**Cardiac surgery**

Overall mortality = 3%
(<1% for elective CABG, >30% for complex cardiac surgery with co-morbidities)

Pre-op preparation and intra-operative management largely determine post operative course

In general, post cardiac surgery recovery is relatively rapid. However, if complications occur, there is significant consumption of time, resources and budget. If prolonged ICU stay is required, the outlook is better if the barrier is pulmonary and worse if due to heart failure or neurological dysfunction

**Post cardiac surgery ICU management**

(See also section on Valvular disease for specific components)

**Handover**
- Procedure performed
- Indication for procedure
- Pre, intra and post op cardiac status (ECGs, ECHO, Cor angio, haemodynamics)
- Comorbidities
- Anaesthesia - ease of intubation, intra and post op course, blood loss, fluids and blood products given, urine output, analgesic plan

**Monitoring**

Consider invasive monitoring for high-risk surgery: 3 or more of
- Thoracic, abdominal and major vascular surgery
- Known IHD
- Known CCF
- Known cerebrovascular disease
- On insulin
- Renal impairment

**Methods**
- Continuous ECG + 12 lead
- SpO2
- EtCO2
- Continuous invasive BP
- U/O
- PA catheter (Merits & limitations)
- PiCCO (Merits & limitations)
- Temp
- Routine bloods
- CXR

**Fluids & electrolytes**

- No evidence for preference of crystalloid over colloid for volume resuscitation in this population. Volumes should be titrated to effect
- Keep K and Mg at higher range of normal to limit arrhythmias

**Cardiovascular**

Hypotension
- Assess for treatable cause -> commonly hypovolaemia (behind on fluids, blood loss), peripheral vasodilation (low SVRI), cardiac tamponade, heart failure, myocardial ischaemia (thrombosed, kinked, ruptured graft) or arrhythmia.
- Dobutamine, milrinone and levosimendan are ino-dilators with lusitropic effect. Excessive tachycardia will increase myocardial MvO2 in already at risk myocardium
Noradrenalin balances low SVRI from ino-dilators but excess increases afterload and cardiac work. IABP (I.C.P.D.O.C.) Reopening sternal wound with delayed closure may be required.

**Hypertension**
- Assess for and treat reversible causes -> pain, pre-existing HT with meds on hold, undiagnosed secondary HT.
- Therapeutic options: β-blocker (reduces MvO2 and vascular shear force), clonidine, SNP (cyanide toxicity esp if liver or renal impairment, theoretical coronary artery steal), GTN (less effective than SNP).

Low C.O. (C.I.)
- Preload, afterload, myocardial or obstruction.
- Consider also calibration error, measurement error.
- Treat cause.
- Support as for hypotension.

**Myocardial ischaemia**
- Perform serial ECGs.
- Consider thrombosed, kinked, ruptured graft, missed lesion, arrhythmia.
- Liaise with cardiothoracic and cardiology team.

**Arrhythmias**
- Management as per ILCOR guidelines.
- VF/ pulseless VT may require resternotomy and open cardiac massage and defibrillation.
- AF: often reverts to sinus spontaneously. Check K & Mg. ECG. Therapeutic options = *rate control*: β-blocker, amiodarone, sotalol, dexamethasone, atrial pacing, digoxin often ineffective in this population; *cardioversion*: Mg, amiodarone, ibuletide, DC; *anticoagulation* if > 48hrs or DC.

**Haemorrhage**
- Multiple factors in effect -> antiplatelet agents, anticoagulation, bypass induced thrombocytopaenia, coagulopathy +/- hypothermia & acidosis.
- Treat cause.
- Optimal transfusion threshold still debated - generally 7g/dL unless active bleeding, active ischaemia or elderly when 10g/dL is commonly used (TRICC trial).

**Emergency resternotomy**
- Performed when post cardiac surgery instability cannot be corrected with medical management.

**Respiratory**
- Hypoxia -> atelectasis, pulmonary oedema, (TR)ALI, pulmonary hypertension with patent foramen ovale (10-15% of pop.) causing right-to-left shunt. PE rare due to platelet and coagulation defects. HAP/VAP if prolonged mechanical ventilation.
- Generally aim to extubate as soon as practical, ideally no longer than 12 hours. Prolonged ventilation more likely post cardiac surgery if elderly patient with pre-existing pulmonary or vascular disease, poor ventricular function, reoperation or massive blood transfusion.

**Neurological**
- Delirium (pump encephalopathy, metabolic, drug, ICH), peripheral neuropathies, paraplegia, CVA.
- Identify and treat cause.
- Physiotherapy and neurology teams helpful.

**Renal**
- Multifactorial impairment post cardiac surgery.
- Treat identifiable causes.
- Usual supportive therapies.

**GIT**
- Generally uncommon.
- Elderly patient, complicated surgery and prolonged hypotension increases risk.
Sternotomy infection

- Increased risk if: male, obese, reoperation, diabetes, prolonged low C.O., dialysis required, blood transfusion
- Wound dehiscence suspected on inspection and palpation, confirmed on CXR or CT thorax. Involve cardiothoracic team

References

- Oh's Intensive Care Manual, 6th Ed.