atrial Fibrillation.

AFFIRM - large North American study in which rate control and rhythm control were compared for eth mnagment of atrial fibrillation.

AFl – Atrial Futter.

AHA – American Heart Association

Algorithm – sequence or plan of disease investigation or treatment.

Ambulatory electrocardiograms (ECG) – a one or two lead *ECG* may be attached to a patient externally by sticky patches for one or several days. Ambulatory *ECG*s usually capture

every beat, which creates a time-consuming task for a technician to analyse the whole recording.

Amelioration - improvement

Amiodarone – an *anti-arrhythmic* drug agent. This primarily affects the flow of potassium *ions* through the membranes of heart cells. Whilst a very effective drug, it has many important side effects, including sensitivity to sunlight, and damaging effects on the thyroid gland, liver and lungs.

AMIOVERT – study comparing amiodarone and the ICD for the treatment of life threatening arrhythmias in patients with dilated cardiomyopathy.

Anaemia – a blood condition where the red blood cells are reduced in number and often in quality, leading to a low haemoglobin count.

Andersen syndrome – genetic condition characterised by abnormal QT interval (see below) intermittent paralysis and very frequent ventricular ectopic beats/tachycardia.

Aneurysm – scar tissue in the heart muscle or sac-like ballooning out of an artery wall.

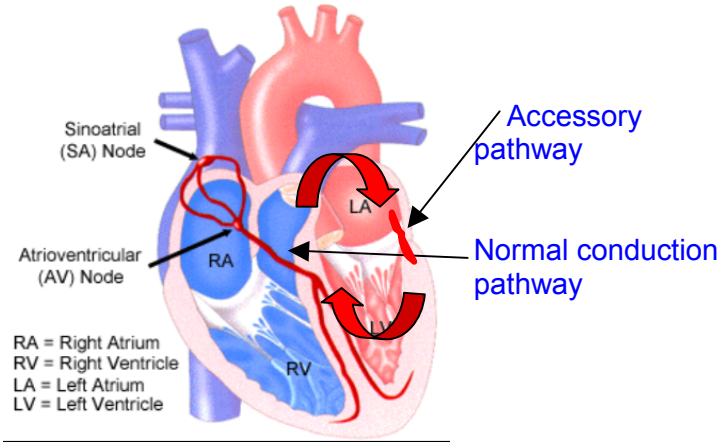
Angiography – a fine tube (catheter) is passed to the heart under local anaesthetic and a dye shows up any narrowings or weaknesses. Also known as '*cardiac catheterisation'*

Angiotensin – human protein substance which causes blood vessels to constrict.

Anorexic – eating disorder – severe weight loss, refusal to eat.

Anteroposterior vector – front to back direction.

Antidromic AVRT – a *supraventricular tachycardia* using the normal conduction pathway to conduct from the ventricles to the atria, and an accessory pathway to get back from the atria



and complete a rapid short-circuit. This is only possible when the accessory pathway can conduct in a forward direction towards the ventricles as in *WPW Syndrome.* AVRT stands for atrioventricular re-entrant tachycardia.

Aneurysmectomy – removal of an abnormally dilated part of the heart or major blood vessel.

Anti-arrhythmic – action which stops or prevents heart rhythms disturbances (*arrhythmias*).

Anti-coagulation – thinning of the blood with drugs, usually *Warfarin*.

Anti- convulsant drug – a drug that tends to stabilise brain cells in *epilepsy*, making an epileptic attack less likely.

Antidromic – literally "against the flow" meaning conduction the unusual way around a circuit which supports a tachycardia.

Anti-platelet – platelets are small sticky cell fragments in the blood that immediately rush to any site of bleeding, clump together and try and prevent blood loss. They are responsible for causing the initial blood clot when a *myocardial infarction* starts. Drugs such as *aspirin* make the platelets much less sticky, and reduce the risk of a *myocardial infarction*.

Anti-Ro and anti-La antibodies – proteins which react against Ro and La, which are found in patients with congenital heart block.

Anti-tachycardia pacing – A *pacemaker* with the ability to terminate *tachyarrhythmias* through pacing the heart at a rate faster than the *tachyarrhythmia.*

Anti-thrombotic – against the formation of a clot.

Aortic stenosis – narrowing of the aortic valve (between the left ventricle and aorta).
Apnoea – cessation of breathing.

Arrhythmia – an abnormality of the heartbeat. The heart could beat too fast, too slow or beat irregularly.

Arrhythmia Awareness Week – AAAW – www.aaaw.org.uk

Arrhythmia specialist – a *cardiologist* who has taken a special interest in the management of heart rhythm disorders. In addition to the normal period of training in disorders of the heart, (cardiology), such consultants will have undertaken a further period of training which is exclusively or mainly devoted to managing patients with *arrhythmias* using anti-arrhythmic drugs, implantable devices that control or correct heart *arrhythmias* and techniques to record electrical activity from within the heart, *(Electrophysiological study - EPS).* Usually, such consultants will also undertake *catheter ablation*, procedures which may cure many patients with *arrhythmias*. Some specialists in the care of cardiac disorders that may cause *sudden cardiac death*, such as *hypertrophic cardiomyopathy (HCM),* may specialise more in the overall care of the condition, and seek collaboration with an *arrhythmia specialist* for particular care of these patients' *arrhythmias*.

Arrhythmia surgery – when drugs, devices and *catheter ablation* cannot control *arrhythmias*, some patients may have to be subjected to heart surgery to cut away tissue that is giving rise to *arrhythmias*. Such surgery is often risky, and modern techniques are preferable.

Arrhythmogenic right ventricular cardiomyopathy (ARVC) – see ARVD below.

Arrhythmogenic right ventricular dysplasia (ARVD) – an inherited condition in which heart muscle may be progressively replaced by fatty and fibrous tissue. Areas of muscle where this occurs can set up short-circuits and lead to VT or VF.

Arrhythmogenic zone – part of the heart which generated arrhythmias.

Artery – blood vessel carrying blood away from the heart.

Aspirin – pain killing medicine which reduces inflammation and fever. It is used to limit damage form heart attacks and to reduce the likelihood of blood clots in atrial fibrillation.

Asymptomatic – without symptoms.

Asynchronous - occurring out of sequence with the natural heart beat (used to describe type of pacemaker).

Asystole/asystolic – lack of any electrical activity in the *sinus node*, *atrioventricular (AV) node, His-bundle, Bundle branches* or *Purkinje fibres* to trigger the heart muscles to contract. This may effect the *atrial* muscle alone, the *ventricular* muscle alone, or both.

Atheroma – fatty deposit in the arteries; sometimes known as hardening of the arteries.

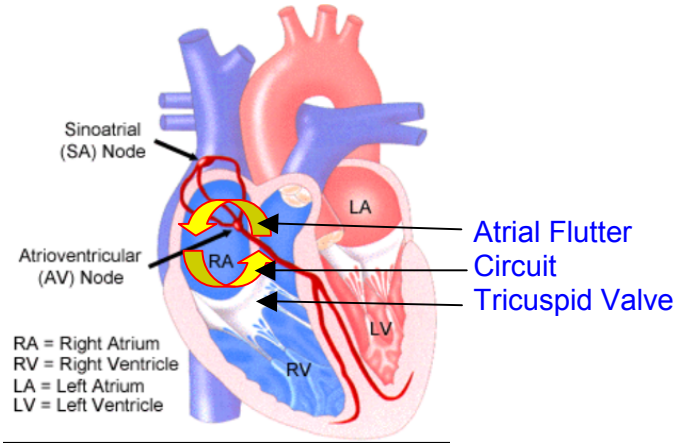
Atresia – failure of development.

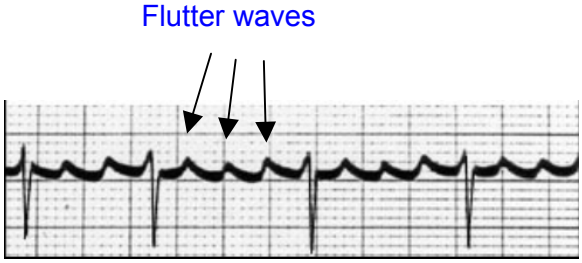
Atria – Two upper chambers of the heart: left and right atrium.

Atrial lead – wire leading from artificial pacemaker to the muscle of the atria (see below).

Atrial fibrillation – a disorganised activation of *atrial* muscle with loss of the normal electrical activation of the *atria*, which is replaced by many electrical circuits activating over the surface of the muscle in a rapid and disorganised way. This will usually result in a rapid irregular response by the ventricles as rapid irregular impulses pass down the *AV node* and *bundle branches.*

Atrial flutter – an arrhythmia related to *atrial fibrillation*, but much simpler, in that just a single abnormal circuit is found, typically rotating around the main valve on the right side of the heart, the tricuspid valve.

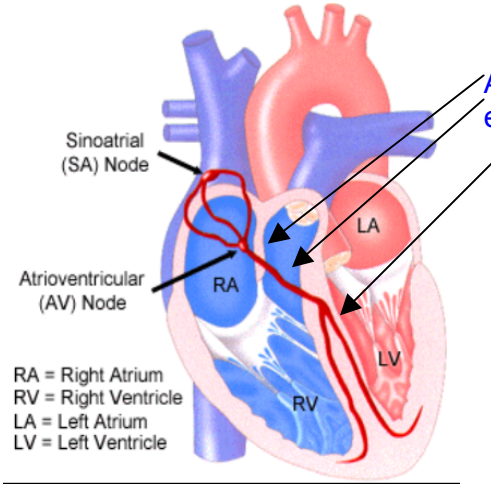




Atrial septal defect – an abnormal hole-in-the-heart between the right and left atrium.

Atrioventricular (AV) – Junction box in the electrical system of the heart preventing rapid heart beats affecting the pump's action by limiting the number of beats.

Atrioventricular block (see heart block) – Abnormally slow or absent conduction through the *atrioventricular node* or conduction tissues below this.



Atrioventricular or heart block occurs with blockage of the electrical impulse in these areas

Atrioventricular dyssynchrony – A situation arising when the atria and ventricles do not beat at the same speed in a synchronised fashion with a 1:1 ratio between contractions. This will result in reduced heart function and may result in *pacemaker* syndrome in the paced patient.

Atrioventricular node – An area of specialised conducting tissue within the heart, connecting the atria with the ventricles and providing a small delay of conduction in order to allow synchronised contraction of atria and ventricles.

Atrioventricular reentrant tachycardia (AV RT) - tachycardia arising from circular movement involving the normal conduction system in one direction and an aberrant pathway in the reverse direction.

Atrioventricular synchrony – correct sequence of atrial and ventricular activation and contraction.

Atropine – A short-acting drug used to speed up the heart through blocking the action of the *vagus nerve.*

Automatic external defibrillators – an external heart-shocking device, usually sited at airports, sports grounds and shopping centres where many people are clustered together. Modern devices can recognise heart rhythm abnormalities such as *ventricular fibrillation*, and help bystanders successfully resuscitate patients with a *cardiac arrest.*

Autosomal dominant – genetic condition which is inherited when only one parent has the abnormal gene (or condition).

Atrium – upper, thin walled chambers (right and left) of the heart which are reservoirs for blood returning from the body and lungs and which pump blood into the ventricles.

Audit – process of assessment of (medical) practices.

Autonomic nervous system – a system of nerves controls many of the involuntary and automatic functions of the body consisting mainly of *vagus nerve* and *sympathetic nerves.*

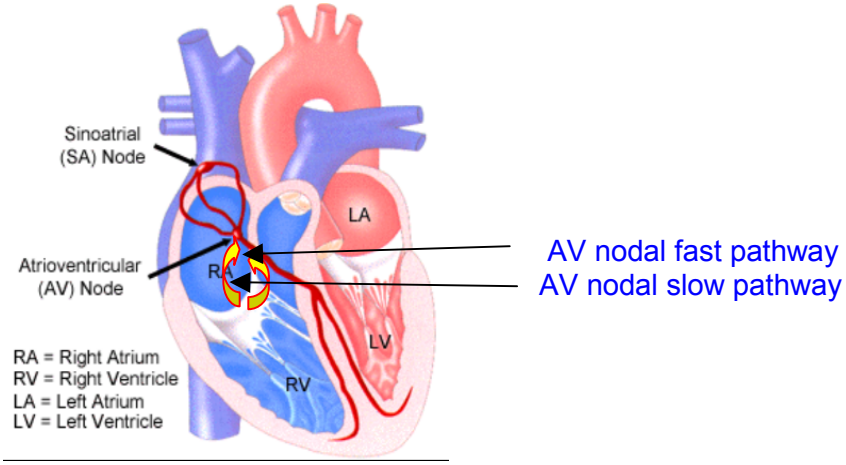
AV block – block of conduction in the electrical pathway between the atria and the ventricles.

AV node – part of the electrical conduction pathway between the atria and the ventricles. This part of the pathway usually delays or limits the conduction of electrical impulses in order

to ensure that the ventricle does not beat too quickly and the correct sequence is maintained between atria and ventricles.

AVID – a trial in which patients who had had an episode of *sudden cardiac death*, but had been resuscitated and had survived it were randomly given either an *ICD* or no *ICD.* Patients who received the *ICD* lived longer.

AVNRT – AV nodal re-entrant tachycardia – a common form of *supraventricular tachycardia* where there are two pathways associated with the *AV node.*



AV node - structure between the atria and the ventricles which delays the conduction of the impulse sufficiently to allow the ventricle to fill with blood before contracting.

AV node dysfunction (block) – delay or block of conduction (sometimes in the AV node) between the atria and the ventricles.

Azimilide – new antiarrhythmic drug which is not yet approved for use in patients.

B

Background recordings – recording made when a patient has no symptoms, neither spontaneous nor provoked.

BCPA – British Cardiac Patients Association (www.cardiac-bcpa.co.uk).

Benign – not life-threating.

Beta adrenergic blockade – block of the effects on the heart of adrenaline.

Beta adrenergic receptor blocker – see above.

Beta blocker – see above.

Biopsy – technique of obtaining a small piece of tissue, for example heart muscle (or the tissue obtained in this way).

Bio-therapy – treatment involving the use of modified tissue or other biological substances (e.g. gene therapy, stem cells) to replace diseased tissue. In the future, such approaches may replace *pacemaker*s.

Biphasic defibrillators – a defibrillator using shocks with biphasic waveforms (see below).

Biphasic waveforms – an electrical waveform with positive and negative components.

Bisoprolol – a commonly used beta b locker (see above).

BiV devices – a pacemaker connected to both the right and the left ventricle (i.e. to two ventricles).

Biventricular cardiac defibrillator - an implantable cardioverter defibrillator with pacemaker leads connected to both ventricles (see above).

Biventricular devices – see BiV device (above).

Biventricular pacing (see CRT) – A *pacemaker* implanted primarily to improve heart function as a treatment for heart failure rather than *bradyarrhythmia.* The system utilises an additional lead in the left ventricle. See also *multi-chamber pacing.*

Blackout – a term familiar to patients for transient loss of consciousness or *T-LOC.*

BNF – British National Formulary (a book containing the names and details of the medicines available in the United Kingdom).

BPEG – The British Pacing and Electrophysiology Group. Affiliated to the British Cardiac Society and comprising doctors, *technicians* and nurses with an interest in *arrhythmias*.

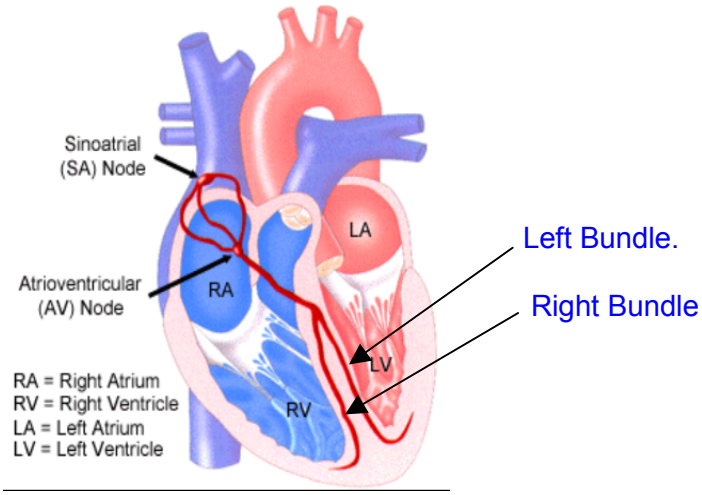
Bradycardia– abnormally slow heart rate below 60 beats per minute, caused by failure of electrical activation mechanisms.

Bradyarrhythmia – see bradycardia (above).

Brain scan – machine for taking pictures of slices through the brain and reconstructing the structures, using magnetic fields, (Magnetic Resonance Imaging – MRI), or X-ray, (Computer Tomography Scan (CT Scan).

Brugada Syndrome – an inherited condition caused by abnormal genes that code for the development of the *ion*-channels that allow ions to flow across heart cell walls and thus allow an electrical current to flow. Understanding of this condition is still poor, but sudden *cardiac* death can occur due to *ventricular fibrillation* even when the heart is structurally normal.

Bundle branch block – the connection between the top of the heart, (atrium), and the bottom of the heart, (ventricles), is made by a specialised conducting bundle of heart cells, (the His bundle). After passing between the *atria* and the *ventricles,* the *His bundle* divides. The right bundle goes to the *right ventricle* and the left bundle goes to the left bundle.



Here, the*bundle branches* spread out to deliver the pulse that causes the heart muscle to beat. This whole system is known as the "*His-Purkinje System",* a network of specialised heart muscle cells dedicated to carrying the normal electrical impulses that make the heart beat, the "wiring system of the *ventricles".* Diseases such as infarction and fibrosis with old age may cause parts of the system to fail. Often this leads to characteristic changes on the *ECG* of bundle branch block.

Biventricular pacing (resynchronization therapy) – see BiV device (above).

C

Ic agents – class of antiarrhythmic drug (Vaughan Williams classification).

CAF – chronic (long-lasting) atrial fibrillation.

Calcium antagonists – drugs which prevent for reduce the entry of calcium into the muscle cells of the heart or blood vessels.

Calcium channel blocker – see calcium channel antagonist (above).

Calman system – system of training for young cardiologists (and other medical specialties).

Cardiac – belonging to the heart, of the heart.

Cardiac arrest – abrupt failure of adequate beating action of the heart causing unconsciousness and inability to maintain breathing. This leads to death within minutes if the beating action is not quickly restored and the breathing supported. A *cardiac arrest* may be accompanied by any rhythm where the beating action is inadequate, but usually there is *ventricular fibrillation, ventricular*
cardiac arrhythmia.

Cardiac asystole – heart standstill, with no electrical activation to trigger pumping of blood.

Cardiac conduction system – specialised muscle cells which act as pathways along which the heart is electrically activated.

Cardiac catheterization – technique of passing thin plastic tubes through blood vessels to the heart. If X-ray pictures are being taken, these tubes, or *catheters,* are hollow, if electrical signals are being recorded, or *catheter ablation* is being conducted, the *catheters* are usually solid but flexible and safe.

Cardiac death – death which is caused by a failure of the heart to beat or beat effectively.

Cardiac events – episodes of heart disease resulting from or occurring after initiation of a particular treatment. Often used as an end-point in a clinical study.

Cardiac output – the amount of blood ejected by the heart over a period of one minute. Usually reduced in heart failure.

Cardiac re-synchronisation therapy (CRT) – use of new pacing techniques to correct poorly coordinated contraction of the heart muscle by stimulating in multiple sites, usually the right and left ventricles with a *biventricular pacemaker*. This saves lives and improves heart failure.

Cardiac tumours – growths in the heart are very rare, but a common cause of VT in children.

Cardiologist - doctor (physician) specialising in the diagnosis and treatment of patients with heart disease.

Cardiomyopathy – a disease of the heart muscle, which may cause thickening, thinning and weakness, or replacement of muscle with fibrous tissue or fat. Patients with *cardiomyopathies* are at increased risk of *arrhythmias* and sudden cardiac death.

Cardioneurogenic syncope – transient loss of consciousness due to a combination of heart and nervous causes.

Cardio-respiratory – of the heart and lungs.

Cardio-thoracic surgery – operations on the heart and/or the lungs.

Cardio-vascular outcomes – the effect of a treatment on the heart and blood vessels.

Cardioversion – the process of converting the heart back to a *normal rhythm.* This may involve drugs, (chemical *cardioversion*), or with a high-voltage shock delivered across the chest, (direct current-DC *cardioversion*) or inside the heart, (internal *cardioversion*).

Cardioverter defibrillator - device which cardioverts (converts back to a normal rhythm from a rapid regular rhythm) or defibrillates (converts back to normal rhythm from a rapid irregular rhythm).

Carotid sinus – area in the carotid arteries which senses the blood pressure and may be sensitive to pressure from outside.

Carvedilol – a drug with combination of beta blocker (see above) and artery dilating (vasodilator) actions used for the treatment of heart failure.

CAT – computed axial tomography which is an x-ray imaging technique.

Catecholamine dependant – refers to *arrhythmias* that only come on when levels of adrenalin are high in the blood-stream, such as during exercise.

Cathecholaminergic polymorphic ventricular tachycardia syndrome –a liability to a fast heart beat (tachycardia) which is inherited and triggered by adrenaline (a catecholamine substance).

Catheter – a fine plastic tube that can be passed into the body. *Catheters* are purpose built and used in many different ways. A *catheter* can be used to relieve a full bladder in a patient who cannot pass water. It can be used to pass fluids into the abdominal cavity in patients who have kidney failure. In cardiology *catheters* are usually of two kinds. One type of *catheter* is hollow and is used to inject X-ray dye into the heart or arteries. Another type of *catheter* is solid, but flexible and steerable under X-ray guidance, and is used to record electrical signals from the heart or apply energy to abnormal electrical pathways to stop *arrhythmias*, *(catheter ablation).*

Catheter ablation – use of *catheters* to pass energy into the heart to cauterise abnormal tissues that are giving rise to *arrhythmias*.

Catheter laboratory – special room where heart conditions are investigated and treated using X-rays to position *catheters* in the body.

Catheterisation – a procedure which is usually performed under local anaesthesia during which catheters are positioned within the chambers and arteries of the heart.

Cauterise – heating tissue to seal blood vessels, stop bleeding and make tissue electrically inexcitable.

Cautery – see cauterise (above).

Cerebral anoxia – lack of oxygen supply to brain cells from the blood. This could be due to low levels of oxygen in the blood supply, but much more commonly the blood supply is cut off transiently, causing loss of consciousness. When this kind of *blackout* happens, it is called *syncope. Blackouts* due to other mechanisms are not *syncope*.

Cerebral hypoperfusion – reduced blood flow to the brain.

Chagas's disease – disease causing heart failure and arrhythmias, common in South America, due to infection with trypanosome.

Chamber – a term used to describe the cavities of the heart (atria and ventricles).

Chanellopathies – inherited disease where abnormal genes give rise to abnormal movement of ions through the walls of heart cells. These can give rise to life-threatening *arrhythmias*, as in the *Long QT Syndrome*.

CHD – Coronary Heart Disease which is atheroma (see above) in the coronary arteries (see above).

Chronic – long-lasting.

CIDS - trial of the implantable cardioverter defibrillator compared with amiodarone in patient with life-threatening ventricular arrhythmias.

Circus movement – mechanism of tachycardia in which the electrical impulse becomes trapped in a circuit of heart tissue.

Class 3 (III) agents – class of antiarrhythmic drugs (Vaughan Williams classification).

Clinical audit data – audit data on patient-care and outcomes of treatment. Audit involves the collection of a set of information. This is best agreed in advance and collected as each patient goes through the process of being cared for. All staff who look after a patient should contribute, and the data are best collected using a computer database. This requires all staff to become trained users, and requires all areas where patients are cared for to be equipped with computers that can access the database. Audit can be done on clinical data later, but this is much less useful. Audit data should be used to evaluate practice, and then make changes to seek better outcomes. Further data should then be collected to see if the changes have worked. This is called the audit cycle.

Clinical evaluation and inexpensive tests – the process of talking to patients to understand the story of their illness and symptoms, the physical examination of the patient, and the performance of simple tests, usually at the bedside.

Clopidogrel – drug which prevent the activation of platelets (small particles in the blood which are involved in blood clotting process).

CMA – The Cardiomyopathy Association (www.cma.org.uk).

CME – Continuing Medical Education.

Coarctation of aorta – narrowing of the aorta (large blood vessel stemming directly from the heart.

COMPANION – study of biventricular pacing and biventricular pacing plus an ICD versus optimal medical treatment in patients with heart failure.

Co-morbidities – coexisting illnesses.

Complete heart block (CHB) – total block of all impulses from the atria to the ventricles.

Conduction tissue disease – disorder of the tissue which conducts electrical impulses within the heart.

Congenital – born with.

Congenital heart disease – heart disease caused by deformed development of the heart in the womb.

Congestive – associated with swelling and fluid accumulation.

Connective tissue disease – generalised inflammatory condition which affects joints, skin, blood and other organs. Associated with anti-bodies to the body's own tissues.

Convulsive syncope – during a blackout caused by sudden lack of blood flow to the brain, there are abnormal movements of limbs face and eyes due to brain cells being irritated by a lack of oxygen supply from the blood, (see *cerebral anoxia*).

Coroner - official responsible for certifying and investigating the cause of death.

Coronary heart disease – heart disease due to atheroma (see above).

Contra-indication – not to be used in this disease or circumstance.

Coxsackie – type of virus.

CRT – Cardiac Resynchronisation Therapy, a form of pacemaker treatment to coordinate the contraction of the ventricles.

Cyanosis – blue discolouration of the face or lips. This often indicates a problem with respiration, and not enough oxygen in the body.

D

DARE study – study of patients who are vulnerable to long QT syndrome produced by drugs.

DC cardioversion - "Direct Current" cardioversion (see above).

DDD *pacemaker*s – pacemakers attached to both the atrium and ventricle of the heart.

DDD(R) – a dual chamber *pacemaker*, i.e. one with wires or leads in both the *atria* and *ventricles.* If present, the "R" indicates *rate-adaptive ability.*

Defibrillator – device for converting atrial or ventricular fibrillation to the normal heart rhythm

Defibrillation threshold DFT – level at which VF can reliably be shocked back into normal rhythm during *ICD* implantation.

DEFINITE - Study of value of implantable defibrillator in patients with dilated cardiomyopathy.

DGH– a District General Hospital. These hospitals always provide acute services for patients with urgent medical or surgical conditions. Many also provide specialist services that are more common in tertiary care or teaching hospitals.

Diabetes mellitus – excess sugar in the blood, commonly with other metabolic effects and often requiring insulin treatment. Diabetes greatly increases the risk of *heart attack* and stroke.

Diagnostic electrophysiology – test of the cardiac electrical function usually using several wires placed in the cavities of the heart for recording and stimulating the heart.

Diagnostic yield – the number of diagnoses made as a proportion of the number of tests performed.

Digoxin – drug derived from the foxglove used to slow the heart during atrial fibrillation and to treat heart failure.

Dilatation of peripheral arterioles – see "*Vasodepression*".

DINAMIT – study of the value of the implantable defibrillator in patients who have recently suffered a heart attack (myocardial infarction).

DNA – biochemicals which contain the genetic code that gives rise to different organs and tissues, as well as specific characteristics like hair and eye colour. Also contains abnormal genes coding for inherited cardiac diseases.

Dofetilide – antiarrhythmic drug which is only available in the United States.

DoH – Department of Health.

Dose increment – increased dose of drug added to previous dose.

Drug-induced – often applied to arrhythmias which are triggered by drugs.

Drug toxicity – many drugs in overdosage can cause or exacerbate *cardiac arrhythmias*.

Duchene dystrophy – inherited form of skeletal muscle disease.

Dysfunction – working badly.

Dysmorphic – wrong shape.

Dysplasia – grown wrongly.

Dyssynchrony – Usually used to indicate abnormal patterns of electrical impulse conduction within the ventricles, resulting in impaired contraction and function of the heart.

E

Ebstein's anomaly – *congenital* deformity of the heart where the *tricuspid valve* develops abnormally further into the right ventricle. It is associated with multiple accessory pathways that can cause WPW Syndrome and *arrhythmias*.

Echo –short form of echocardiograph (see below).

ECG – ElectroCardioGram.

Echocardiography – use of ultrasound to provide moving images of the heart muscle and valves, and make measurements of the functions and any damaged tissues.

Ectopic beats – extra beats arising from the *atria* or ventricles. These often occur before the heart has had time to fill properly, and are consequently felt as a missed beat. Patients may have a lot of discomfort and fell there heart "is about to stop". Usually harmless and respond well to patient explanation and reassurance.

Ectopy – see ectopic beats above.

EEG – ElectroEncephaloGram.

Electro-anatomic mapping systems – traditionally electrophysiological studies and *catheter ablation* techniques have relied upon X-rays to position and manoeuvre *catheters* in the heart. X-rays can see the *catheters*, but cannot see the detail of the heart chambers and valves. In recent years a number of different systems have been developed to try and give a picture of the anatomy of the heart, the positions of *catheters* and the timing of signals of electrical activity. Many of these rely upon positioning within electrical fields created around the body. This is similar to a mini-GPS (Global Satellite Positioning) system used in cars and planes. These systems allow more difficult *arrhythmias* to be tackled more safely and quickly. Such systems are becoming part of a modern electrophysiology *catheter* laboratory, and typically cost £80-£150,000.

Electrocardiogram (ECG) – electrical tracing of the heart's activation by the sinus node and *His-Purkinje* System recorded on the body's surface, usually with twelve leads recording in two different planes at right angles.

Electroencephalogram (EEG) – recording of the brains electrical activity made from many electrodes placed over the scalp.

Electrophysiologist (EP) – physician specialising in treatment of arrhythmias or a scientist interested in the electrical behaviour of biological tissue.

Electrophysiological study (EPS) - process of recording and interpreting the electrical signals arising from inside the heart when electrical recording *catheters* are placed within the heart.

Electrophysiological mechanism - the detailed mechanism of an arrhythmia derived from looking at the signals recorded during an *EPS.*

Electrophysiological testing – technique of stimulating and recording cardiac electrical activity using wires placed in the heart through veins in the leg or neck.

Electrophysiologist – a specialist who performs and interprets an *EPS*, as well as *catheter ablation*s.

Embolic – usually used to describe a blood clot that is lodged in a blood vessel blocking blood flow.

Emery Dreifuss dystrophy – inherited form of skeletal muscle disease.

Embolic phenomena – an embolism is material from within the heart or circulation becoming free to flow until it lodges in a small blood vessel and blocks it causing damage to the tissue of organ supplied with blood by that blood vessel. Most emboli within the body are blood clots, and many of these break off from inside the heart when stagnant blood in the left atrium has formed a loose clot.

Embolism – blood clot or other material in the blood circulation which blocks a blood vessel and prevents blood flow.

Endocarditis – infection of the inner surface of the heart, particularly the heart valves.

Encainide – class 1c antiarrhythmic drug (see above).

Enzyme – protein that catalyses biochemical chemical reactions in the body.

EP – Electrophysiologist.

Epidemiology – study of the origin and spread of disease.

EP study – see electrophysiology study (above).

EPS – electrophysiology study (see above).

Epicardial or endocardial – an epicardial pacing route accesses the outside of the heart through the skin and attaches a pacing electrode there. With an endocardial route, a pacing electrode is introduced through a vein, usually under the collar bone, and fed down to the heart using X-ray control.

Epilepsy – *epilepsy* is an intermittent disorder of the nervous system due presumably to a sudden, excessive, disorderly discharge of cerebral neurons. This discharge results in an almost instantaneous disturbance of sensation, loss of consciousness, convulsive movements, or some combination thereof. Sometimes it is an obvious symptom of a brain disease that also manifests itself in other ways, and at times it is the solitary expression of deranged cerebral function in an individual who otherwise maintains perfect health. It is illogical to suppose that a convulsion occurring by itself represents a disease, whereas one occurring in combination with other symptoms is only a manifestation of a disease. www.geocities.co.jp/Berkeley/1074/e-yougo_btm.html or a neurological disorder which results in recurrent seizures. www.finr.com/glossary.html.

Epileptic – someone who has epilepsy (see above).

Epileptic fit – see epilepsy (above).

Epilim – drug used for the control of epilepsy.

Episodic pallor – marked paleness of the skin which occurs from time to time.

Epsilon waves – small deflections on the ECG found in ARVC (see above).

Erythromycin – antibiotic which may prolong the QT interval.

European Federation of Neurological Societies working group on Terminology – a European professional group of doctors with a special interest in nerve and brain disorders who are trying to achieve agreement on the words used to describe symptoms such as blackouts.

Event recording with ECG – some devices can be carried around or work by patients for long periods of time and only activated when the typical symptoms occur. These can be useful for palpitations, but are unreliable in blackouts.

Evidence-based interventions – healthcare provision for which properly constructed and conducted clinical trials have reported a statistically significant benefit.

F

Familial dysautonomia – abnormality of the autonomic nervous system that occurs in families.

False positives and True negatives – tests with a positive result when actually the underlying condition and diagnosis means the test should have been negative. A true negative test is where the test is expected to be negative because the disease is not that diagnosed by that test, and the test does prove to be negative.

Familial syndromes – refers to conditions that occur in families.

Fascicular VT - Ventricular Tachycardia that comes form the conduction system of the ventricles of the heart.

Fifth Joint Report of the BCS and the RCP – report published jointly by the British Cardiac Society and the Royal College of Physicians (UK) detailing the future directions of cardiac care, the need for many more resources and staff, and the devolution of many more treatments to *DGHs* from *tertiary* care so as to make them more available to patients.

Fibrillation – very rapid, chaotic heart rate which fails to result in mechanical heart beats.

Fibrosis – scar reaction.

First degree block – slowing of conduction between the atrium and ventricle.

Flecainide – class 1c antiarrhythmic drug (see above).

Fluoroscopy – continuous real time X-ray imaging (for example of the heart).

Flutter ablation – catheter ablation (see above) of the circuit that causes atrial flutter (see above).

Focal atrial fibrillation – atrial fibrillation that arises because of rapid repetitive activation of a small point in the atrium or pulmonary veins.

Focal atrial tachycardias – rapid heart rates caused by areas of “rogue” cells in the atria that beat rapidly out of control.

Foetal – relating to the foetus

G

General anaesthetic – anaesthetic drug or procedure which makes the patients unconscious.

General medical duties – many different types of physician take part in emergency care duties in the UK. Typically, *cardiologists* in *secondary care* also partake. This makes them responsible for many different types of disease and patients, ranging from bowel diseases to psychiatric diseases. This takes *cardiologists* away from the delivery of cardiac care.

Genetic – related to the genes that are inherited from both parents and code for development of the bodies organs and systems, as well as features such a hair and eye colour. Abnormal genes can be inherited from parents in a number of different patterns.

Genetically positive – found to have an abnormal gene in the body’s cells by testing the *DNA.*

Geneticists - doctors or scientists who are interested in genetic conditions.

Genotypes – the particular gene make-up of an individual. Usually this is used when referring to the presence or absence of one or a small number of gene abnormalities that give rise to an inherited disease, or a disease caused when a common spontaneous gene mutation has occurred.

GPSIs – General Practitioners with a Special Interest in (for example, cardiology).

H

Haemodynamics – the characteristics of blood flow around the body to the organ systems. Poor haemodynamics are seen in heart failure, where there may be insufficient pumping action to adequately supply the lungs and kidneys, resulting in breathlessness and retention of fluid in the body, leading to more breathlessness and swelling.

Haemodynamic monitors – equipment to measure and display the blood pressure and other measurers of the circulation of the blood.

Haematoma – blood clot.

HCM – Hypertrophic cardiomyopathy – overgrown heart muscle caused by genetic disorder.

Heart attack – blockage of a coronary artery leading to death of the heart muscle supplied by that artery.

Heart block (see atrioventricular block) – Abnormally slow or absent conduction through the *atrioventricular node* or conduction tissues below this. *Complete heart block (CHB)* indicates that no conduction exists from the atria to the ventricles.

Heart Failure – the failure of the heart to pump blood to the bodies organ systems and maintain their functions. Heart failure commonly results in accumulation of fluid in the lungs and legs because of the failure to pump enough blood to the kidneys to make urine. Fluid in the lungs causes breathlessness, which gets worse with exercise when the heart cannot keep up with a further increase in the body's demands. Fluid in the legs and elsewhere causes swelling.

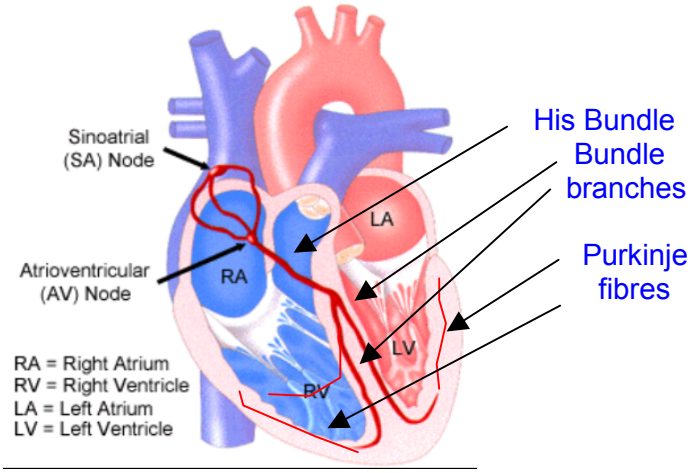
Heart murmur – noise made by turbulent blood flow (for example, though a narrowed or leaking valve).

Heart valve – valve in the heart to ensure the one way flow of blood through the heart.

HF – Heart Failure.

High grade heart block - complete or nearly complete heart block (see above).

His-Purkinje System – a system of specialised heart muscle cells that conduct the electrical impulse from the *AV node* through the *His bundle*, and down the *bundle branches.*



The *bundle branches* spread out to activate all the heart muscle of the *ventricles* at about the same time. This means that under normal circumstances, the beating of the *ventricles* is very well co-ordinated, leading to optimum pumping action).

HIV infection – infection with the human immunodeficiency virus (that causes AIDS).

HLPIs - High Level Performance Indicators.

HOCM – Hypertrophic Obstructive Cardiomyopathy – HCM (see above) with obstruction to blood flow through the left ventricle.

Hybrid approach – using several different forms of treatment together to treat one condition.

Hybrid therapy for cardiac arrhythmias and high risk of sudden cardiac death – some patients with *arrhythmias* may be cured by a single type of arrhythmia treatment, for example, curative *catheter ablation* for *supraventricular tachycardia*, Others may need combination treatment with *anti-arrhythmic* drugs, *ICDs* and *catheter ablation* in order to control their *arrhythmias* and reduce the risk of sudden cardiac death. Some patients with I*CDs* and frequent shocks from their device, may need *catheter ablation* and drugs to control the number of discharges from the device.

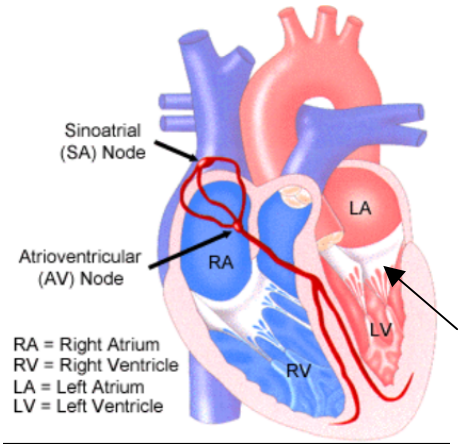
Hydrops foetalis – manifestation of heart failure in a baby in the womb. There is accumulation of excessive fluid in the sack around the baby (excessive amniotic fluid).

Hypertension – high blood pressure.

Hypotension syndrome – condition in which the blood pressure is low.

Hyperthyroidism – the symptoms and signs of an over-active *thyroid* gland (see also *thyrotoxic*).

Hypertrophic cardiomyopathy (HCM) – an inheritable *genetic* condition where the heart muscle of the *ventricles* is abnormally and progressively thickened. The thickening causes stiffness, which prevents normal pumping, and it may also obstruct the flow of blood out of the heart.



It may cause the *mitral valve* to leak. It is associated with *arrhythmias* and *sudden cardiac death.* It runs in families and children of an affected parent have a 50% chance of inheriting the condition. The gene causing the condition may also appear as a *spontaneous mutation.*

Hypertrophy – excessive growth.

Hypothyroidism – bder -activity of the *thyroid* gland; this may be a reversible cause of *bradyarrhythmias.*

I

Iatrogenic – caused by doctors, medicine or medical processes.

Ibutilide - new class III (3) antiarrhythmic drug (see above).

ICD (implantable cardiac defibrillator) – a self-contained device implanted under the skin or muscle of the upper chest wall, and connected to electric leads passing through the veins to be fixed to the heart muscle of the atrium or ventricles. This combined system can sense the heart's own electrical signals continuously throughout a battery-life of 5-7 years. When a life-threatening fast rhythm meets the criteria that have been set up in the device by programming, the device will charge up built-in capacitors and then release a sudden shock of energy to correct the fast rhythm and restore the normal beat. Most devices can now also use rapid trains of fast pacing, which is not painful, and terminate a proportion of fast rhythms. Modern devices have a very large memory to store details of episodes of treatment and have many functions that can be programmed from outside the body using a *pacemaker/ICD* computer/programmer with a radio-link to the device through the skin.

ICD implantation – usually undertaken under local anaesthetic using drugs to provide conscious sedation which often allows patients to be quite comfortable and have no memory of the implant experience. Implantation commonly takes 45-90 minutes and is usually done in a *catheter* laboratory. Where a *biventricular ICD* is implanted, implantation takes longer, commonly 120 - 150 minutes. During implantation ICD wires or electrodes are passed through the veins under the collar-bone beneath the skin in the same way as *pacemaker* electrodes. *ICD*electrodes can pace the heart, but also have coils of wire on them that are used to deliver shock-therapy. The pacing energy and detection of the heart electrical signal

are checked. In all cases the device should be used to cause VF, to check that the device and leads together can detect, charge up and correct and episode of VF reliably with an adequate safety margin. This should be not less than 10 Joules of energy below the maximum energy that the device can deliver.

Idiopathic outflow tract VT - tachycardia arising form the outflow tract part of the right or left ventricle.

ILR's - Implantable Loop Recorders, used for recording relatively rare but serious rhythm abnormalities.

Ions and ion channels in heart cells – electrical activation of heart cells and their contraction to pump blood from the heart depends on the movement of small particles called *ions.* These carry an electrical charge, and hence when many of them move across the membranes or walls of cells, they cause an electrical current to flow. The flow of this current causes electrical stimulation to heart cells to beat, and also allows the electrical signal to pass rapidly through the heart tissues to make sure that the heart beat is co-ordinated.

Implantable loop recorder – ILR – an device measuring 6 x 2 x 0.7cm that is placed under the skin on the chest near the heart to continuously monitor the heart *ECG.*

Implanting specialists – Specialist clinicians (usually *cardiologists* in England/Wales) trained and interested in implantation of *pacemaker*s and/or *ICDs.*

Incessant – tachycardia which is present for almost all the time, each time starting shortly after stopping.

Inducible VT – during *electrophysiological* testing a sequence of pacing pulses can be delivered to the ventricles to try and start *ventricular tachycardia.* When this is done easily with a very gentle programme, this implies a greater risk for spontaneous VT.

Inotropy – the heart can pump more vigorously if there are higher levels of adrenalin in the circulation or there is higher nervous stimulation. Some drugs suppress the inotropic state of the heart, and if the heart is already struggling, can cause deterioration and *heart failure.*

Infarction– process of heart muscle death after a heart attack (see above).

INR– International Normalized Ratio (a measure of the effectiveness of blood thinning).

Invasive – a procedure which done inside the body (for example, with reference to the heart usually using wires or tubes inserted through veins or arteries and manoeuvred back to the heart under X-ray control).

Intensive care – area of type of medical care involving close supervision of the [patient.

Interictal – the period of time between attacks in patients with *epilepsy*.

Interventional – usually refers to procedure which is intended to change the status of a patient.

Interventricular septal thickness – width of the muscle between the right and left ventricles.

Intracardiac – within the heart.

Intracerebral pathology – abnormalities of the brain and tissues inside the skull.

Intrauterine – within the uterus (womb).

Ischaemic heart disease – disease producing lack of blood supply to heart muscle through the coronary arteries due to fatty deposits in the walls of arteries that may gradually block the flow of blood, causing angina. When these fatty deposits burst and blood clot forms on the raw surface of the burst deposit, a coronary *thrombosis* occurs and may cause a *myocardial infarction.*

Ischaemia – shortage of blood supply to part of the body, for example the heart.

Ischaemic – relating to ischaemia.

J

Junctional tachycardia - fast heart rate arising in the junction between the atria and ventricles, for example AVRT and AVNRT (see above).

K

Kawasaki disease – generalised disease which can affect all the arteries of the body including the coronary arteries.

Kearns-Sayre – form of inherited nerve and skeletal muscle disease.

L

Latent pathway – an accessory pathway in the WPW syndrome that may cause ventricular pre-excitation, but is not necessarily seen on the *ECG*. This is usually because the abnormal muscle bundle causing the extra connection between the *atria* and the *ventricles* is located distant from the *AV node*. The heart impulse reaches the *AV node* before it reaches the extra pathway.

LEG – London Electrophysiology Group.

Left bundle branch block – delay or block of electrical conduction through the left part of the His-Purkinje system (see above).

Left ventricular dyssynchrony – some patients with more severe damage to the heart muscle, often after a *heart attack*, have poor coordination of pump-action in different parts of the muscle. This reduces the efficiency of pumping, and increases the chance that the pump will not function adequately, resulting in heart failure. Special pacing techniques in implanted devices with multiple wires to different areas of the *ventricles* can restore a measure of normal coordination of pump-action and reduce heart failure. This has been shown to save lives, especially if the device can also deliver a life-saving shock if needed. Such techniques are known as cardiac re-synchronisation therapy, (CRT), or biventricular pacing.

Left ventricular ejection fraction (LVEF) – this is the measure of the amount of blood pumped out of the *left ventricle* with each beat measured as a percentage of the total amount in the *left ventricle* just before it beats. The normal amount is 50-70%, and research has shown that patients with an LVEF less than 35% after a heart attack are at an increased risk of *sudden cardiac death* even when they have had no previous symptoms. This risk is significantly reduced if they receive an *ICD.*

Lenegre disease – disease causing delay or block within the His-Purkinje system (see above).

Lipid-lowering therapy – drugs used to bring down high levels of fat in the body. The most commonly used drugs have names ending in “statin”.

Long QT Syndrome – a genetic condition that runs in families where abnormal genes cause abnormal patterns of flow on *ions* within heart cells. These abnormal patterns disrupt the electrical activation of heart cells and can give rise to life-threatening *arrhythmias.*

Loop diuretics – medicine causing increased production of urine.

LV function – the ability of the Left Ventricle to contract (pump).

LV dysfunction – poor left ventricular function.

LVEF - Left Ventricular Ejection Fraction (one way to measure the ability of the left ventricle to contract.

Lyme disease – infectious disease which affects joints, the electrical conduction system in the heart may also be damaged.

M

MADIT – trial in which patients at high-risk of *sudden cardiac death* after a *myocardial infarction* were randomly given an *ICD* or no *ICD.* Patients with an *ICD* had a significantly longer life.

Malignant – life-threatening.

Metabolic disturbance – disturbance in the biochemical reactions.

Medical therapy – treatment by tablets rather than surgery.

Meta-analysis - combination of study results to give overall picture.

Metoprolol – a beta blocker often used to treat arrhythmia or to treat heart failure.

MI - Myocardial Infarction (see below).

Midodrine – a drug used to raise blood pressure and prevent falls in heart rate in patients with *reflex syncope.* Not currently licensed in the UK, despite being the only drug with clear scientific evidence to support its use.

MINAP - Myocardial Infarction National Audit Programme, a study of all patients in the UK who are admitted to hospital with myocardial infarction (see above).

Misdiagnosis – getting the wrong diagnosis.

Mitral valve – valve between *left atrium* and *left ventricle* (see diagram below).

Mitral stenosis – narrowing or obstruction of the mitral valve.

Modes – ways in which a pacemaker can be programmed to pace and sense the atrium and/or ventricle.

Monomorphic ectopics – single shaped extra heart beats.

Motor neurones – brain and spinal cords nerve cells that make voluntary muscles move.

Morphology – shape.

MRI – Magnetic Resonance Imaging.

Multi-chamber pacing – pacing involving more than two chambers of the heart; may use 3 or 4 leads to pace the left *ventricle* and/or left *atrium* in addition to the right *atrium* and *ventricle* (see CRT).

Muscular dystrophy - an inherited skeletal muscle disease.

MUSTT - Multicentre UnSustained Tachycardia Trial – a study of the ICD versus best medial therapy for the treatment of patients with left ventricular dysfunction (see above) after myocardial infarction see above).

Myocoplasma – an organism that causes chest infection.

Myocardial infarction – coronary thrombosis causing blockage of a coronary artery resulting in a heart attack.

Myocarditis – an inflammatory condition of the heart muscle. This may commonly be caused by certain viral infections, leading to weakening of the pump action and sometimes *heart failure* and *arrhythmias.*

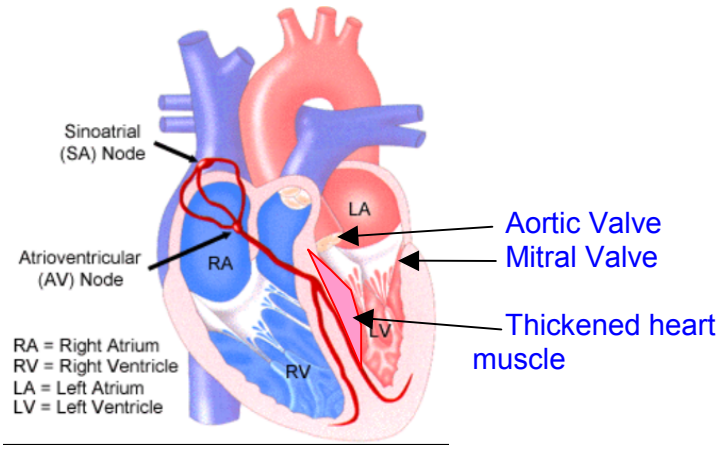
Myocardium – the heart muscle.

Myoclonic – see below.

Myoclonus – a fairly random jerking or twitching movement of the arms and legs, often seen when people faint, but also sometimes seen in *epilepsy*.

Myocytes - heart muscle cells.

Myomectomy – an operation to cut away overgrowth of muscle in the septum of the left *ventricle* which is obstructing the flow of blood out of the heart through the aortic valve.



N

NASPE – North American Society of Pacing and Electrophysiology. The largest society in the world for those interested in *arrhythmias.* Also responsible for many guidelines relating to *arrhythmia* management. Now known as the Heart Rhythm Society.

Necropsy - a post-mortem examination.

Neonates – a new born child (less than one month old).

Neonatologist – specialist in looking after sick children immediately after birth.

Neurally mediated bradycardia - a slow heart rhythm that is produced by reflex nervous activity.

Neurological – a disease due to brain or nerve problems.

Neurologist – a specialist in brain and nerve problems.

New York Heart Association (NYHA) Class – a method of describing the severity of *heart failure* based on the symptoms experienced by patients at rest and with exercise, including the simple activities of daily living such as dressing and bathing. Patients in Class I have no restrictions, ranging to patients in Class IV, who are bed-ridden.

NICE Guidelines for Epilepsy – a document published by the National Institute for Clinical Excellence (NICE) outlining good standards of care for patients with *epilepsy*.

NICE Guidelines for Falls – a document published by the National Institute for Clinical Excellence (NICE) outlining good standards of care for patients with falls.

Non-pharmacological - not involving drugs (medicines).

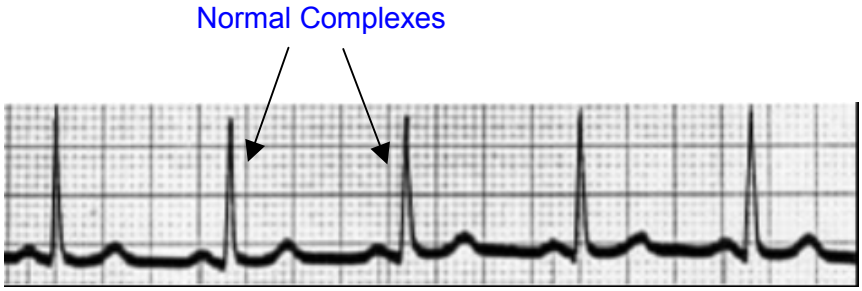
Non-thoracotomy – without opening the chest using surgery.

Non-sustained ventricular tachycardia – *ventricular tachycardia* lasting for less than 30 seconds and then stopping on it's own, is an abnormal heart rhythm arising from the muscle of the ventricles, rather than arising through the normal mechanism in the atrium and being conducted through the *AV node*, the *His bundle* and the *bundle branches.*

Normal conduction pathway - the sinus node (see below), the AV node (see above) and the His Purkinje system (see above).

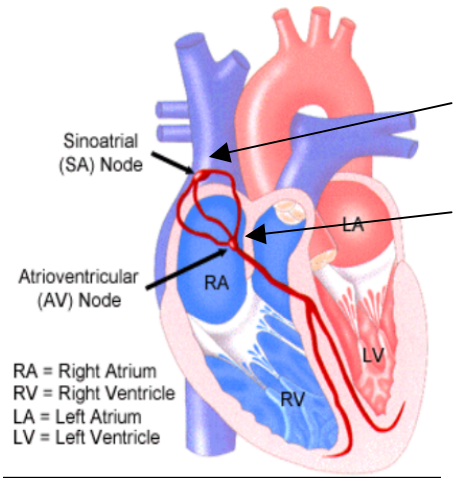
Normal heart rate and rhythm – a heart rate that is appropriate for the age and activity of the person and that starts in the correct part of the heart (called the sinus node).

Normal rhythm – narrow complexes (less than 0.1 second).



A normal heart rhythm is conducted down the *Bundle Branches.* These specialised bundles of heart cells can conduct very quickly, hence the normal *ECG* complexes are narrow. *Ventricular tachycardia* arises from a short-circuit in the muscle of the ventricles. This typically makes the *ECG* complexes appear very wide and rapid.

Ventricular tachycardia often occurs in patients with badly damaged hearts, often with a previous heart attack, and is associated with a high risk of death.



Sinus Node the main *pacemaker* of the heart

AV Node secondary *pacemaker* and relay station of the heart

NWREPG – North West Regional Electrophysiology Group (www.nwrepg.com).

NSF – National Service Framework.

NSF for CHD – National Service Framework for Coronary Heart Disease Guidelines – first published in March 2000.

NYHA - New York Heart Association (classification used to describe degree of breathlessness).

O

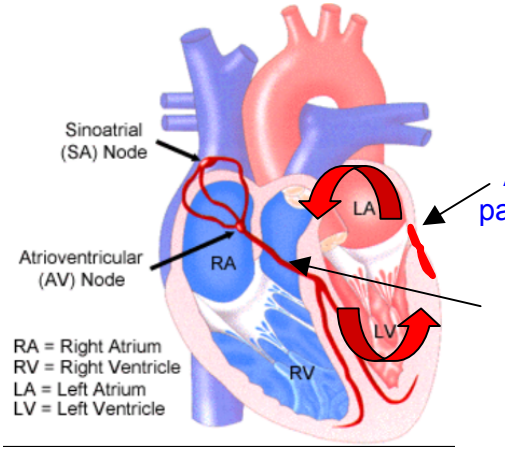
Obtunded – an obtunded patient is typically has dulled senses and reflexes, and needs care and supervision of breathing and vital signs.

Occupational health – a medical system for providing medical care for employees of an organisation.

Organic disease – disease having an underlying physical cause.

Other cardiac drugs – heart tablets, including b-blockers, diuretics, ACE-inhibitors and statins.

Orthodromic AV re-entry tachycardia (AVRT) – a *supraventricular tachycardia* using the *normal conduction pathway* to conduct from the atrium to the *ventricles*, and an *accessory pathway* to get back from the *ventricles* and complete a rapid short-circuit.



Accessory pathway

Normal conduction pathway

P

Paediatric – related to children.

Pacemaker – a system of maintaining the heart rate by stimulation of heart muscle with an artificial electric current. Usually this is consists of a sealed battery-box which also contains electrical circuits and a radio transceiver which can talk to a *pacemaker* programming computer over short distances, including through the skin after surgery. The battery-box is connected to one or more insulated wires that are usually passed through views and steered into the heart under X-ray control. Mechanisms are built into these wires or electrodes to keep them anchored to the heart muscle. Very low levels of current are needed to stimulate a heart beat. Modern *pacemaker*s only stimulate when needed and can detect the heart's own beats. They also speed up with exercise if needed using built in sensors. *Pacemaker*s are usually implanted under local anaesthetic within 1-2 hours.

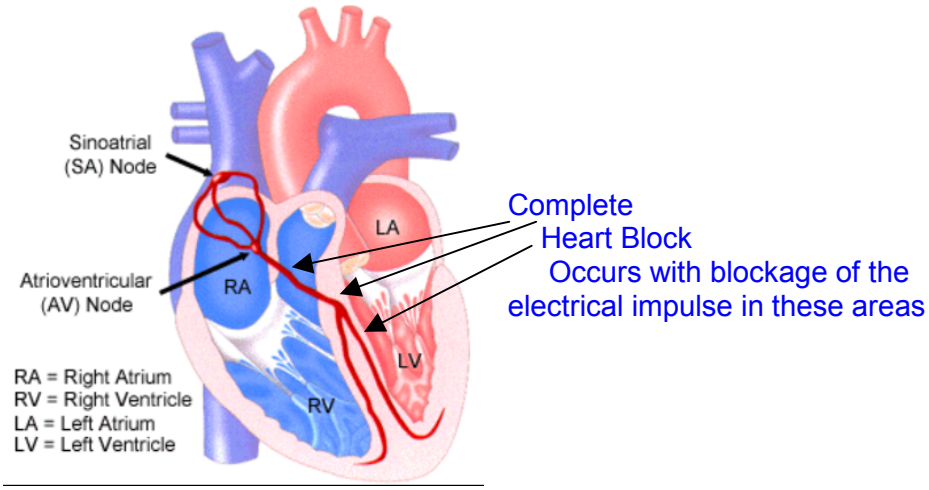
Pacing mode – describes the way in which the *pacemaker* is working (or is able to work) and relates to the implanted device and lead(s).

Palliative – treating symptoms only.

Palpitations – sensation of the heart beating.

Paroxysmal atrial fibrillation – intermittent *atrial fibrillation* that changes spontaneously to normal sinus rhythm.

Paroxysmal complete heart block – complete blockage of activation of the *ventricles* by the impulse from the *atria*. Complete heart block may occur in the *AV node* or *His bundle.*



Physiologic pacing – a *pacemaker* system that maintains *atrioventricular* synchrony, either through atrial pacing utilising the heart's normal conduction system or through a dual *chamber* approach.

Pathogenesis – the underlying disease process giving rise to symptoms, physical signs and abnormal tests.

Pathology – disease.

PCI - Percutaneous Coronary Intervention, such as dilatation or stenting the coronary artery using a catheter (see above).

PCT – Primary Care Trust. A commissioning body responsible for most medical services through GPs and hospitals.

Percutaneous coronary angioplasty – dilating a narrowed coronary artery by inflating a balloon inside the coronary artery.

Permanent junctional reciprocating tachycardia – an unusual form of *SVT* commonly in children, but also seen in adults. The *tachycardia* of often relatively slow at 120-160 beats per minute. The *accessory pathway* conducts slowly, and often present much if not all of the time. Treatment is by *catheter ablation* whenever possible to avoid the development of a *tachycardiomyopathy* and *heart failure.*

Persistent atrial thrombus on echo – *echocardiography* can be used to scan the inside of heart chambers and may show that clots have formed within the heart.

Petit mal epilepsy – short loss of consciousness without fitting.

Pharmacogenomics – study of the interactions between inherited genes and drugs (medicines).

Placebo effect – the chance that any treatment by a health care professional will make the patient feel better, even if it is a dummy tablet or the wrong treatment. Estimated to occur in up to 30% of cases.

Physiologic Pacing – dual chamber or atrial pacing (closer to normal or physiologic condition than ventricular pacing).

Polymorphic ventricular tachycardia – a very fast, dangerous heart rhythm starting in the main pumping chambers of the heart that can cause sudden death.

Positive and negative predictive value of the test – the positive predictive value of a test is the likelihood of positive test result being a true positive. Negative predictive value is the likelihood of a negative test result being a true negative. Unfortunately, no medical tests are perfect.

Postinfarction – after myocardial infarction (see above).

Postoperative – after surgery.

Post radiofrequency ablation – ablation (see above) using radiofrequency energy.

Potassium channels – pore in the membrane (outer covering) of a cell that allows potassium to enter or leave the cell.

PPM – pulses per minute.

PR interval – the interval on the *ECG* representing passage of the electrical impulse between the *atria* and the *ventricles.*

Pre-admission clinics – a forum for EP nurse specialists to see patients 2 or 3 weeks before admission, to take questions, explain procedures and admission protocols, take blood for analysis and ensure that medication is continued or stopped at admission appropriately.

Pre-syncope – almost losing consciousness because of lack of blood to the brain.

Primary, secondary and tertiary care – parts of the health service: primary = general practice, secondary = hospital, and tertiary = highly specialist service.

Primary inappropriate discharge of cerebral neurones – the cells in the brain spontaneously begin activating and are out of control.

Primary prevention – trying to put off the development of disease, for example by lowering cholesterol levels or stopping smoking.

Pro-arrhythmia – the ability of a drug to cause a *cardiac arrhythmia*. This is especially true of *anti-arrhythmic* drug therapy. This typically causes slowing of electrical conduction in the heart, and some *arrhythmias* need such slowing in order to start up. Pro-arrhythmia is especially dangerous in patients with *structural heart disease.* Other drugs can cause *arrhythmias*, including some antibiotics, anti-histamines and anti-depressants.

Prolapse – floppiness of the *mitral valve*, which may leak. Said to be associated with *arrhythmias*.

Prognosis – long-term outlook.

Propafenone – a class III (3) antiarrhythmic drug (see above).

Prosthetic valves – replacement heart valve that can be put in place during heart surgery, usually made of cow or pig tissue or provoked recording of an episode – recordings made during a test where a possible cause is demonstrated by a provocation, for example a tilt-table test. Such tests are helpful but not perfect, and can be misleading.

PSVT – Paroxysmal Supra Ventricular Tachycardia.

Psychiatrist – physician who treats mental illness.

Psychogenic blackouts – blackouts not due to a heart or blood pressure problem, but due to a psychological reason.

Pulmonary – related to the lungs.

Purkinje fibres – furthest reaches of the cardiac conduction system.

Q

QRS complex – wave on the *electrocardiogram* (ECG) due to the electrical activation of the *ventricles*.

QRS duration - the time taken on the *ECG* for electrical activation of the *ventricles* to occur.

QT interval – a measurement taken from the ECG (see above) representing the time taken for the ventricles to activate and recover.

QT prolongation – lengthening of the QT interval (usually due to inherited condition, disease or medicines.

Quality of Life (QoL) – Used as a measure of success of a treatment; there are many validated questionnaires used for reliable measurement.

Quinidine – a class I antiarrhythmic drug (see above).

Quinidine syncope – loss of consciousness due to a ventricular tachycardia cause by quinidine.

R

Radiofrequency catheter ablation – ablation (see above) using radiofrequency energy.

Random variation – the unpredictable variability that occurs for any event, as with the chances of any one number appearing on the lottery.

Randomised clinical trial – a research study where patients are assigned to different treatments versus no treatment, or treatment versus a dummy treatment, according to a set of numbers which are generated randomly by a computer. During the trial (in secret), and after the trial, the outcomes are monitored to see if the patients receiving the treatment fair better than those who do not. Usually this involves comparing the number of those who have died in each group of the trial.

Rate-adaptive pacing – use of *pacemaker*s containing a sensor to detect the need to changes heart rate. This allows approximation to normal heart rate response to circumstances such as exercise when the patient's own *sino-atrial node* is not functioning normally.

Rate-responsive pacemakers – a method of speeding or slowing the pacemaker rate to adjust for the body's needs.

RCT – *Randomised Control Trial*, a method to ensure that "like is compared to like" when drugs or devices are studied.

Re-entrant excitation – re-activation of part of the heart due to the electrical wave doubling back on itself.

Reflex anoxic seizures (RAS) also known as reflex asystolic syncope – episodes where the patient has what looks like a fit / epileptic attack, but in fact has had heart slowing / stopping. Occurs mainly in young children – any unexpected pain, however slight, such as a bump, fright, shock, causes the heart and breathing to stop. Because the heart stops there may be *abnormal movements* of the arms and legs due to the brain being deprived of blood and oxygen. The eyes roll, the complexion becomes deathly white, often blue under the eyes and around the mouth. Frequently mis-diagnosed as *epilepsy* or breath holding in the young.

Reflex asystolic syncope (RAS) – loss of consciousness due to reflex anoxic seizures (see above).

Reflex syncope – occurs when a nervous system trigger causes stimulation of relay stations for control of the heart rate and the blood pressure, (the cardio-inhibitory and *vasodepressor* centres in the brain stem). There are many different triggers, and they are poorly understood. They include emotional triggers that come from the higher brain centres, (cerebral cortex). They include the effect of gravity on blood returning to the heart, since *reflex syncope* most commonly occurs in the upright position. This in turn may trigger receptors in the chest that help control blood pressure and heart rate. *Reflex syncope* produces two effects. The heart rate slows down or stops because of *vagal* activation. The blood pressure falls because of opening up of small blood vessels that divert blood into muscles and away from the brain. Other terms for the same condition include: *vasovagal syncope*, *vasodepressor syncope*, *situational syncope*, *neurally mediated bradycardia and hypotension syndrome*, *neurocardiogenic syncope.*

Rehabilitation and support – in *ICD* patients functioning and quality of life has been shown to be improved with programmes of supervised activity and adequate support from specialist nurses.

Relative risk reduction (RRR) – the proportion of those who would have died or suffered an event that is prevented by a drug (medicine) or device.

Resting 12-lead electrocardiogram, with appropriate report – an electrical recording of the heartbeat that shows how the hearts electrical system is working, and is reviewed by an experienced doctor.

Resuscitation – process of reversing a life-threatening condition where there is emergency failure of the heart and circulation and/or breathing. A variety of conditions may threaten life in this way, but the most severe are the presence of *ventricular fibrillation,* which causes death within minutes if untreated, as does *asystole,* and as may *ventricular tachycardia.*

Restrictive cardiomyopathy – a form of heart muscle disease that prevents relaxation of the heart.

Resynchronisation – technique to coordinate the pumping of the right and left ventricles.

Retrograde amnesia – forgetting what happened immediately before a faint or head injury. Even though a patient was fully awake and aware at that time, the events may not be recalled later.

Revascularisation – process by which impaired blood flow to heart muscle through coronary arteries can be improved when the arteries are effected by a build up of fatty deposits, (*atheroma*), often from smoking and high fat levels, (lipids), in the blood. Partial obstructions and complete blockages can be treated by angioplasty (PCI), where a balloon is used to stretch the narrowing under local anaesthetic, usually leaving a metal strut in place to maintain a good result, (*stent*). Coronary artery bypass grafting, (CABG), can also be used, but rates for surgery a falling quite quickly as PCI becomes commoner and more successful, without requiring a major operation, and with lower risks.

Rhabdomyomas – muscle tumour.

Rheumatic fever – fever, often with associated heart damage, due to an allergic response to the streptococcus bacterium.

Rheumatic valve disease – rheumatic fever contracted in childhood can cause scarring of heart valves that produces illnesses decades later.

Risk-assessment/stratification for sudden cardiac death - attempting to assess the chances of a patient dying suddenly by taking a history from a patient, examining them and undertaking heart tests, including *ECG* and *echocardiography.*

Rolling retrospective memory – ability to continuously store the last pre-determined period of time, at any time, as in a moving window of time, and store it in an electrical memory for later review.

Rubella – organism responsible for German measles.

S

SADS UK – Sudden Arrhythmic Death Syndrome Trust (www.sads.org).

SCD-HeFT – Sudden Cardiac Death Heart Failure Trial, a study of the ICD, Amiodarone and placebo in patients with heart failure and left ventricular dysfunction.

Second degree block – condition in which some but not all atrial activations are transmitted to the ventricles.

Secondary care – hospital care.

Sedated/sedation – for many procedures undertaken in a *catheter* laboratory, sedative drugs are used to calm patients and keep them comfortable whilst allowing them to breath normally.

Seizures – a sudden attack or convulsion due to involuntary electrical activity in the brain. May have a wide variety of manifestations including muscle twitching, staring, tongue biting, urination, *T- LOC* and body shaking. **Not synonymous with epilepsy**, since all these manifestations may occur when the involuntary electrical activity of the brain is due to *cerebral anoxia,* as occurs with *syncope.*

Scar-related VT - Ventricular Tachycardia due to a scar in the ventricles, usually due to a previous heart attack (myocardial infarction).

Sensorineural - related to nerves which carry sensations.

Serum potassium - the concentration of potassium in the blood.

Severe electrolyte imbalance – the normal heart rhythm depends upon the organised flow of electrically charged *ions* across the walls of heart cells. If the composition of salts and *ions* in the fluid of the tissues is upset significantly, cardiac *arrhythmias* may result.

Severe RV dystunction – dilation of the Right Ventricle.

Shock therapy – the use of an high-voltage, direct-current electric shock to restore the normal heart rhythm.

Short QT syndrome – a condition in which the QT interval (see above) is shorter than is normal. This is associated with ventricular tachycardia and sudden cardiac death.

Short-range radio link – *pacemaker*s*, ICDs* and other implantable devices can be interrogated for stored information using a short-range radiofrequency two-way communication protocol. This can be used for getting information out, and for changing programmed functions of the device.

Sick sinus syndrome (SSS) – a clinical syndrome resulting from *sinus node* dysfunction.

Single chamber pacing – use of a *pacemaker* with a lead in only one chamber (*atrium* or *ventricle*). Such systems are usually *ventricular* rather than *atrial.*

Sino-atrial node – the natural pacemaker of the heart which is situated in the right atrium.

Sinus node – see sinoatrial node (above).

Sinus node dysfunction/disease (SND) – A situation where the patient's own *sinus node* does not provide normal heart rate responses; this may result in inappropriate *tachycardia* and/or *bradycardia.*

Sinus pauses – the *sino-atrial node* beats at about 60-70 beats per minute at rest. This is determined by the electrical properties of the *sinus node* cells that automatically "twitch" roughly every second. If the cells are damaged or diseased, then they may fail to "twitch" for a few seconds. Cells lower down the chain of electrical activation may take over, or they may fail to "twitch" in which case a period of *asystole* may occur. This can sometimes occur in normal people, but pauses longer than three seconds are considered abnormal.

Situational syncope – loss of consciousness which occurs only in specific circumstances, for example when looking up or when blowing a trumpet.

SMEG – South Midlands Electrophysiology Group.

SND – Sinus or sinoatrial Node Disease (see above).

Sotalol – a class III antiarrhythmic drug (see above).

Specialist nurses – senior nurses who have left ward nursing to take a interest in a specialty such as cardiology or neurology.

Specificity and sensitivity – if a test has fewer false positive results it is more specific. If a test has fewer false negative results it is more sensitive.

Spironolactone - a drug (medicine) which increases urine production without losing potassium. It is valuable for the prevention of sudden death in patients after myocardial infarction.

Spontaneous mutation – a gene defect that is not inherited, occurring for the first time in the patient with the disease.

Spontaneous recordings – a recording made during an attack of T-LOC, for example by *ECG* or *EEG*.

SPR's - Specialist Registrars or trainees in a medical speciality.

Strategic Health Authorities – level of organisation within the National Health Service which coordinates primary and secondary care.

STARS – Syncope Trust And Reflex anoxic Seizures (www.stars.org.uk).

Statin – drug (medicine) which reduces blood cholesterol and reduces the likelihood of myocardial infarction (heart attack) and improves survival.

Stent – a device which keeps open dilated narrowings in arteries, for example the coronary arteries.

Stroke – a stroke or cerebrovascular accident results when brain tissue dies as a result of an acute defect of the blood supply to that tissue. The underlying cause may be blockage of an artery supplying that tissue with blood, or alternatively, bleeding into the brain tissue as a result of a ruptured blood vessel.

Structural heart disease – disease of the structure of the heart for example valve, muscle or artery disease).

Suboptimal – less than the best.

Sudden cardiac death – when a patient dies unexpectedly from a cardiac cause up to 24 hours (Official Definition) after the onset of symptoms. Usually, the death is within minutes of the onset of symptoms.

SUDEP – Sudden Unexpected Death in Epilepsy – the association of *epilepsy* with sudden death. Overall sudden death is three times commoner in *epilepsy*, and fifteen times commoner in young people and children. It is not clear whether some of these deaths are due to *epilepsy* or to heart problems that may have been incorrectly diagnosed as *epilepsy*.

Supraventricular – heart beats starting in the upper part of the heart, which are in general troublesome but not dangerous.

Surgical ablation – ablation (see above) performed at surgery (rather than by a catheter – see above).

Surgical revascularisation – an operation to repair the arteries to the heart by using other arteries or veins from the body.

Sustained VT - Ventricular Tachycardia which lasts more than 30 seconds.

SVT – Supra Ventricular Tachycardia.

Symptom/ECG correlation – recording the heart rhythm while the patient has their typical symptoms.

Supervised controlled exercise – formal exercise-stress testing is available in *secondary care,* (District General Hospitals) and *tertiary care*, (Teaching Hospitals). Patients undertake exercise according to a systematic, graded protocol, which gradually increases the amount of effort required to keep up with a "rolling road", while supervised by a doctor and/or a *technician*.

Sympathetic nerves – involuntary nervous system responsible for many body functions. Cause speeding up of heart beat. Responsible for the small blood vessels that control how much blood goes into voluntary muscles, (for walking, running etc). They are a major component of blood pressure control through this mechanism. If sympathetic nerve supply to voluntary muscles is suddenly shut off, blood pressure falls suddenly and drastically. This is the major mechanism by which blood pressure falls and blood supply to the brain is shut off in *reflex syncope.*

Syncope - In *syncope*, the blackout or T-LOC is due to transient global impairment of cerebral blood flow. *Syncope* should not be used inter-changeably with "*seizure*" or "fit", and a diagnosis of *syncope* is not compatible with a diagnosis of *epilepsy*. In *syncope* the primary disturbance is *cardiovascular* with inadequate brain blood flow to maintain consciousness. In *epilepsy*, the primary disturbance is inappropriate activity of brain cells, with preserved blood flow to the brain.

Systolic function - the ability of the heart to contract.

T

Tachyarrhythmia – a fast heart beat at over 100 beats per minute.

Tachycardia – tachyarrhythmia (see above).

Tachycardiomyopathy – some patients with continuous tachycardia may develop weakening of the heart muscle, enlargement of the heart and heart failure. This can be reversed if the tachycardia is eradicated.

Tachynoea - fast breathing rate.

Technician – a *cardiology technician* with special training and experience dealing with patients with heart rhythm abnormalities and implanted devices to manage *arrhythmias*. *Technicians* undergo a four-year training course and are essential for running a cardiology department. In *tertiary* centres it is common for technicians to specialise in one area of cardiology, e.g. *cardiac arrhythmia* management.

Telemedicine – medicine conducted at a distance, for example by video or internet links.

Tertiary – the most specialised level of care available, usually in teaching hospitals.

Tetralogy of fallot – a common *congenital* deformity of the heart during development in the womb and a common cause of a blue baby. There is narrowing of the channel out of the *right ventricle*, a hole-in-the-heart between the *ventricles* and abnormalities of the large arteries coming out of the heart. *Arrhythmias* occur because of the condition and after surgical repair, where the risk of *sudden cardiac death* is increased significantly.

Thioridazine - a drug, used to treat patients with schizophrenia, which prolongs the QT interval (see above).

Thoracic – to do with the thorax (or chest).

Thromboembolic – *embolism* of a blood clot.

Thrombosis – blockage of a *coronary artery* supplying blood to the beating heart muscle. Usually this will cause muscle to die and may result in death or scarring of the heart, (*myocardial infarction*).

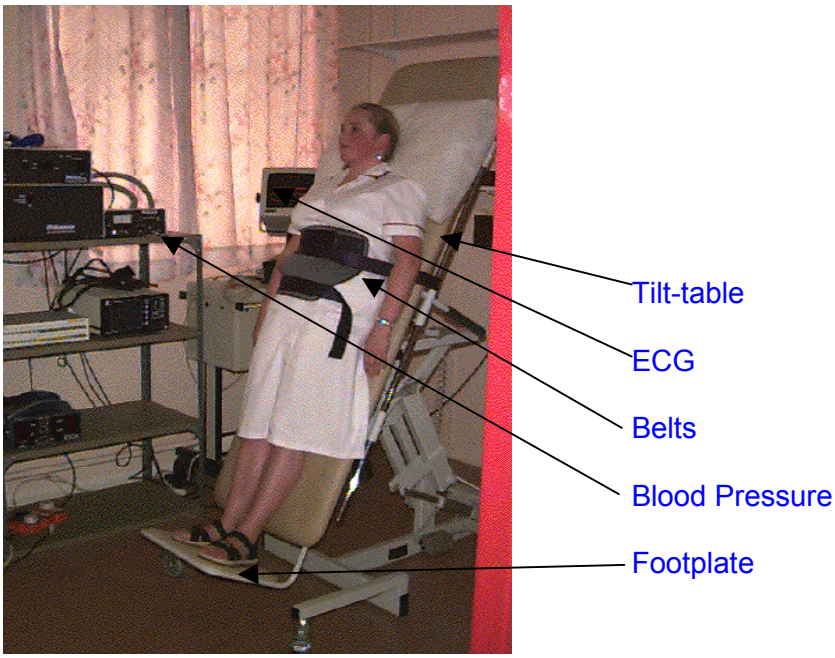
Thyroid – a gland in the neck that produces a hormone (thyroxine) that regulates the rate of biochemical reactions in the body (metabolic rate).

Thyroid function test – blood test to assess the thyroid gland.

Thyrotoxic – due to overactivity of the thyroid gland.

Thyrotoxicosis – state of overactivity of the thyroid gland.

Tilt-table testing (tilt testing) – a test for fainting where the patient is tilted on a special table to near upright, but not quite (60º), to determine if they have a tendency to faint and why. Patients are monitored for heart rate and rhythm, blood pressure and sometimes brain waves, (*EEG*).



Thyrotoxic – effects of an over-active *thyroid* gland, including weight-loss, jitteriness, *tachycardias* and sweatiness.

Titration – system of adjusting the dose of drugs to achieve the desired effect.

T-LOC – Transient Loss of Consciousness / Fainting / Blackout with spontaneous recovery.

T-LOC during exercise – this suggests an *arrhythmia* or other serious cause.

T wave inversion – change in the direction (down rather than up) of the T waves (ECG deflections to do with the electrical recovery of heart muscle).

Tonic-clonic movements – movements of the limbs where initial marked stiffening of the limbs then gives rise to rhythmic thrashing of arms and legs.

Tonsillectomy – surgical removal of the tonsils.

Torsades de pointes – a very fast, dangerous heart rhythm starting in the main pumping chambers of the heart that can cause sudden death.

TPEG - Trans-Pennine Electrophysiology Group.

Transient global cerebral hypoperfusion – a short episode where the brain does not receive enough blood often resulting in dizziness or fainting.

Treadmill - exercise machine with an endless motorised belt which is used to assess the heart under stressful conditions.

Triage – identifying and then sending the patient to the correct area/ specialist for treatment with priority for the sicker patient first.

Tricuspid valve – one way valve between the right atrium and right ventricle.

Troponin assays – measures of heart chemicals leaking into the blood and signifying damage to heart muscle. This usually means that a *heart attack* has occurred or is threatened, but levels may also be raised after an *arrhythmia* alone.

U

UKICES – UK Interventional Cardiac Electrophysiology Society (www.ukices.org).

Urinary incontinence – involuntary passage of urine.

V

Vagal stimulation – activating the vagus nerve (see below).

Vagus nerve – nerve connecting the brain to the heart and vice versa. When the vagus nerve is stimulated the heart rate slows.

Vagus nerve, activation of – the autonomic, or "involuntary" nervous system consists of *sympathetic nerves* – these speed the heart up under stress and exercise, and the *vagus nerve*. This slows the heart down during rest and sleep, as well as having many other effects on the body. It also stimulates digestion, and many patients with *reflex syncope* have attacks accompanied by abnormal behaviour of the digestive system such as vomiting or bowel movements.

Valsalva manoeuvre – a breathing manoeuvre, which stimulates the *vagus nerve* and may stop a tachycardia.

VASIS – a group of heart rhythm doctors in Europe who have classified the various different responses of blood pressure and heart rhythm during *syncope* induced by *tilt-table testing.*

Vasodepression - relaxation of blood vessels resulting in a fall of blood pressure.

Vasodepressor – a fall in blood pressure due to opening up of blood vessels in muscles diverting blood away from other vital organs, such as the brain, and therefore causing dizziness or fainting.

Vasovagal syncope – loss of consciousness due to fall in blood pressure and slowing of heart rate due to relaxation of blood vessels and stimulation of the vagus nerve.

Ventricle – the main (lower) muscular pumping chamber of the heart.

Ventricular arrhythmias – abnormal heart beats from the main pumping chambers of the heart.

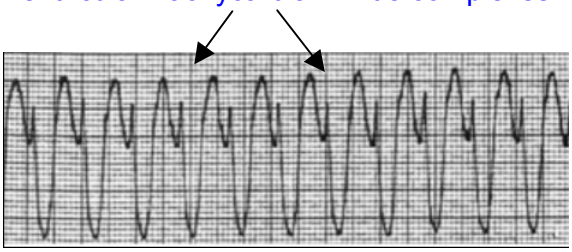
Ventricular dilation – increase of the size of the ventricle cavity.

Ventricular fibrillation (VF) – chaotic electrical activity of the heart from which the patient will usually die if not treated quickly by an electric shock, only minutes are available for effective action in order to save life.

Ventricular premature beats (VPBs) – extra heart beats arsing in the ventricles of the heart.

Ventricular tachycardia (VT) – ventricular *tachycardia* is an abnormal heart rhythm arising from the muscle of the ventricles, rather than arising through the normal mechanism in the atrium and being conducted through the *AV node*, the *His bundle* and the *bundle branches.*

Ventricular Tachycardia – wide complexes



A normal heart rhythm is conducted down the *Bundle Branches*. These specialised bundles of heart cells can conduct very quickly, hence the normal *ECG* complexes are narrow. *Ventricular tachycardia arises* from a short-circuit in the muscle of the ventricles. This typically makes the *ECG* complexes appear very wide and rapid.

Ventricular pre-excitation – the *ECG* pattern indicating *Wolff-Parkinson-White WPW Syndrome.*

Verapamil - a calcium antagonist/blocker (see below) which is used to treat arrhythmias.

Video-telemetry – a combined video, brain-wave and heart rhythm monitoring system.

VVI(R): A single chamber *pacemaker* with a single lead implanted in the *ventricle*. If present, the "R" indicates *rate-adaptive* ability.

W

Warfarin – drug which interferes with clotting mechanisms of blood, and causes blood thinning.

White breath-holding attacks – another term for *Reflex Anoxic Seizures*. In fact the heart stops causing breathing to stop -not to be confused with blue breath-holding where the child holds his breath and the heart slows or stops.

Wide QRS complex – see Normal Rhythm. The large spikes, (QRS-complexes) on the *ECG* are usually less than 0.1 second in duration. Complexes wider than 0.12 seconds in patients with *heart failure* may indicate that there is left *ventricular dyssynchrony,* and that *biventricular pacing* may be beneficial.

Wolff-Parkinson-White (WPW) syndrome – a heart condition with an electrical 'short-circuit' causing heart racing and on rare occasion's life-threatening problems, see *Ventricular pre-excitation.*