

MANAGEMENT OF ARRHYTHMIAS

The types of arrhythmias you are likely to encounter in the ICU can be broadly divided into bradyarrhythmias and tachyarrhythmias

Tachyarrhythmia

Heart rate > 100 bpm

Supraventricular

Paroxysmal supraventricular tachycardias

Atrial fibrillation

Atrial flutter

Multifocal atrial tachycardia

Junctional tachycardia

Sinus tachycardia

Ventricular

Ventricular tachycardia (≥ 5 beats at ≥ 120 bpm; non-sustained < 30 s, sustained > 30 s; monomorphic, polymorphic; with pulse, pulseless)

Ventricular fibrillation

Diagnosis

Rhythm strip is easily accessible in ICU. However, must obtain a 12-lead ECG as much as is possible

How to differentiate between SVT vs VT will not be mentioned in this manual

Echo may be necessary to exclude structural heart disease

Invasive electrophysiological study

Acute treatment

If in doubt, treat as VT. If patient is haemodynamically unstable, immediate DC cardioversion

Active seek out and treat reversible causes

- acute coronary syndrome
- acute respiratory failure: hypoxia, hypercapnea
- electrolytes imbalance
- drug: especially those prolong QTc. Commonly used in ICU: macrolide antibiotics, haloperidol, quetiapine, metoclopramide

In this ICU, our first line anti-arrhythmic is amiodarone unless contraindicated

Correct electrolytes : keep serum K > 4 mmol/L and Mg > 2 mmol/L

Narrow complex tacharrhythmias

- Haemodynamic unstable
Immediate DC cardioversion as per ACLS protocol
- Haemodynamic stable
 - Vagal manoeuvres
 - IV Amiodarone (loading dose of 150mg over 10 mins, may repeat if failed to rate control; followed by infusion 30 mg/hour)
Check with senior if failed to rate-control with amiodarone – may consider other anti-arrhythmics eg
 - Diltiazem (0.25 to 0.35 mg/kg loading followed by infusion 5-15 mg/hour) – caution hypotension
 - IV Beta- blockers (metoprolol titrate 0.5-1mg, esmolol 0.5mg/kg/min for one min followed by 0.05-0.2mg/kg/min) – caution hypotension
 - IV Digoxin (1 mg over 24 hours in increments of 0.25 to 0.5 mg, followed by 0.125 mg to 0.25 mg daily)

Wide complex tachyarrhythmias

- Haemodynamic unstable
Immediate DC cardioversion as per ACLS protocol
- Haemodynamic stable
SVT (see above)
VT
 - IV Amiodarone (loading dose of 150mg over 10 mins, may repeat if failed to rate control; followed by infusion 30 mg/hour)

Note: for tachyarrhythmias postoperative cardiac surgery – the surgeons prefer their protocol which is 300 mg amiodarone IV over the first hour and 900 mg infusion over the next 23 hours (600 mg if small patient)

Atrial Fibrillation

Deserves a separate mention as it is very commonly encountered in the ICU
Can be classified into

Recurrent: when AF occurs on 2 or more occasions

Paroxysmal: episodes that generally last ≤ 7 days (most last < 24 h)

Persistent: AF that last ≥ 7 days

Permanent: paroxysmal or persistent AF with failure to cardiovert or not attempted

Causes (refers to those seen in ICU, list not exhaustive)

Acute and temporary (alcohol, post-operative esp cardiac or thoracic surgery, electrocution, myocarditis, pulmonary embolism, other pulmonary diseases, hyperthyroidism, post-operative AMI)

Underlying CVS diseases (valvular heart esp mitral, coronary artery disease, hypertension esp if LV hypertrophy present)

Neurogenic – heightened vagal or adrenergic tone

Note: PAF can be a non-specific sign of failed weaning, acute respiratory pathology, sepsis, acute coronary syndrome

Assessment

What nature and symptoms associated with AF, clinical type, previous treatment received, underlying heart or pulmonary diseases or other reversible causes

Investigations – 12 lead ECG looking for LV hypertrophy, BBB, AMI
CXR – acute pneumonia, heart failure

Echo

Thyroid function test

Management

Unstable – DC cardioversion as per ACLS protocol

Stable – rate control (antiarrhythmics, cardioversion), anticoagulation

Anticoagulate if AF present \geq 48 hours and if persistent (LMWH bd dose or UH to APTT 1.5 -2 times)

Long term antiarrhythmic agent not necessary unless AF > 3 months' duration

Antiarrhythmics commonly used in ICU for AF

Amiodarone (loading dose of 150mg over 10 mins, may repeat if failed to rate control; followed by infusion 30 mg/hour) – caution long term side effects

Check with senior if failed to rate-control with amiodarone – may consider other anti-arrhythmics eg

Diltiazem (0.25 to 0.35 mg/kg loading followed by infusion 5-15 mg/hour) – caution hypotension

Beta- blockers (metoprolol IV, esmolol)

Bradyarrhythmia

Heart rate < 60 bpm

Sinus node dysfunction (sinus bradycardia, sinus pause)

AV node dysfunction (1st, 2nd, 3rd degree AV block)
Actively seek and eliminate causes (ICU mediated, extrinsic)

ICU vagally mediated causes

- Intubation, suctioning, increased intracranial pressure, urination, defaecation, vomiting, retching

Extrinsic causes

- Drugs (antiarrhythmic agents, Dexmedetomidine)
- Electrolytes (K, Mg, Ca)
- Hypothyroidism
- Hypothermia
- Sepsis
- Specific infection (eg. endocarditis)
- AMI (inferior AMI related AV blocks often transient; Anterior AMI related AV blocks often irreversible)

Acute treatment

May not need immediate treatment if haemodynamically stable

Correct electrolytes

Treat if

- Symptomatic sinus bradycardia (hypotension, ischaemia, escape ventricular arrhythmia)
- Ventricular asystole
- Symptomatic AV block (2nd degree Type I or 3rd degree with narrow-complex escape rhythm)

Give

- Atropine: IV 0.6 mg (max 3 mg)
- Isoprenaline: Infusion at 0.5 – 10 mcg/min (caution in ischaemic heart disease)

Pacing: for symptomatic bradycardia. Types including transcutaneous/epicardial/transvenous/permanent. Inform ICU senior if pacing required

Pacing

Indications for urgent transcutaneous pacing

1. Sinus bradycardia with symptoms (SBP <80mmHg) unresponsive to drug therapy
2. Mobitz type II 2nd degree AV block
3. 3rd degree heart block

4. Bilateral BBB (alternating BBB or RBBB with alternating LAFB/LPFB)
5. Newly acquired or age indeterminate bifascicular block (LBBB, RBBB with LAFB or LPFB) with 1st degree AV block

Because transcutaneous pacing may be uncomfortable, especially when prolonged, it is intended to be prophylactic and temporary. Refer to cardiologist for transvenous pacing in patients who require ongoing pacing and in those with a very high probability of requiring pacing

Indications for temporary transvenous pacing

1. Asystole
2. Symptomatic bradycardia (includes sinus bradycardia with hypotension and Type I 2nd degree AV block with hypotension not responsive to atropine)
3. Mobitz type II 2nd degree AV block
4. 3rd degree heart block
5. Bilateral BBB (alternating BBB or RBBB with alternating LAFB/LPFB)
6. Newly acquired or age indeterminate bifascicular block (LBBB, RBBB with LAFB or LPFB) with 1st degree AV block

Monitor to ensure appropriate pacing and sensing functions and absence of dislodgment (CXR)

Frequent (at least once per 24 hours) testing of pacing thresholds (pacing energy is usually set at more than 3 times the threshold)