



Newsletter - December 2009

Group Meeting on 17th September 2009

The meeting at Hatherley Church Centre was attended by 22 ICD recipients/carers. As we have come to expect, several members were unable to join us, mainly due to transport difficulties as a result of DVLA Driving Restrictions. Any members who are willing to bring others to a meeting should let us know well before meetings. This also makes us realise that we need to address the venue of some of our forthcoming proposed meetings, to be reached easily by public transport. Some members have also had spells of ill-health. We emphasise the importance of members sharing anxieties with us and to network within the Group. We had 2 speakers at the meeting:

1. Cardiac Drugs (Part 2) -Nick Butler, Pharmacy Manager, Gloucester Royal Hospital

In June 2008 Nick gave a very clear and graphic talk on how drugs worked generally, how they were taken up by the body, the main ways in which they worked, the timescales of action and how the body dealt with them. Nick kindly agreed to return to focus more on drugs for the heart, particularly for the arrhythmia patient. A summary of what he covered is given below.

The main way to control abnormal heart rhythms is by influencing the electrical system that controls the heart beat – the pathway from the sino-atrial node to the atrio-ventricular node and then the subsequent electrical conduction pathways around the ventricles - by interfering with the firing mechanisms that initiate heart muscle contractions (ie beating). Drugs can do this by reducing the conduction of electrical impulses through the heart, or by prolonging the recovery period of the heart muscle cells after they have contracted to make the heart beat (known as the refractory period). Either way, it is possible to slow down a heart beat that otherwise might rapidly increase to dangerous levels

A convenient way of addressing the various drugs available is via the Vaughan-Williams classification, introduced some 40 years ago. Though this classification has limitations (eg, several popular medicines fall into several of the categories), it is a useful means to describe the overall problems that arrhythmia patients encounter, and how clinicians try to control them with drugs.

Class I drugs control the natural body chemicals that constantly pass in and out of the heart muscle cells during heart beating – particularly sodium ions. These enter and leave the cells via ‘channels’. Controlling sodium through gateways in these channels reduces the ‘action potential’ or energy required to make the heart beat. Typical Class I drugs include dysopyramide, procainamide, flecainide and lignocaine.

Class II drugs control the parasympathetic nervous system, ie the release of hormones in response to stress, trauma or threats. These are also known as beta-blockers. They work by reducing the rate of electrical conduction through the heart muscle, lowering the rate of heart beat and blood pressure. Common examples are atenolol, bisoprolol, propranolol, carvedinol.

Class III drugs influence potassium passing through the heart muscle cells after contraction. These slow down the repolarisation of the cells, so that it takes longer before the muscle contracts again, thereby controlling fast rhythms. Amiodarone is an example (and this drug also falls into classes (I, II & IV), as is sotalol (which also has beta-blocking actions as well).

Class IV drugs influence the flow of calcium, thereby slowing conduction of electrical impulses through the heart and thus heart rate. Verapamil is an example.

Class V. This is a collection of drugs that work by a variety of other mechanisms to control heart rate, and include adenosine and digoxin.

Some of these drugs are also used in hospital tests to help the cardiologist to diagnose precisely the nature of an arrhythmia.

The cardiologist will choose the particular drugs, depending upon the characteristics of a patient's arrhythmia (and every one is different!). Generally ICD patients will be on a cocktail of several drugs, which work in concert to reduce the chances of the heart speeding up and going into ventricular tachycardia (very fast heart beating, above 200 beats per minute) or ventricular fibrillation, where the muscle ceases to beat and circulate blood around the body and merely quivers.

Also, because of other underlying conditions, a person might have (such as: following heart attack; asthma, angina, diabetes; fluid retention, depression, etc.), the nature of the drug cocktail can be quite complex, and characteristic side effects are then more common (tiredness/fatigue/ sleep disturbance/black-outs or dizziness if jumping up too quickly, coldness of hand and feet). Under such conditions it is probably best to talk to the cardiologist about options available to the patient.

Of all of these drugs, amiodarone is seen as the 'Domestos' of the arrhythmia world, as it has a variety of very effective, important controlling functions. A point about its use is that it takes several weeks before it can exert its full function, as levels need to build up the membranes of the cells it influences. Moreover, when coming off the drug, it can take weeks before the last traces are lost from the body. Another drawback is that this also has some side effects. Amiodarone contains iodine and this can often affect the thyroid gland (either speeding it up or slowing it down) – the solution to this has been well worked out, however. Amiodarone can also cause visual disturbances, which usually disappear when one stops taking it. It is also a photosensitizer, meaning that exposed skin will go red when exposed to sunlight. The use of Factor 25/30 sun filter products (available on prescription) is recommended to all amiodarone users. In rare cases, amiodarone can also affect lung and kidney functions.

Recently, the manufacturer of amiodarone has launched a new drug, dronedarone, that has many of the functions of amiodarone, but does not contain iodine and so has fewer potential adverse side effects. This is currently under test for patients with atrial fibrillation and its results are promising. It is hoped that soon this will be licenced in this country for use with people with the propensity to go into ventricular fibrillation – ie the ICD recipients.

One thing that is being encouraged these days is for the 'patient' to become more involved with the clinical staff in decisions being made on medication. This is strongly influenced by the availability of information on the Internet, as well as the stories and articles that appear increasingly in the popular press, (but beware, some of which may be eye-catching and dramatic, but at the expense of inaccuracy). It is well-known, for example, that warfarin users should avoid certain fruits and vegetables (spinach; cranberries) as they contain agents that interfere with warfarin's action on blood clotting; statin users are told not to take grapefruit juice, as this inhibits the ability to reduce cholesterol production; people with susceptible kidney function might be advised not to use ACE inhibitors.

One final note: though traditionally many arrhythmia patients who receive ICDs are also placed on drug therapy as well, in order to reduce the dependency upon the ICD, thereby prolonging its battery life and thus the time between device replacement, such is the sophistication that is now being built into ICD and similar device technology, it may be that dependence on all of such drugs might be reduced as the devices can exercise the control better.

These are fascinating times for the arrhythmia patient, and it behoves all of us to increase our understanding of what is happening, and how the treatments we receive do their job.

2. Paramedics – Mr John Middleton, Great Western Ambulance Service (GWAS)

We have very positive feelings towards the Emergency Services and the role of Paramedics, particularly when they have intervened personally for several of us soon after attacks of VT or Sudden Cardiac Arrests, and we are alive to tell the tale. We were fortunate that John Middleton from the GWAS unit at Staverton, Gloucester agreed to talk to our group about his job of saving lives.

Once a 999 call has an address the message goes immediately to the GWAS CAD system (Computer-Aided Dispatch) and the process begins – whilst the caller is being advised by the telephone operator, the paramedic is on the way to the incident.

On arriving at the scene, after assessing the safety of the location (eg no electrical power, traffic etc) the first operation is to check then victim's airway, ensuring that the head is back. If the patient is not breathing, CPR is applied first, after ensuring the airway is clear – anti-vomit tubes are to hand as is a hand pump to increase air into the lungs. If no pulse is detected, defibrillation will be applied by means of an AED. Modern ambulances have comprehensive equipment for monitoring blood pressure, pulse and blood oxygen tension and this information can be transmitted to the receiving hospital while on the way.

ICD recipients are urged to carry documentation that describes the technical characteristics of their device, as well as a listing of all medicines that are taken, as this information is important for the Emergency Services in the event of their involvement.

The Ambulance Service has a set of guidelines for ICDs produced by the Joint Royal Colleges Ambulance Liaison Committee (JRCALC). This is a very comprehensive description of what an ICD does, and, in particular, what specific precautions or prerequisites need to be observed by Paramedics. JRCALC has very kindly allowed us to include the Guideline in this newsletter, which is very gratefully acknowledged. As this material is subject to copyright, we have permission only for it to be used for the purposes of this newsletter, and not used elsewhere.

3. Cardiac Rehabilitation DVD

Stemming from discussions we have had with local Rotary Clubs we became aware of a DVD entitled ***Exercises for Cardiac Rehabilitation*** issued by the Gloucestershire Cardiac Rehabilitation Service, part of the Gloucestershire Hospitals NHS Trust. This was produced by the University of Gloucestershire, and all costs have been met by a group of 14 Rotary Clubs throughout the county. This DVD will be issued to all patients being discharged after heart surgery (including open-heart surgery as well as angioplasty), to encourage rehabilitation exercises to aid recovery to normal. It is recognised that many such patients find it difficult to attend rehab, classes after treatment, so this course of exercises can be followed at home. When we first heard of this we made representation to the Cardiac Rehabilitation Service to ask whether specific exercises for recipients of ICDs and pacemakers would be included. We are all aware of the specific problems, particularly regarding shoulder and arm mobilisation that often develop after implantation of such devices, and the specific exercises that have been recommended by physiotherapists to avoid frozen shoulders etc. Unfortunately we were told that this was beyond the scope of this DVD. We found this very disappointing, as once again we learned that ICD recipients always seem to fall outside the scope of most established 'Cardiac Rehab' classes – except for a few enlightened areas. We accept that this is

a hobby horse that we ride regularly – and will continue to do so until NHS Trusts recognise this is a need that remains unfulfilled in many areas.

Notwithstanding, the DVD is very useful as it brings home to people that regular regulated and progressive exercise of specific types is vital for all people returning to a full and quality life-style after cardiac treatment.

Should any members like a copy of this DVD, we will readily provide them by mail – please contact us and supply us with an A5 stamped addressed envelope.

4. Recent and future activities

We propose that our next meeting should be a 'post-Christmas' Lunch. Following the success of early this year, we plan to attend the Brockworth Toby Carvery, on Thursday 21st January, at 12.30. The Carvery has on offer a wide menu including a choice of Carvery meals for £5. *We do ask if you would please let either of us know as soon as possible if you can attend so we can arrange seating.* Should any members who foresee difficulty in getting to the Toby Carvery, let us know beforehand, in the hope we might be able to find transportation. The Carvery is well served by public transport with the very frequent 10 bus service from Cheltenham and Gloucester stopping outside.

It is also our wish to hold a Patients' Day, probably in May or June, where we will meet, hopefully at Gloucester Hospital and invite a group of specialist clinical speakers. We would aim for a lunch to be provided. Further details on this will follow, but we would appreciate your views as to whether you would be likely to attend. An important aspect of the Patients' Day would be for various members to give short presentations on their own situation – the key problems they have encountered and how they have overcome them – we find this information is probably the most valuable, particularly for people new to the wonderful world of living with an ICD. Please let us know if you are willing to participate

5. The N. Glos. ICD Group Automated External Defibrillator (AED) Project.

This began about 2 years ago. One of our members, Shirley Harvey, persuaded the choir of which she is a member (Gotherington Singers) to have a collection in aid of AED's at their 2007 Christmas Concert. This realised about £600. Shortly thereafter, the Rotary Club of Cheltenham Cleeve Vale generously donated £2,500. By the middle of 2008 another of our members (Anna Browne) gave us a significant sum of money - instead of receiving presents at her 50th Wedding Anniversary to Jonathan, she asked for contributions to the 'AED Fund'. Anna did not stop at this – she then persuaded the Bredon Bridge Club to contribute also. Funds were then swelled by ICD Group member Dave Bailes, who gave his time and energy to produce a DIY book that he sold around Gloucester, and he handed the proceeds to us. Moreover, the Pittville Townswomen's Guild made a generous contribution. With well over £4000 we set up a project to install AED's in the local community.

Our first step was to talk to Mr Kevin Dickens of the Great Western Ambulance Service (GWAS) at Staverton, Gloucester, who is responsible for raising the awareness of basic life support and AEDs throughout Gloucestershire. Kevin was able to identify locations in the county where, should someone suffer from Sudden Cardiac Arrest, the Emergency Services might have some difficulty arriving at the scene within a few minutes – there are many semi-rural locations where this might apply. We specifically wanted areas of high footfall (supermarkets, shopping malls, schools, theatres etc.) and the location that we chose was Cleeve School in Bishops Cleeve. This has a student population of over 1600, a staff of over 200, and a Sports Hall that is used evenings and at week-ends.

Second, we spoke to the Arrhythmia Alliance and the SADS Trust; both organisations have great experience of placing AEDs in the community. We were advised of the various issues and hurdles we might encounter. For the location we had chosen it was suggested that AEDs should be complemented with oxygen equipment. Although the equipment was clearly accessible and on view, it was thought unlikely that vandalism would be a problem, as close supervision of usage would be maintained at all times by trained staff in the school and the sports centre. The cabinets containing the AEDs are alarmed, which would sound when opened. The equipment was recorded on the Great Western Ambulance Service Computer-Aided Dispatch System, thereby being available for relevant 999 calls.

On Tuesday November 10th 2009, Olly Morgan, the Gloucester and England Rugby player inaugurated the placement of Automated External Defibrillators (AEDs) and oxygen therapy equipment at Cleeve School, Cheltenham. This marked the culmination of the joint project between the Rotary Club of Cheltenham Cleeve Vale, the Great Western Ambulance Service, St Johns Ambulance and the North Gloucestershire ICD Support Group.

An AED is a vital piece of life saving equipment for someone suffering a Sudden Cardiac Arrest, a problem all too common these days. AEDs are located throughout Gloucestershire and are being deployed within minutes, which enhances the chance of survival from this condition. Olly Morgan who readily agreed to support this venture said "Raising the awareness of the benefits of basic life support and using this type of equipment will have the potential to save lives". The inauguration was attended by the project team members and contributors as well as Mr Ted Seaman, who recently suffered Sudden Cardiac Arrest and whose life was saved by the rapid use of an AED in a similar environment. Ted, complete with a new ICD, has recently become a member of the ICD Support Group and is now very active in helping GWAS to publicise the importance of AEDs in the community. The Gloucestershire Echo gave us a half-page spread to help publicise the importance of AEDs.

Two AEDs have been installed in the school, one in the first aid room at the Student Reception Area and one in the Sports Centre in another part of the campus. The latter location is also open at evenings and weekends to members of the public and the AED will provide a vital piece of first aid support during these times. We added oxygen respiration equipment, as advised by the Ambulance Service, and the staff training programme covered the use of oxygen, as well as CPR and use of AEDs. Dr Stuart Wilson, Associate Head Teacher at Cleeve School, said "We were delighted to be involved in the project which now provides additional first aid support to our students and staff, and to members of the public using the schools facilities."

Mr Kevin Dickens, Great Western Ambulance Service, (GWAS) said "Working with all these partners to deliver this project has been beneficial. Having Mr Ted Seaman at the inauguration again showcases the partnership working between St John Ambulance and GWAS. I am grateful to Cleeve Vale Rotary Club and North Gloucestershire ICD group for their commitment to this project."

The project was co-ordinated by the Cleeve Vale Rotary Club and the North Gloucestershire ICD Group. Dr Colin Prottey from the Cleeve Vale Rotary Club and the ICD group said this represented the completion of a project that began nearly 2 years ago. Cleeve Vale Rotary Club is very keen to give its continuing support to the installation of Life-Saving Equipment in the local community and will encourage other Rotary Clubs to do likewise. Robin Harvey of the ICD Support Group commented "Many of our members are fully aware of or have experienced Sudden Cardiac Arrest and have an Implantable Cardioverter Defibrillator (ICD) fitted. Our support group recognises the potential of AEDs to saving lives and is committed to extending our support to similar projects in Gloucestershire."

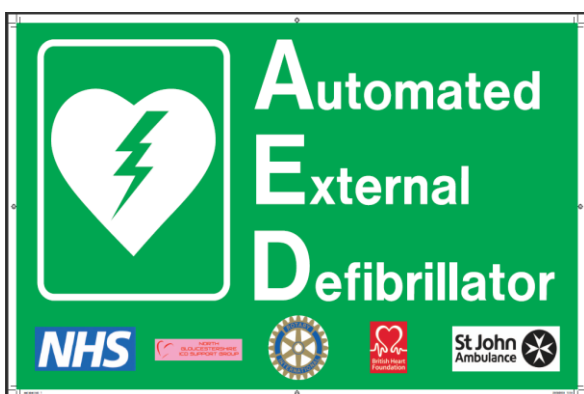
Staff at the school and Sports Centre were trained by St John Ambulance, Gloucestershire. Mrs Kim George of St John Ambulance said “We are really pleased to have worked on this initiative. We would encourage all members of the public to gain life saving skills in basic life support, first aid and AEDs, as these skills could help to save lives.

During the course of the Project we were awarded grants from The British Heart Foundation as well as from Rotary District 1100 towards the cost of the project. Cleeve Vale Rotary Club has generously offered us a further sum of money to continue the activity during 2010.. Moreover, The Gotherington Singers have very generously offered to us the 2010 Summer Concert to raise further money for AEDs in the county. We will also use this to publicise and to raise public awareness of Sudden Cardiac Arrest and the vital role of training, CPR and AEDs.

We think that as a group of people whose lives have been clearly influenced by Sudden Cardiac Arrest, and having benefited by the intervention of Emergency Services, The North Gloucestershire ICD Group is keen to help wherever it can to increase the current low survival rate of victims of SCA by supporting the installation of AEDs. The project team is now looking to install AEDs in other identified locations in the county. We will work closely with the Rotary movement in the UK and we particularly look to our members to help us by advising appropriate locations where AEDs might be installed in the community. A simple ‘Road-Map’ of the key steps to be taken has been produced and is available. We will readily help and advise any organisation that wishes to take up this initiative. Also, any contributions towards future placements will always be gratefully received.

For us, the most compelling comment was made by Kevin Dickens at the inauguration “ I would like AEDs to become like Fire Extinguishers – everyone recognises them and knows how to use them, they are in all the key places, and fortunately, we rarely have to use them...”

The project team - the ICD Group, Cleeve Vale Rotary Club, Great Western Ambulance Service and St Johns Ambulance - will continue for the foreseeable future. The Ambulance Service has identified a couple of possible locations where placement of AEDs would be beneficial and we will address these early in the New Year. We would be very pleased to hear particularly from any members who have thoughts on potential new locations for placements of AEDs. Moreover, we will try to encourage other Rotary Clubs in Gloucestershire to consider supporting this initiative.



6. Financial Support to the ICD Group

We would like to express our gratitude to those who attended the last meeting. A total of £57 was donated, which we use for our running costs. Any excess goes straight into the AED fund. We particularly appreciate such donations, as doing things this way we can meet our running costs without having to charge subscriptions, appoint a treasurer and auditor. Thank you.

We look forward to seeing you at our next meeting – please give us feedback to help us serve a useful purpose.

7. Travel Insurance

It has always been problematical and confusing getting travel insurance if you have an ICD fitted. My recent experiences in getting insurance for myself and Shirley may be useful to members. I rang a company I had previously dealt with and a whole series of relevant questions were asked and a price quoted. I then decided to try another company (MedicAlert) who offer an online quotation service. Previous attempts at online services stopped once you mention ICD and you were asked to call and speak to someone. However this web site was fully aware of the ICD situation and did actually come up with a quote that was noticeably cheaper than the earlier company I had spoken to. I did try one other online quotation service (AllClear) and it became obvious they were using the same medical questionnaire package. This was all very encouraging and in the end we did sign up with the MedicAlert quotation. The usual caveat still applies in that you must declare all existing medical conditions or you risk not being covered.

Colin Prottey, Robin Harvey - 16 November 2009

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The Implantable Cardioverter Defibrillator (ICD)

INTRODUCTION

The Implantable Cardioverter Defibrillator (ICD) has revolutionised the management of patients at risk of developing life-threatening ventricular arrhythmia. Several clinical trials have testified to their effectiveness in reducing deaths from sudden cardiac arrest in selected patients,¹⁻⁴ and the devices are implanted with increasing frequency.⁵⁻⁸

ICDs are used in both children and adults.

ICD systems consist of a generator connected to electrodes placed transvenously into cardiac chambers (the ventricle, and sometimes the right atrium and / or the coronary sinus (Figure 1). The electrodes serve a dual function allowing the monitoring of cardiac rhythm and the administration of electrical pacing, defibrillation and cardioversion therapy. Modern ICDs are slightly larger than a pacemaker and are usually implanted in the left subclavicular area (Figure 1). The ICD generator contains the battery and sophisticated electronic circuitry that monitors the cardiac rhythm, determines the need for electrical therapy, delivers treatment, monitors the response and determines the need for further therapy.

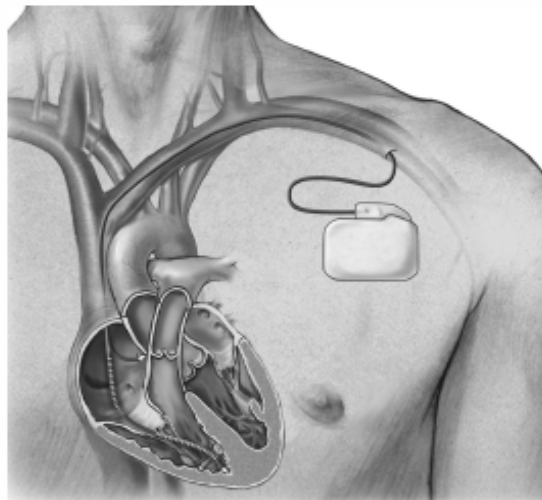


Figure 1 – Usual Location of an ICD (used with the permission of medmovie.com).

The available therapies include:

- Conventional programmable pacing for the treatment of bradycardia
- Anti-tachycardia Pacing (ATP) for ventricular tachycardia (VT)
- Delivery of Biphasic shocks for the treatment of ventricular tachycardia and ventricular fibrillation (VF)

- Cardiac resynchronisation therapy (CRT) (biventricular pacing) for the treatment of heart failure.

These treatment modalities and specifications are programmable and capable of considerable sophistication to suit the requirements of individual patients. The implantation and programming of devices is carried out in specialised centres. The patient should carry a card or documentation which identifies their ICD centre and may also have been given emergency instructions.

The personnel caring for such patients in emergency situations are not usually experts in arrhythmia management, nor familiar with the details of the sophisticated treatment regimes offered by modern ICDs. Moreover, the technology is complex, and evolving rapidly. The non-specialist may have difficulty remaining familiar with the detail of this. In an emergency, patients will often present to the ambulance service or Emergency Department (ED), and the purpose of this guidance is to help those responsible for the initial management of these patients.

GENERAL PRINCIPLES

Some important points should be made at the outset.

When confronted with a patient fitted with an ICD who has a persistent or recurring arrhythmia or where the ICD is firing, expert help should be summoned at the outset. Outside hospital this will normally be from the ambulance service who should be summoned immediately by dialling 999.

When confronted with a patient in cardiac arrest, the usual management guidelines are still appropriate (*refer to cardiac arrest and arrhythmia guidelines*).^{9,10} If the ICD is not responding to VF or VT, or if shocks are ineffective, external defibrillation / cardioversion should be carried out. Avoid placing the defibrillator electrodes / pads / paddles close to or on top of the ICD; ensure a minimum distance of 5cm between the edge of the defibrillator paddle pad/electrode and the ICD site. Most ICDs are implanted in the left sub-clavicular position (see Figure 1) and are usually readily apparent on examination; the conventional (apical / right sub-clavicular) electrode position will then be appropriate. The anterior / posterior position may also be used, particularly if the ICD is right sided.

Whenever possible, record a 12-lead electrocardiogram (ECG) and record the patient's rhythm (with any shocks). Make sure this is printed out and stored electronically (where available), for future reference. Where an external defibrillator with an

electronic memory is used, (whether for monitoring or for therapy) ensure that the ECG report is printed and handed to appropriate staff. Again, whenever possible, ensure that the record is archived for future reference. Record the rhythm during any therapeutic measure (whether by drugs or electricity). All these records may provide vital information for the ICD centre that may greatly influence the patient's subsequent management.

The energy levels of the shocks administered by ICDs (up to 40 Joules) are much lower than those employed with external defibrillators (100–360J). Personnel in contact with the patient when an ICD discharges will not be harmed, and no special precautions are necessary when handling or treating such patients. Chest compression and ventilation can be carried out as normal and protective examination gloves worn as usual.

Placing a ring magnet over the ICD generator can temporarily disable the shock capability of an ICD. The magnet does not disable the pacing capability for treating bradycardia. The magnet may be kept in position with adhesive tape if required. Removing the magnet returns the ICD to the status present before application. The ECG rhythm should be monitored at all times when the device is disabled. An ICD should only be disabled when the rhythm for which shocks are being delivered has been recorded. If that rhythm is VT or VF, external cardioversion/defibrillation must be available. With some models it is possible to programme the ICD so that a magnet does not disable the shock capabilities of the device. This is usually done only in exceptional circumstances, and consequently, such patients are rare.

The manufacturers of the ICDs also supply the ring magnets. Many implantation centres provide each patient with a ring magnet and stress that it should be readily available in case of emergency. With the increasing prevalence of ICDs in the community it becomes increasingly important that emergency workers have this magnet available to them when attending these patients.

Decisions to apply a Do Not Attempt Resuscitation (DNAR) order will not be made in the emergency situation by the personnel to whom this guidance is directed. Where such an order does exist however, it should not be necessary to disable an ICD to enable the implementation of such an order.

Many problems with ICDs can only be dealt with permanently by using the programmer available at the ICD centre.

The guidelines should be read from the perspective of your position and role in the management of such patients. For example, the recommendation to

'arrange further assessment' will mean that ambulance clinician should transport the patient to hospital. For ED staff however, this might mean referral to the medical admitting team or local ICD centre.

Coincident conditions that may contribute to the development of arrhythmia (like acute ischaemia, worsening heart failure), should be managed as appropriate according to usual practice. Oxygen (O₂) in high concentration will nearly always be appropriate.

Receiving ICD therapy may be unpleasant "like a firm kick in the chest", and psychological consequences may also arise.^{11,12} It is important to be aware of these, and help should be available from implantation centres. An emergency telephone helpline may be available.

MANAGEMENT

To be read in conjunction with the treatment algorithm (Appendix 1).

Approach and assess the patient and perform basic life support according to current BLS guidelines. Monitor the ECG.

1. If the patient is in cardiac arrest

- 1.1 Perform basic life support in accordance with current BLS guidelines. Standard airway management techniques and methods for gaining IV access (if required) should be used.
- 1.2 If a shockable rhythm is present (VF or pulseless VT), but the ICD is not detecting it, perform external defibrillation and other resuscitation procedures according to current resuscitation guidelines.
- 1.3 If the ICD is delivering therapy (whether by anti-tachycardia pacing or shocks) but is failing to convert the arrhythmia, then external defibrillation should be provided, as per current guidelines.
- 1.4 If a non-shockable rhythm is present, manage the patient according to current guidelines. If the rhythm is converted to a shockable one, assess the response of the ICD, as in 1.2 above, performing external defibrillation as required.
- 1.5 If a shockable rhythm is converted to one associated with effective cardiac output (whether by the ICD or by external defibrillation), manage the patient as usual and arrange further treatment and assessment.

2. If the patient is not in cardiac arrest

Determine whether an arrhythmia is present.

2.2 If no arrhythmia is present:

If therapy from the ICD has been effective, the patient is in sinus rhythm or is paced, monitor the patient, give O₂ and arrange further assessment to investigate possibility of new myocardial infarction (MI), heart failure, other acute illness or drug toxicity / electrolyte imbalance etc.

An ICD may deliver inappropriate shocks (i.e. in the absence of arrhythmia) if there are problems with sensing the cardiac rhythm or there are problems with the leads. Record the rhythm (with shocks if possible), disable the ICD with a magnet, monitor the patient and arrange further assessment with help from the ICD centre. Provide supportive treatment as required.

2.3 If an arrhythmia is present:

If an arrhythmia is present and shocks are being delivered, record the arrhythmia (and shocks if possible) on the ECG. Determine the nature of the arrhythmia. Transport rapidly to hospital in all cases.

TACHYCARDIA

2.3.1 If the rhythm is supraventricular i.e. sinus tachycardia, atrial flutter, atrial fibrillation, junctional tachycardia, etc. and the patient is haemodynamically stable, and the patient is continuing to receive shocks, disable the ICD with a magnet. Consider possible causes, treat appropriately and arrange further assessment in hospital.

2.3.2 If the rhythm is ventricular tachycardia:

- Pulseless VT should be treated as cardiac arrest (1.2 above).
- If the patient is haemodynamically stable, monitor the patient and convey to the emergency department.
- If the patient is haemodynamically unstable, and ICD shocks are ineffective, treat as per VT guideline.
- An ICD will not deliver anti-tachycardia pacing (ATP) or shocks if the rate of the VT is below the programmed detection rate of the device. Conventional management may be undertaken according to the patient's haemodynamic status.
- Recurring VT with appropriate shocks.

Manage any underlying cause (acute ischaemia, heart failure etc.). Sedation may be valuable. Disable ICD (apply magnet) **ONLY** if haemodynamically compromised.

Key Points – Implantable Cardioverter Defibrillators (ICD)

- ICDs deliver therapy with bradycardia pacing, ATP and shocks for VT not responding to ATP or VF.
- ECG records, especially at the time that shocks are given, can be vital in subsequent patient management. A recording should always be made if circumstances allow.
- Cardiac arrest should be managed according to normal guidelines.
- Avoid placing the defibrillator electrode over or within 5cm of the ICD generator site.
- A discharging ICD will not harm a rescuer touching the patient or performing CPR.
- An inappropriately discharging ICD can be temporarily disabled by placing a ring magnet temporarily over the ICD site.

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METHODOLOGY

Refer to methodology section.

The Implantable Cardioverter Defibrillator (ICD)

APPENDIX 1 – ICD Treatment Algorithm

