

## Cardiac Advanced Life Support (CALS)

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Post cardiac surgery cardiac arrest is a specific and special situation in advanced life support (ALS). In the west, the incidence of post cardiac surgery cardiac arrest is reported to be 0.7% to 2.9% and is considered a low incidence. The survival rate is 79% and contrasts significantly with the survival after traditional in-hospital cardiac arrests (18%). Clear statistics are not available for Sri Lanka but the observed success rates from personal experience appear to be much lower.

The management of post cardiac surgery cardiac arrest is different from conventional resuscitation. The knowledge and awareness as well as integration of the Cardiac Advanced Life Support (CALS) algorithm among the Sri Lankan health professionals is low and may explain the reasons for the likely low success rates.

The key differences of CALS from the conventional Advanced Life Support (ALS) algorithm include avoidance of External Cardiac Compressions (ECC), avoidance of full-dose Adrenaline in favour of three stacked shocks and immediate re-sternotomy within five minutes.

Common causes for deterioration of the post cardiac surgical patient are hypovolaemia bleeding, Low Cardiac Output State (LCOS), graft and valve failure, tamponade, arrhythmias, vasodilatation and equipment failure.

In the management of cardiac arrest in the post cardiac surgical patient the priority is to correct the reversible cause of arrest quickly and to perform

immediate chest re-opening if these measures fail. In this patient group the precipitants for arrest are commonly reversible with Ventricular Fibrillation (VF) accounting for up to 50% and bleeding and tamponade contributing to a significant proportion. The CALS protocol and the algorithm has been designed for use in all Cardiac Intensive Care Units (CICUs) for any cardiac surgical patient.

The absence of a pulsatile arterial line with flat saturation and central venous pressure and ECG traces and reduction in end tidal carbon dioxide all signify cardiac arrest and are indications for the activation of the CALS protocol. In contrast to conventional resuscitation, and owing to potentially fatal complications of cardiac/graft injury, External Cardiac Compressions (ECC) can be delayed for up to 1 minute following identification of either VF or pulseless ventricular tachycardia (pVT) to allow for expeditious defibrillation and to allow for institution of pacing in asystole or severe bradycardia. After this time, conventional ECC should be commenced. Pulseless electrical activity (PEA) arrests should receive immediate ECC in line with conventional published guidance.

In VF arrest, immediate defibrillation with three sequential shocks at 150 Joules is advised. If unsuccessful, immediate re-sternotomy is advised. During early re-sternotomy, a bolus of 300 mg of Amiodarone should be administered with a further dose of 150 mg in refractory cases. Lidocaine at a dose of 1 mg kg<sup>-1</sup> is a suitable alternative.

Many patients arrest with a non-shockable rhythm

resulting from tamponade, tension pneumothorax, or severe hypovolaemia (often secondary to bleeding). Hence, if immediate pacing fails to resolve an asystolic arrest or if the presenting rhythm is PEA, then immediate ECC should commence whilst preparing the patient for re-sternotomy.

In the situation of cardiac arrest refractory to immediate treatment, emergency re-sternotomy should occur **within 5 minutes** to facilitate internal cardiac massage and/or defibrillation (at 20 Joules).

A six person team performing the six key roles in the arrest management has been advocated.

The six roles for the attending personnel have been designated as:

1. External cardiac massage
2. Airway and breathing
3. Defibrillation.
4. Team leader
5. Drugs & syringe drivers
6. ICU coordinator

The CALS re-opening kit which contains the bare essentials to access the heart in the shortest possible time are as in fig 1:



**Fig 1 :** The CALS re-opening kit

Given the success of the CALS algorithm as demonstrated by the high survival rates in the west it is high time that CALS training is initiated in Sri Lanka and CALS is integrated into the clinical practice wherever cardiac surgery is practiced on the island.

Further reading: NAP7. <https://www.rcoa.ac.uk/nap7-perioperative-cardiac-arrest>