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# Initial management of cardiac arrhythmias

**Background**

Diagnosis of acute arrhythmias requires recognition and interpretation of important electrocardiogram (ECG) findings, and knowledge of Australian resuscitation guidelines.

**Objective**

This article aims to provide a guide for general practitioners in managing patients who present with acute arrhythmias in the rural or regional setting.

**Discussion**

Rural GPs need to be familiar with acute management of bradycardias, supraventricular tachycardia, atrial fibrillation and ventricular tachyarrhythmias, despite the fact that they may deal with these problems infrequently. A good local or regional network will help determine which patients can be treated locally, versus the need to refer to a hospital emergency department or outpatient setting. This might include a colleague reviewing an ECG sent by fax or email. Coronary care and emergency staff, both medical and nursing, have the expertise to participate collaboratively in such a network.

■ **Diagnosis of arrhythmias can be a challenge, in particular if a patient has no symptoms and a normal electrocardiogram (ECG) between symptomatic episodes. Ideally, the patient should be managed in an area with access to ECG monitoring, oxygen and an external defibrillator. Acute arrhythmias may require urgent intervention including resuscitation. All clinical staff should be trained in basic life support (BLS) and advanced life support (ALS) (see *Resource*).**

**Assessment of the patient with an abnormal rhythm****History**

Cardiac arrhythmia is an important differential diagnosis in any patient with palpitations, syncope, near syncope or chest pain. Palpitations are a sensitive but not particularly specific symptom of arrhythmias. They are usually of benign origin. An association with syncope, near syncope or dizziness, is more worrying.<sup>1</sup>

Symptoms preceded by postural change or micturition suggest orthostatic hypotension or micturition syncope. Relationship to an emotional upset should be sought, as severe anxiety may result in a vasovagal episode.

Exercise induced symptoms may indicate aortic stenosis or supraventricular tachycardia (SVT). However, exertion and anxiety can also be associated with sudden cardiac death due to prolonged QT syndrome, and clinical features alone can be poor predictors of arrhythmias in general practice.<sup>2</sup>

High risk features include cardiovascular disease (CVD), in particular cardiac failure, and history of ventricular arrhythmia (VA).

**Examination**

Examination should focus on vital signs and haemodynamic stability. It is also important to look for structural heart disease, eg. mitral prolapse – mid systolic click murmur, aortic stenosis – ejection



Table 1. Drug doses for treatment of arrhythmias

Drug	Initial dose	For urgent rate control or when IV therapy is indicated
Atenolol	50 mg orally once per day, titrate to 100 mg as required	5 mg IV slowly, titrate to effect, repeat if needed Maximum 10 mg
Metoprolol	50 mg orally twice per day, titrate to 100 mg twice per day as required	1 mg IV slowly, titrate to effect Maximum 10 mg
Diltiazem	30 mg orally three times per day, increase to 60 mg three times per day	Not available in Australia
Verapamil		2.5–5.0 mg IV slowly, repeat in 15–30 minutes as required Maximum 20 mg
Digoxin	1000 µg in 3–4 divided doses over 24 hours	No advantage over oral administration
Flecainide	50 mg orally twice per day (AF) 100 mg orally twice per day (VT)	Not applicable
Sotalol	80 mg twice per day	
Amiodarone	5 mg/kg IV over 20–120 mins	
Procainamide	Not applicable	17 mg/kg (maximum rate 50 mg/min) 100 mg every 5 minutes Maximum 500 mg

Note: Consultation with product information regarding side effects and contraindications is advisable

systolic murmur, and hypertrophic obstructive cardiomyopathy (HOCM) – systolic murmur at lower left sternal edge, louder on Valsalva.

## Investigations

All patients with suspected arrhythmia require an ECG. Useful blood tests include:

- troponin (suspected coronary artery disease)
- urea, creatinine and electrolytes (eg. K<sup>+</sup> abnormalities); (NB: the routine use of magnesium and/or calcium and phosphate produces a very low yield), and
- thyroid function tests (if clinical features of thyroid disease are present).

## ECG findings and management between episodes

The following findings may be precursors to tachyarrhythmias:

- short PR interval (<120 msec) and slurred upstroke of QRS complex (delta wave) are associated with SVT due to Wolff-Parkinson-White syndrome. Management may include anti-arrhythmic medications and electrophysiological radiofrequency ablation of the accessory pathway
- prolonged QT syndromes (>500 msec)<sup>3</sup> may be congenital or acquired, associated with sudden death due to ventricular fibrillation (VF) or torsades de pointes (polymorphic VF). Treatment includes betablockers,<sup>4</sup> normalising electrolytes, avoiding medications that prolong QT interval, and implantable cardiac defibrillators in patients who have had cardiac arrest, or syncope while on beta blockers. Risk factors for sudden death with prolonged QT interval

include: interval >500 msec, history of syncope, family history of sudden death

- short QT syndromes (<300 msec) are inherited in an autosomal dominant fashion. Patients are at risk of VF and should be referred to a cardiologist for consideration of implantable cardiac defibrillator.<sup>4</sup>

The following findings may be precursors to bradyarrhythmias:

- first degree heart block = PR interval >200 msec
- second degree heart block = some P waves not followed by a QRS
- bifascicular block = bundle branch block (wide QRS >120 msec) + axis deviation
- trifascicular block = bifascicular heart block + first degree heart block.

If patients have frequent symptoms, admission to a local hospital emergency department for cardiac monitoring may assist with the diagnosis. Consider admission to hospital for high risk patients with arrhythmia, including those with:

- syncope and CVD, or symptoms or signs of cardiac failure
- structural heart disease, eg. cardiomyopathy, HOCM
- VAs
- abnormal ECG, ie. signs of ischaemia, arrhythmias, significant conduction abnormalities, or those
- >65 years of age.

Ambulatory ECG is indicated when there is a need to clarify the diagnosis by detecting arrhythmias, QT interval changes to evaluate risk, or to judge therapy. Event monitors are indicated when symptoms are sporadic to establish whether they are caused by transient arrhythmias.<sup>4</sup>



## Acute management

### The unconscious/collapsed patient

Key take home messages from the Australian Resuscitation Council guidelines<sup>5</sup> are:

- any attempt at resuscitation is better than none
- reduce interruptions: deliver chest compressions 'harder and faster'
- attach pads and use defibrillator early
- if a cardiac arrest is witnessed by a clinician with access to a manual defibrillator: three shock strategy, otherwise give single shock for VF/pulseless ventricular tachycardia (VT)
- after each defibrillation, 2 minutes of CPR before checking for pulse
- all shocks with monophasic defibrillator are 360 J; biphasic defibrillators are 150 J unless otherwise specified by the manufacturer.

Unconscious patients with VAs are managed according to ALS guidelines.<sup>6</sup>

Early access to defibrillation saves lives. Due to the proven success of 'first responder systems' using defibrillators in public places,<sup>7</sup> defibrillation is now accepted as a BLS intervention. Given the success in training nonhealth care professionals,<sup>7</sup> all staff working in health facilities should have BLS skills and the ability to use either an automatic<sup>8</sup> or semi-automatic defibrillator.

Education options include brief face-to-face sessions<sup>9</sup> and online tutorials that include video demonstration of skills (see *Resource*).

### Initial management of conscious patients with cardiac arrhythmias

All patients require intravenous (IV) access, oxygen and continuous cardiac monitoring. *Table 1* lists medications used in the management of acute arrhythmias.<sup>9</sup>

### Ventricular tachycardia (Figure 1)

A conscious patient with a broad complex tachycardia has VT until proven otherwise; digoxin and calcium channel blockers are contraindicated. In conscious patients who are stable with adequate circulation and blood pressure, current evidence supports the use of IV procainamide<sup>4</sup> or amiodarone.<sup>4,8</sup> Consulting a cardiologist or regional emergency department may facilitate a second opinion regarding the ECG and initial treatment, or early consideration of hospital transfer to an appropriate bed.

### Supraventricular tachycardia (Figure 2)

If vagal manoeuvres such as Valsalva are unsuccessful, adenosine can be used to revert SVT. Administer adenosine as a bolus through a large proximal vein, with oxygen. The initial dose is 6 mg; this can be followed by 12 mg if the initial dose is unsuccessful. Adenosine causes a high grade, temporary AV block, and patients should be warned that they will experience an unpleasant sensation. Patients previously treated with adenosine may refuse it again. A small dose of midazolam (1.5 mg IV) may reduce recall of unpleasant symptoms without adverse outcomes.<sup>10</sup>

There is evidence to suggest verapamil and adenosine have similar clinical outcomes.<sup>11</sup> However, misinterpretation of the ECG is common and verapamil is contraindicated in broad complex arrhythmias. Therefore, adenosine may be safer.

### Atrial fibrillation (Figure 3)

The approach to management of atrial fibrillation (AF) is covered in detail in published guidelines.<sup>12,13</sup> Patients with haemodynamic instability due to acute AF require urgent DC cardioversion. Patients who are stable require anticoagulant therapy and rate control. Anticoagulation is achieved with low molecular weight heparin and warfarinisation unless contraindicated. There is a lack evidence to support superiority of rhythm control.<sup>12</sup>

Rate control focuses on controlling the ventricular rate while leaving the heart in AF rhythm. Atenolol, metoprolol, diltiazem and verapamil are all effective. Digoxin is a second line treatment, and IV loading rather than oral has not been shown to be superior to oral loading.

Rhythm control with reversion may be indicated in patients who:

- present for the first time in AF
  - are aged <65 years
  - have significant symptoms, or
  - are in cardiac failure
  - have no coronary artery disease, and
  - have no contraindication to chemical or electrical cardioversion.
- Reversion options include use of electrical direct current defibrillation or anti-arrhythmic drugs. Flecainide can be used if there is no structural cardiac disease, otherwise amiodarone is the drug of choice.

These options should be discussed with the patient. If the AF has been present for >48 hours, anticoagulate and refer for delayed cardioversion.

Figure 1. Ventricular tachycardia

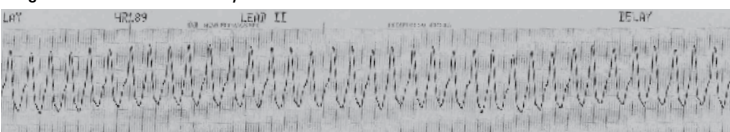


Figure 2. Supraventricular tachycardia

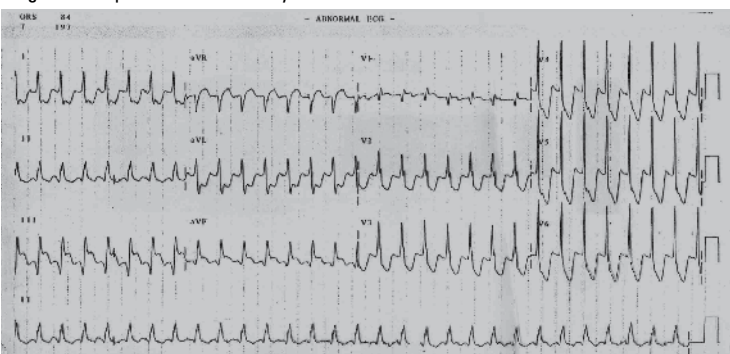




Figure 3. An ECG demonstrating a patient in AF. Note the irregular time interval and the loss of P waves preceding each QRS complex



For patients with known Wolff-Parkinson-White syndrome and AF, flecainide can be used for cardioversion. Lignocaine and AV node blockers are contraindicated (eg. digoxin, verapamil, diltiazem, beta blockers).

### Initial management of bradycardia

Bradycardia is generally defined as a heart rate of <60 bpm (Figure 4). Asymptomatic patients do not require treatment. Patients with symptomatic bradycardia should be placed in a supine position with feet elevated and given oxygen. Regardless of the cause, acute treatment aims to increase the heart rate.<sup>14</sup> Methods include:

- withholding or reducing the doses of negative chronotropes such as digoxin, beta blockers and calcium channel blockers such as verapamil. Remember, the combination of verapamil and beta blockers in the same patient is potentially dangerous
- atropine – at least 0.6 mg for the first dose (otherwise paradoxical slowing may occur<sup>1</sup>), then 0.5 mg per dose every 3–5 minutes up to a maximum of 3.0 mg. Use cautiously in the presence of acute coronary syndromes as the increased heart rate may worsen ischaemia or increase the zone of infarction<sup>14</sup>
- temporary external pacing is preferable to isoprenaline, which may cause hypotension<sup>15</sup>
- temporary pacemaker is indicated in cases of acute symptomatic heart block.<sup>4</sup> This may be achieved with transcutaneous cardiac pacing (TCP) performed under analgesia and sedation by a skilled operator (Table 2). Failures may occur if capture is not

Figure 4. Bradycardia

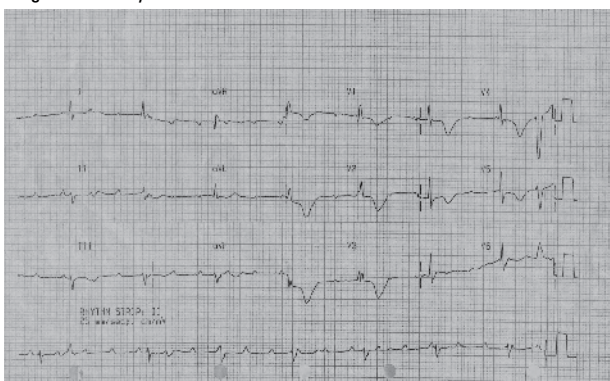


Table 2. Use of external transcutaneous pacing<sup>16</sup>

- Inform the patient of the reason for pacing, the discomfort that may be experienced, and the option of providing analgesia or sedation if needed
- Pacemaker pads, often labeled 'front/back' or 'anterior/posterior' are applied over the cardiac apex and just medial to the left scapula
- Use synchronous mode, set heart rate to 80. Set current initially to zero milliamperes (mA)
- Turn on pacemaker unit, increase current in 10 mA increments until capture is achieved
- Confirm capture on ECG by the presence of a widened QRS followed by an ST segment and T wave, and correlate with palpable carotid pulses
- In the unconscious patient, starting with a high current output (200 mA) to rapidly achieve capture and then decreasing the output to the level needed to maintain capture is acceptable

achieved or the patient's symptoms are not actually caused by the bradyarrhythmia

- permanent pacemakers are indicated in complete heart block in patients with a reasonable expectation of survival with a good functional status for more than 1 year.<sup>4</sup>

### Conclusion

Management of arrhythmias is dependent on ECG interpretation, and if there is doubt about the diagnosis, it is reasonable to seek a second opinion or formal report from someone experienced in ECG interpretation. This article attempts to briefly highlight the major issues for rural general practitioners. Referral to a specialist and/or published consensus guidelines for cardiac arrhythmias is appropriate when considering treatment in difficult cases.

### Resource

- Basic life support and advanced life support training for both health and nonhealth care professionals: [www.meditute.org](http://www.meditute.org).

Conflict of interest: none declared.

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