Atrial fibrillation: assessment and diagnosis

Up to 90% of atrial fibrillation (AF) events may be asymptomatic (Page et al, 1994) and AF accounts for up to 1 in 6 strokes (Fuster et al, 2001). That is why it is so important that practitioners become proactive in the screening and detection of AF in primary care. In those people with asymptomatic AF a simple pulse check may be enough to detect AF (Cambell and Jackson, 2009).

AF is an age-related condition, with the highest percentage of diagnosed AF in people over the age of 65 years (National Collaborating Centre for Chronic Conditions (NCC-CC), 2006). Risk factors associated with AF include obesity, hypertension, chronic disease, established cardiovascular disease and diabetes. A family history of AF and cardiovascular disease also raises the risk of developing AF (Kannel et al, 1998; NCC-CC, 2006). Other risks include stimulants: smoking, alcohol, caffeine, high intensity sports and psychological and physical stress may induce or precipitate AF (Camm, 2000; Katan, 2005).

Pulse checks—it takes a minute
One way to improve the detection of AF is to identify opportunities in clinical practice to be proactive in screening for AF, for example, by adding a simple pulse check to existing protocols for established clinics such as hypertension, weight management, asthma, chronic obstructive pulmonary disease (COPD), spirometry, cardiovascular and diabetes clinics. Consider performing a pulse check at both opportunistic and routine visits, particularly if you know the patient/client has a family history of cardiovascular disease including AF. It may also be worth considering a pulse check during annual flu or vaccination clinics, particularly in your elderly population (NCC-CC, 2006).

The Arrhythmia Alliance provides guidance and information on conducting pulse checks for health professionals and patients (Table 1) (Figure 1).

A normal pulse is one between 60–100 beats per minute. However, a pulse that is within ‘normal’ limits on palpation may not mean the patient has a normal rhythm. A small cross-sectional sample of 105 UK practice nurses completed a questionnaire survey which showed that only one quarter (24%) of those surveyed performed routine manual pulse checks when recording a blood pressure (Madoc-Sutton et al, 2009). Most (67%) recorded a pulse rate when using a battery-operated blood pressure manometer. These devices may not be able to measure the blood pressure if the person has an arrhythmia. Palpating the pulse is important because it will indicate whether the pulse is regular or irregular in rhythm. Pulse palpation is a vital opportunity to detect AF in general practice.

The Screening for AF in the Elderly study (SAFE) found that opportunistic screening using pulse palpation in high-risk patients including the elderly, followed by recording an electrocardiogram (ECG), is as effective as systematic screening using ECG interpretation (Fitzmaurice et al, 2007). Any irregularly...

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Table 1. Resources

<table>
<thead>
<tr>
<th>Arrhythmia Alliance</th>
<th><a href="http://www.heartrhythmcharity.org.uk">www.heartrhythmcharity.org.uk</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial Fibrillation Association</td>
<td><a href="http://www.atrialfibrillation.org.uk">www.atrialfibrillation.org.uk</a></td>
</tr>
<tr>
<td>British Heart Foundation</td>
<td>Atrial fibrillation booklet: This booklet describes the heart’s normal rhythm, what atrial fibrillation is, diagnosis, complications, and different types of treatment: <a href="http://bit.ly/iUBPcCf">http://bit.ly/iUBPcCf</a></td>
</tr>
</tbody>
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Key words: Atrial fibrillation, assessment, diagnosis, pulse rate, pulse check, ECG, paroxysmal AF, persistent AF, permanent AF
ty in pulse should then be investigated further by recording an ECG, and this will determine whether the person is in a ‘normal’ sinus rhythm or an abnormal rhythm.

AF will present as an irregularly, irregular rhythm (Neal, 2007) on manual palpation with or without symptoms in those with permanent AF. Paroxysmal or persistent AF may not be detectable unless an event is occurring at the time of the pulse check or ECG.

If paroxysmal AF is suspected, an ambulatory recording device can be used to pick up such an abnormality, i.e. a 24-hour recorder may detect AF in those whose episodes are frequent daily events; a 7-day or 30-day recording device may be needed for those with less frequent episodes. To use such devices the patient needs to be referred to a ECG department to have the monitors fitted. The ECG department will usually interpret the ECG and send the results back to the primary referrer.

Assessment
To determine a correct diagnosis of AF an assessment should include taking a history to establish signs and symptoms, if any, and identify risk factors that may predispose the patient to AF or precipitate AF, including those with paroxysmal AF who at the time of assessment may have a regular pulse and a normal ECG on examination.

A history of any patient presenting with suspected AF should enable a differential diagnosis, but it is important to ask the appropriate questions about:

➤ Symptoms
➤ Risk factors
➤ Onset
➤ Duration
➤ Any precipitating factors or triggers
➤ Past history to identify risk factors or triggers
➤ Family history (Fox et al, 2004)
➤ Lifestyle issues, including substance abuse, e.g. smoking, drug and alcohol misuse.

### Table 2. Classification of atrial fibrillation-related symptoms: European Heart Rhythm Association (EHRA) score

<table>
<thead>
<tr>
<th>EHRA I</th>
<th>No symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHRA II</td>
<td>Mild symptoms; normal daily activity not affected</td>
</tr>
<tr>
<td>EHRA III</td>
<td>Severe symptoms; normal daily activity affected</td>
</tr>
<tr>
<td>EHRA IV</td>
<td>Disabling symptoms; normal daily activity discontinued</td>
</tr>
</tbody>
</table>

From: Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology, 2010
History taking

A history of someone with suspected AF should include the following key questions (Morgan et al, 2002; Kirchhof et al, 2007; NHS Improvement Service, 2009):

➤ During an episode, does the heart feel as though it is beating regularly or irregularly, fast or slow, pounding or fluttering? It may be helpful to ask if the person can tap it out on the table using the fingers

➤ Are there any precipitating causes? In what circumstances did the episode start, e.g. during exercise or rest, during emotional stress, after taking stimulants, e.g. alcohol, caffeine, smoking

➤ What are the presenting symptoms when it occurs, e.g. chest pain or angina, discomfort, palpitations, breathlessness, light-headedness, feeling faint, syncope, tiredness?

➤ How long does it last for, e.g. seconds, minutes, hours, days?

➤ How often do the episodes occur, e.g. every few days, every week or monthly?

➤ Are there any other predisposing factors such as a history of hypertension, coronary heart disease, heart failure, peripheral vascular disease, cerebrovascular disease, stroke, diabetes, chronic pulmonary disease, inflammatory conditions, age, family history of AF.

An AF-related symptom classification tool has been proposed by The European Heart Rhythm Association (2010) (Table 2). This is a useful tool to assess the severity of patient-reported symptoms and help determine the course of management to be taken.

The most common symptoms of AF include palpitations, discomfort, heavy sensation in the chest, light-headedness, feeling faint, syncope, tiredness. Palpitations may be felt when the heart rate increases to 110–140 beats per minute. Patients describe it as a ‘racing heart beat’ or like a ‘fluttering or butterflies’ sensation in the chest.

Other symptoms include breathlessness, feeling faint or light headed, and fatigue, which may be due to lack of oxygen and blood flow due to a reduced cardiac output. About 70% of blood flow is generated passively via gravity from the atria into the ventricles(628,746),(745,764). The rest of the blood flow is the result of atrial contraction or ‘kick’. In AF there can be a reduction of up to 30% in cardiac output. The loss of the ‘atrial kick’ makes it difficult for the ventricles to fill adequately.

Breathlessness occurs because the body compensates for a lack of oxygen by increasing the respiratory rate, and also as a result of reduced emptying of the atria, there will be ‘back filling’ or pooling of blood in the lungs causing breathlessness (The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC), 2010). The legs should be examined for peripheral oedema as pooling of the blood can occur in the extremities, precipitating heart failure.

Chest pain or discomfort, or angina may be induced by a lack of oxygen and reduced blood flow, which adds strain to the heart. Patients presenting with chest pain need to be treated as an acute presentation and referred as an emergency to rule out an underlying cardiac cause, e.g. myocardial infarction (MI). Normally only about 70% of cardiac output is used so that if the heart rate while in AF is within normal parameters, the common symptoms may not present; such people are difficult to diagnose because they are asymptomatic (University of Nottingham, 2011).

AF is associated with increasing age and the symptoms may be related to co-morbidities that are prevalent in later life. Symptoms such as breathlessness, weakness and fatigue may often be dismissed and assumed to be due to another condition, such as COPD, but they may be the result of unrecognized AF, and could be putting the person at greater risk of stroke, heart failure or cardiomyopathy.

An assessment should include a physical examination as part of a cardiac risk assessment, e.g. blood pressure, height, weight, body mass index (BMI). These should be followed by blood tests to determine potential correctable causes, e.g.

➤ Full blood count to detect anaemia
➤ Urea and electrolytes to detect an electrolyte imbalance
➤ Thyroid function test to assess for hyperthyroidism (AF occurs in 10–25% of patients with hyperthyroidism, especially in men and the elderly) (TFMAF, 2010)
➤ Coagulation screening and liver function tests to assess suitability for further therapy
➤ Cardiac enzymes and troponin testing to detect acute coronary syndrome or MI as a possible cause for the arrhythmia.
The possibility of infection should be considered whether the patient presents with or without fever. Other tests may include a chest X-ray to detect pulmonary pathology, heart failure, or tumours as a possible cause of AF (Fuster et al 2006).

AF is frequently found in people with diabetes owing to associated cardiovascular risk factors such as hypertension, coronary artery disease and left ventricular dysfunction. It is also thought that AF may be precipitated by autonomic dysfunction and dysfunction of ion channel pathways (TFMAF, 2010).

Knowing the frequency and duration of the event helps the practitioner determine the classification of AF (Table 3). Persistent and permanent AF will be classified according to the intervention used to try to reverse the arrhythmia to a sinus rhythm and depends on the success of the intervention.

Once a diagnosis is confirmed by an ECG (NCC-CC, 2006) it is important to classify the arrhythmia to determine long-term management of the patient (to be discussed in the final article of this series).

**Paroxysmal AF**

Paroxysmal AF tends to ‘come and go’. It usually lasts less than 48 hours but should cease in less than 7 days. The problem when diagnosing paroxysmal AF is in trying to capture the rhythm abnormality on an ECG. Unless it is possible to palpate the pulse and record the event when it occurs, it can be difficult to diagnose. Event recording devices are useful in such cases. Event recording devices can be used over periods of 24 hours for up to 30 days.

There is evidence to show that people diagnosed with paroxysmal AF eventually develop persistent and permanent AF because the events become more frequent and last longer in duration (de Vos et al, 2010; Hobbs et al, 2000). This process is thought to be owing to remodelling of the heart muscle and increased intra-atrial mass. This increases potential sites of excitability for accessory pathway signals that will lead to AF.

Patients with paroxysmal AF should be regarded as having a stroke risk similar to those with persistent or permanent AF in the presence of risk factors (TFMAF, 2010).

**Persistent AF**

Persistent AF lasts longer than 7 days and requires either pharmacological and/or electrical cardioversion to terminate the arrhythmia.

**Permanent AF**

Permanent AF is diagnosed when the person has been in AF for 1 year or longer. Usually there have been several unsuccessful attempts at conversion back to sinus rhythm. If not already initiated management should be to reduce risk factors and manage the heart rate to reduce further cardiac strain. A stroke risk assessment should be done for anticoagulation treatment to prevent complications associated with AF such as stroke.

**Lone or idiopathic AF**

Lone or idiopathic AF is usually found in patients younger than 60 years of age without any clinical symptoms or structural heart disease who have normal echocardiographic findings (Fuster et al, 2006). Such patients are considered at lower risk for thromboembolism until they reach older age or they present with other associated risk factors. This is why it is important to ensure that they are recorded on a practice AF register to ensure they are reassessed, in particular, for stroke risk (TFMAF, 2010).

**Diagnosing AF using an ECG**

It is important to ensure the person undertaking and recording the ECG is competent to do so. Misplacement of ECG leads can give misleading results and may lead to a misdiagnosis. To recognize an ECG showing AF it is important to understand the principles of interpreting an ECG.

**Sinus or ‘normal’ rhythm**

An ECG rhythm strip (lead II) shows the

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**Table 3. Classification of AF**

<table>
<thead>
<tr>
<th>Class</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Paroxysmal atrial fibrillation</td>
<td>A self-terminating arrhythmia that lasts for less than 7 days. It can be difficult to assess and so it is essential to obtain a good history during consultation to determine this as a paroxysmal AF</td>
</tr>
<tr>
<td>Persistent atrial fibrillation</td>
<td>When the arrhythmia lasts for more than 7 days but either self-terminates or is terminated via cardioversion then it is diagnosed as persistent AF. Persistent AF may eventually become permanent AF</td>
</tr>
<tr>
<td>Permanent atrial fibrillation</td>
<td>Once the arrhythmia has been long standing for more than 1 year it is classed as permanent AF. Usually, other treatments to restore AF rhythm back to sinus rhythm are unsuccessful</td>
</tr>
</tbody>
</table>

From Levy et al, 2005.
electrical activity of the heart (Figure 2). It consists of the following: a P wave which shows activation of the atria (depolarization). This shows electrical signals are being fired from the sinoatrial (SA) node to the atrioventricular (AV) node. This is only a small wave because it shows atrial activity and the atria are much smaller than the ventricles.

There is a slight delay at the AV node which is why there appears to be no activity directly after the P wave. The delay at the AV node allows the atria to empty. The ventricles are responsible for pushing blood out into the general circulation to the lungs and brain. Therefore, on an ECG this will be a bigger wave of activity than the atrial (or P) wave.

Ventricular activity is represented by the QRS wave. The T wave is called the repolarization or resting stage of the heart rhythm.

An ECG trace of a normal heart rhythm is shown in Figure 3.

**Question**

When looking at an ECG, ask yourself the following questions to distinguish a normal from an abnormal ECG:

- What is the rate?
- Is it fast or slow?
- Is the rhythm regular or irregular?
- Is there a P wave?
- Is the P wave always followed by a QRS complex?
- Is the QRS complex followed by a T wave?

The rate may be slow, normal or fast in AF.

If the patient has AF, there will be no P wave and the QRS complexes will occur at irregular intervals.

**Signs of AF on an ECG**

- Absence of P waves: a stimulus is not being initiated by the SA node
- Presence of f waves, which indicates the heart is fibrillating (Figure 4). Stimuli are being generated from other sites which may be up to a rate of 300–600 signals per minute
- Chaotic baseline owing to the presence of f waves, which are not uniform in shape or size
- Irregular QRS complex: irregular signals passing through the AV node are causing a reduced and irregular cardiac output.

**Figure 4 (below). ECG trace indicating atrial fibrillation. The arrows show an absence of P waves, replaced with multiple oscillating f waves of different shapes and sizes. The QRS complexes are showing an irregular rhythm.**

**Figure 5. ECG showing the ‘saw-tooth’ rhythm of atrial flutter**

**Figure 3. ECG showing a normal heart rhythm.**
This is why AF is defined as being an irregularly irregular rhythm.

**Atrial flutter**

A heart rhythm closely related to AF is known as atrial flutter. Atrial flutter looks different from AF on an ECG. The oscillating waves are more uniform and more regular in shape and size in atrial flutter, and are known as 'saw tooth' patterns (Figure 5).

Ventricular activity also appears regular and coordinated in atrial flutter. This is because fewer signals are generated than in AF, and they appear more coordinated and regular; as a result the AV node is better able to regulate the number of stimuli passing through it. The rate tends to be slower enabling the ventricles to fill adequately and thus symptoms are less noticeable in these patients.

The causes, symptoms and management of atrial flutter are similar to those of AF although the symptoms may be less severe. Atrial flutter is easier to convert back to sinus rhythm using both pharmacological and non-pharmacological interventions (this will be discussed in the final article of this series).

Once a diagnosis of AF has been confirmed, the patient should be added to the practice AF register (Table 4). An appropriate management plan should be discussed to assess for and reduce risk factors.

**Conclusions**

Primary care is a key place to provide opportunistic and systematic screening to detect AF. Adding a simple pulse check to clinic protocols may help improve detection of AF in people who are asymptomatic and at high risk of having a stroke. Early detection and diagnosis of AF is critical to avoid complications such as stroke and heart failure. Key questions that form part of a clinical assessment will help diagnose AF particularly in those with paroxysmal events who present with a regular pulse and a ‘normal’ ECG.

Diagnosis can be confirmed by an ECG (NCC-CC, 2006; Fitzmaurice, 2007). It is vital that a stroke risk assessment is conducted to assess for and reduce risk factors. Stroke risk assessment will be discussed in further detail in the third article in this series.

The Quality and Outcomes Framework asks practitioners to produce a register of patients diagnosed with AF. This register will enable practitioners to recall patients to ensure their condition is stable and allows for reassessment of their stroke risk on a regular basis. It may also help identify other family members who may be at risk of developing AF.

**The management of atrial fibrillation will be discussed in more detail in the next article in this series.**

**Conflicts of interest:** Christine Cottrell has received sponsorship from Boehringer Ingelheim and Sanofi Aventis for educational meetings.

**References**


Campbell J, Jackson A (2009) It takes a minute: Check your patient’s pulse to see if they are in atrial fibrillation. British Journal of Primary Care Nursing 5(6): 288–91


Table 4. Quality and Outcomes Framework indicators for atrial fibrillation

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Points</th>
<th>Payment stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF1: The practice can produce a register of patients with AF</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Initial Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AF4: The percentage of patients with AF diagnosed after 1 April 2008 with ECG or specialist confirmed diagnosis</td>
<td>10</td>
<td>40–90%</td>
</tr>
<tr>
<td>Ongoing management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AF3: The percentage of patients with AF who are currently treated with anti-coagulation drug therapy or an anti-platelet therapy</td>
<td>12</td>
<td>40–90%</td>
</tr>
</tbody>
</table>

From: British Medical Association and NHS Employers, 2011
KEY POINTS

➤ AF is detectable by performing a simple pulse check.

➤ A pulse check could be added to the assessment during clinics for long-term conditions.

➤ A clinical history is key in assessing the risks and causes of AF.

➤ An ECG should be used to confirm a diagnosis of AF.

➤ A classification of AF helps decide on an appropriate management strategy for the patient.


University of Nottingham Division of Nursing (2011) A beginners guide to normal heart function, sinus rhythm & common cardiac arrhythmias. http://tiny.cc/gt4ks (accessed 10 January 2012)

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