

# Understanding ECG Monitors



Working together to improve the diagnosis, treatment  
and quality of life for all those affected by arrhythmias

**[www.hearhythmalliance.org](http://www.hearhythmalliance.org)**

Registered Charity No. 1107496

# Glossary

**Ambulatory Monitoring** A longer-term wearable heart monitor which allows a doctor to track and analyse your heart rhythm over a greater period of time rather than capture your heart rhythm in a particular moment in time

**Arrhythmia** Irregular or abnormal heart rhythm that may be excessively fast or slow

**Atrial Fibrillation (AF)** is the most common arrhythmia (heart rhythm disorder), and a leading cause of AF-related stroke.

**Cardiac Physiologist** A healthcare professional skilled in interpreting and providing information on your heart rhythm

**Electrocardiogram (ECG)** A simple non-invasive test that records the heart's rhythm and rate

**Electrode** A small, sticky pad with a connector on top which picks up the electrical signal on the skin surface. They are used during a 12 lead ECG recording

## Important Information

This booklet is intended for use by people who would like to have more information about the options available for recording the rhythm of their heart through the use of a manual pulse check technique, smartphone app, 12 lead ECG, ECG patch, holter monitor or Insertable Cardiac Monitor (ICM). You can use this information booklet to help decide with your healthcare professional which is best for YOU.

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**Heart rate** The number of times your heart beats per minute

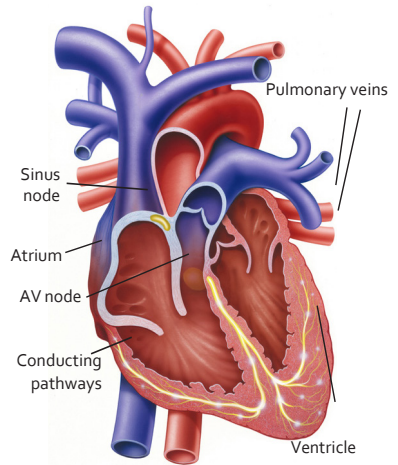
**Holter Monitor** Records the electrical activity of the heart from electrodes placed on the skin over a longer period of time

**Insertable Cardiac Monitor (ICM)** A small thin device inserted under the skin to record your heart rhythm activity

**Manual Pulse Check** A way to check your pulse rate and rhythm by feeling the pulse in your wrist

**Syncope** Unexplained loss of consciousness. Greek word – to faint

## The heart and normal conduction



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# Why your pulse and ECG are important

Your heart is an organ that pumps blood around your body regularly at a rate of about 70 times a minute. In order to do this, special cells in the heart create electrical impulses that make the muscles of the heart contract, which then pushes the blood around the body.

The electrical signal is coordinated in a certain way and runs at a certain speed to maximise its effectiveness. So, when you are walking or climbing stairs, your heart will beat faster than when you are resting.

The ECG is a recording of the electrical signal from the heart and gives a lot of information about how well it is performing. It can tell us if the heart is beating regularly and in normal (sinus) rhythm, it can tell us if the heart is beating at an appropriate rate (fast enough, or too fast for example), and for trained specialists such as cardiologists, electrophysiologists, nurses or cardiac physiologists, it can provide lots more information about how well the heart is performing and indicate any possible problems.



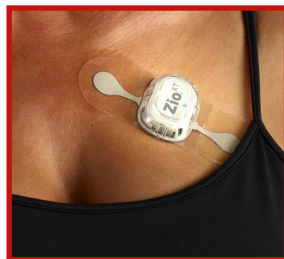
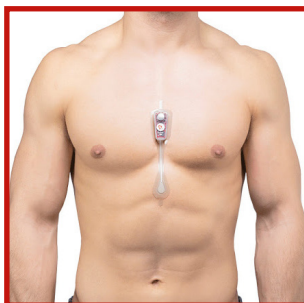
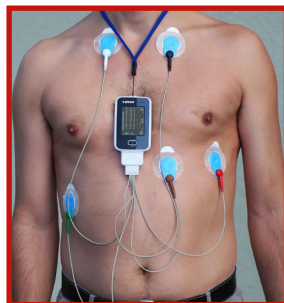
# How can your heart rhythm be measured?

There are many ways that your heart rhythm can be managed. They range from knowing your pulse ([www.knowyourpulse.org](http://www.knowyourpulse.org)), using a smartphone app or monitor, a 12 lead ECG, a patch or Holter monitor or for more long term monitoring of your heart rhythm – an insertable cardiac monitor (ICM).

## Community setting



## Hospital setting



# Manual pulse check – [www.knowyourpulse.org](http://www.knowyourpulse.org)

Measuring your own pulse rhythm is easy once you know how. You have probably seen it done in films or on television where a nurse or doctor take the wrist of a patient and look at their watch at the same time. What they are feeling is the pulse of an artery in the wrist as it carries the blood. It expands a little with every beat of the heart as the blood flows through that part. In the red box is a step-by-step guide of how to take a pulse.

What you are feeling for, firstly, is the pulse rhythm regular? - Does it have a tick tock rhythm, or are the beats uneven? Secondly, how fast or slow is the heart beating: below 60 beats per minute is slow and above 100 beats per minute is fast. It is often normal for the speed to vary, for example if you have just exercised, you would expect the heart to beat faster and if you are resting or are extremely fit, you can expect it to be slower.

Importantly is your pulse in a regular rhythm (and not jumping around like a fish flip/ flopping, or feeling palpitations)?

## Know Your **Pulse** in four steps

- 1 To assess your resting pulse rate in your wrist, sit down for 5 minutes beforehand.



Remember that any stimulants taken before the reading will affect the rate (such as caffeine or nicotine). You will need a watch or clock with a second hand.



- 2 Take off your watch and hold your left or right hand out with your palm facing up and your elbow slightly bent.

- 3 With your other hand, place your index and middle fingers on your wrist, at the base of your thumb. Your fingers should sit



between the bone on the edge of your wrist and the stringy tendon attached to your thumb (as shown in the image). You may need to move your fingers around a little to find the pulse. Keep firm pressure on your wrist with your fingers in order to feel your pulse.



- 4 Count for 30 seconds, and multiply by 2 to get your heart rate in beats per minute. If your heart rhythm is irregular, you should

count for 1 minute and do not multiply.

We recommend you practise doing this when you feel healthy and fine. If you feel unwell, you may want to take your pulse to reassure yourself. Look out for the following things:

- Is it jumping around? Is it fast, then slow, is it irregular, does it have a tick tock regular beat?
- Is it regular? Does it have a 'tick-tock' regular beat?
- Does it seem particularly slow or fast considering the situation? Remember, below 60 beats per minute is slow and above 100 is sometimes considered fast.

If you're feeling unwell with a fast/slow/irregular pulse then call NHS 111, but if you feel fine, then contact your GP. You can also pass this information on to your doctor to help them better understand and monitor in case you have an underlying arrhythmia (irregular heart rhythm).

# ECG recorder and Smartphone Apps

According to estimates, 87% of the UK adult population now owns a smartphone. Smartphones have all kinds of interesting health associated apps (app is short for application) including those that can record your heart rate or take an ECG.

AliveCor Kardia mobile ECG is currently the main mobile application used in the UK and recommended for use by NHS England. DO NOT use with a cardiac pacemaker, ICD, S-ICD or CRT or any other implanted electronic devices.



It allows electrode attachments to connect with a compatible mobile device (smartphone or tablet computer) and transmit, record, auto-analyse, store and view an ECG recording using a dedicated app. The ECG is captured digitally and can be viewed and emailed to your Doctor for a diagnosis. The app also has built-in AF detection algorithms that provides an instant interpretation to the user.

Unlike all other devices, Kardia Mobile documents the symptoms and rhythms at the moment they occur – and is the only device to offer this “symptom+rhythm” correlation so important to a Cardiologist who is making the diagnosis. All other devices require follow-on ECG or symptom diaries/human memory.

There are several smartphone apps that determine heart rate the built-in camera, but these are not yet validated. These apps use the smartphone flash or light source and camera to obtain a recording of pulse waves.

Some smartwatches are able to record an ECG trace as well as monitoring your heart rate. Although this does not replace more formal clinical tools, if these devices detect an abnormal rhythm, you should consult with your doctor with this information.





It is important that your heart rhythm is determined and not just your heart rate.

If you decide to use one of these apps to check your heart rhythm, we recommend you use it when you are feeling in good health for practice to ensure you are happy with how it is working. If you record a rate and/or rhythm that seems unusual, sit down, relax and take a deep breath and then take another reading or use the manual technique described in this booklet. If the reading is still abnormal and you feel unwell, call the NHS helpline (111) immediately and pass the information on to them with a description of how you are feeling.

Fibricheck is an app that you can download on your smartphone via Google Play or Apple Store. It can record an ECG in 30 seconds, it will monitor your heart rhythm and detect if your heart rhythm is too fast, too slow, jumping around (irregular), or if AF is suspected. It is not designed to diagnose a condition, so you should always discuss the results with your doctor.

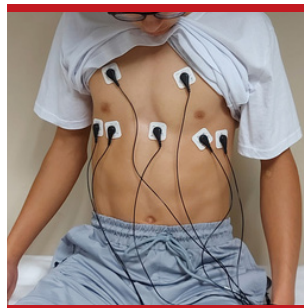
**For a FREE 24 Hour Trial:**

1. Scan the QR code with your smartphone (for most smartphones you can do this via your camera app designed to scan QR codes)
2. Download the FibriCheck app.
3. Create an account.
4. Your free trial will start automatically.



# 12 lead ECG

The 12 lead ECG is a very useful way for doctors and other health specialists to gain more information about your heart. The test is painless, easy and simple to carry out, is often performed in the GP surgery or local hospital by a nurse or physiologist and only takes a few minutes. You will need to remove your outer clothes so that sticky electrodes can be attached to your skin to pick up the electrical signals from your heart so wear something loose and easy to remove when you expect to have an ECG.



The recording is made on a special machine that has a number of wires coming from it that connect to the electrodes attached to your chest. There is a screen and a printer to print out the ECG.

An electrode is a small, sticky pad with a connector on top that is used only for you and picks up the electrical signal on the skin's surface. Good contact between the electrode and the skin is required, so the specialist may want to clean the skin lightly or remove any hair. After that, all you have to do is lie down, relax and breathe easy and let the specialist do their work. Within minutes it will be done and your doctor will have the information they need to help with your diagnosis and potential treatment.

The 12 lead ECG shows whether the heart is beating fast or slow and also shows if the rhythm is regular. Because there are many electrodes on the chest and legs, this gives different views of the electrical activity of the heart and allows a specialist to better understand if there is anything unusual.

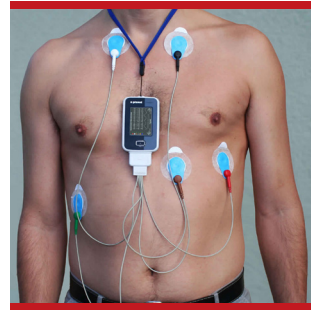
# Holter Monitor

The 12 lead ECG is very helpful to your doctor to help them understand what is happening with your heart in a more detailed way, but it only tells them what is going on at the time it is taken. Sometimes your heart will only occasionally beat in an unusual way and a Holter recording device is designed to record the activity of your heart over a longer period.

The Holter is named after the doctor who invented longer-term recording of the ECG. The recording may be taken for one, two or sometimes three days (24, 48 or 72 hours). Similar to the 12 lead ECG, a specialist will place electrodes on your chest. This time, though, they will be connected to a small, battery operated mobile recording device. This will normally slip into a case on a belt around your waist or other comfortable position. The electrodes will need to stay in place for the whole time the recording is taking place and you may also be asked to keep a diary of how you feel so that this can be compared to your heart rhythm.

You can go about your normal day when you are wearing the recorder, but swimming and showering are not recommended, as the recorder needs to be kept dry.

Once the recording has been made, a specialist will review the ECG over the whole period and see if there is anything out of the ordinary with your heart rhythm during that time.



# Extended continuous ambulatory monitoring

## What is it?

Arrhythmias (irregular heart rhythms) can occur intermittently therefore they may not be detected during a routine 12-lead ECG. Longer, continuous ECG may be required to capture the arrhythmia to enable your doctor to diagnose or confirm there is no irregularity.

A long-term wearable heart monitor allows a doctor to track and analyse your heart rhythm during normal activity. The monitor comes in the form of a small adhesive patch that you can wear on the upper left side of your body for up to two weeks, during which time the device will record and store data from your heart beat and rhythm. You can also highlight the points at which you experience symptoms by pressing a button on the patch to enable your doctor to see any correlations with your heart rhythm. At the end of the prescribed period you can remove the patch, post it back in the box provided and a detailed report will be generated and sent to your doctor to identify whether you have an arrhythmia (irregular heart rhythm) and to determine the diagnosis and appropriate treatment if needed.



## **Who is it designed for?**

For an individual whose symptoms are infrequent, the 24/48 hour monitor would not be appropriate. However, a monitor that will span up to two weeks is more likely to detect an episode. The device is unobtrusive and provides complete data with minimal disruption.

## **How is it fitted?**

The patch is a one-time use monitor that can be applied by your GP/nurse or at home. The skin is cleansed so the patch will stick effectively and remain in place for the prescribed period. You will be asked to record any symptom by pressing a button on the patch and noting it in a booklet.

## **Will it affect my day to day activities?**

This new form of monitor is designed for extended wear with as little upset to an individual's lifestyle as possible. There are no wires to manage or batteries to charge. You will be able to continue normal activities, including showering and exercise. The only attention to your monitor is pressing a button to mark symptoms and promptly mailing the patch upon completion.

# Insertable Cardiac Monitor

Another way to record a long-term ECG that will give the doctor even more information is to use an Insertable Cardiac Monitor (ICM). An ICM is applicable for arrhythmias that happen infrequently. Perhaps you experience recurrent syncope events and the cause has not been explained because it was not possible to capture an ECG at the time of the event.

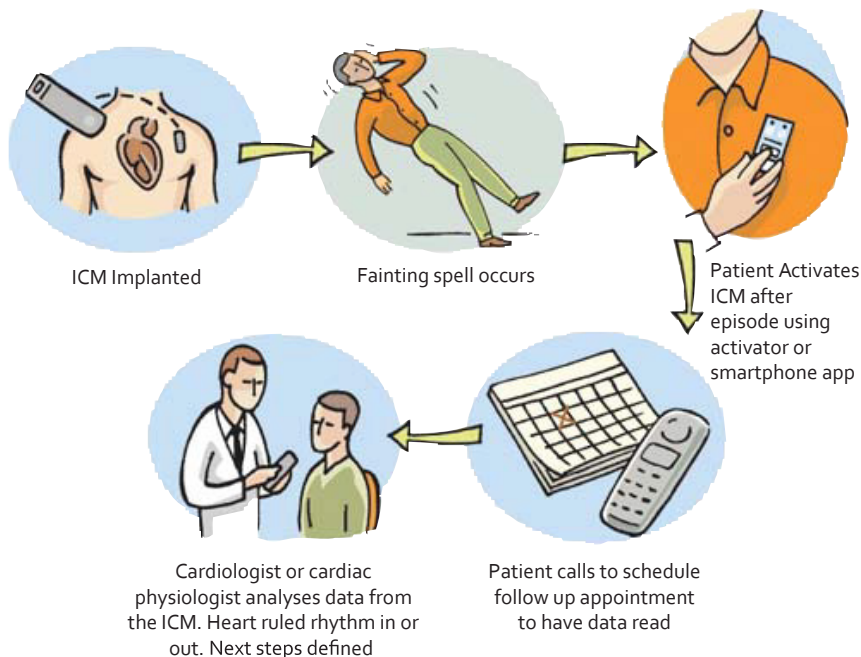
An ICM is a small thin device that is inserted under the skin and can record an ECG for up to three years. It can be set to be manually activated when you feel unwell or to record automatically if it detects something unusual or during a syncopal event. Your doctor will advise you on how it is set and what to do in the event of an episode.



The minimally invasive insertion needs to be undertaken in a hospital environment and it will be performed by a trained clinician. It takes about 15 to 20 minutes. You will be awake during the procedure and receive a local anaesthetic.

The doctor will first make the area below your left shoulder feel very numb, before making a small incision below the collar bone and inserting the device. The wound will have a dressing on it. You should keep the area clean and dry until it has healed; this usually happens quickly.

Specialists can receive information from the device by placing a special reader over the area. If the device model is wireless, the specialist can also receive information directly from the device without any action needed from you, via a remote monitor or a smartphone app if you have a newer ICM. They can then look at that information to see if there has been anything unusual with the rhythm of your heart. This is particularly useful if you have had any symptoms during this time.





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**"I was advised to purchase the Kardia Mobile, I'm pleased I did, it played an important part in capturing my paroxysmal AF episodes which allowed me to share with my Consultant"**

**Richard, Essex**

To view our patient resources, scan the QR code below:



Please remember that this publication provides general guidelines only. Individuals should always discuss their condition with a healthcare professional. If you would like further information or would like to provide feedback, please contact us.

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