



GUIDELINE 12.7

MANAGEMENT AFTER RESUSCITATION IN PAEDIATRIC ADVANCED LIFE SUPPORT

CONTINUING SUPPORT

Supportive therapy should be provided until there is recovery of function of vital organs. This may require the provision of oxygen therapy, mechanical ventilation, inotropic infusion and renal support for several days or longer. Recovery in infants and children is usually slow because cardiorespiratory arrest is often secondary to prolonged global hypoxaemia and ischaemia which implies that other organs sustain damage before cardiorespiratory arrest. Particular care should be taken to ensure adequate cerebral perfusion with well oxygenated blood and blood pressure appropriate for age.

The cause of cardiorespiratory arrest should be sought and treated. Remediable causes include hypoxaemia, hypovolaemia, hypo/hyperthermia, electrolyte disorders including hypo/hyperkalaemia and disorders of calcium and magnesium levels, relief of cardiac tamponade and pneumothorax and removal or antagonism of toxins, poisons and drugs.

Complications of CPR should also be sought, especially if secondary deterioration occurs. A chest radiograph should be obtained to check the position of the endotracheal tube, to detect pneumothorax, lung collapse, rib fracture or aspiration and to check if tamponade is suggested by the cardiac silhouette. A blood sample should be obtained for measurement of haemoglobin, pH, gas tensions, electrolytes and glucose. Echocardiography is useful to monitor recovery of contractility and exclude tamponade.

VENTILATION

Although cerebral oedema could be expected after cardiac arrest and hyperventilation is sometimes used as a temporary measure to reduce intracranial hypertension, hyperventilation results in hypocarbia which causes cerebral vasoconstriction and may impede venous return thus compromising blood pressure and consequently cerebral perfusion¹. Effects of ventilation on cerebral perfusion have not been studied after paediatric cardiac arrest but normocarbia therefore should be the target of post-arrest mechanical ventilation [Class B, Expert Consensus Opinion].

TEMPERATURE CONTROL

No randomised studies have been performed in children, but therapeutic induced hypothermia for adults after VF cardiac arrest^{2,3} [LOE II] and for newborns after birth asphyxia^{4,5} [LOE I] favour induction of hypothermia to optimise neurological outcome. It is acceptable to induce hypothermia (32-34°C) within 6 hours and maintain it up to 72 hours in children who remain comatose after resuscitation from cardiac arrest (Class B; Expert Consensus Opinion). This may require use of muscle relaxant to prevent shivering, use of sedation and EEG monitoring to detect otherwise unrecognizable convulsions.

Hyperthermia after cardiac arrest in adults and animals is associated with a worse neurological outcome¹. Hyperthermia should be prevented and treated aggressively after cardiac arrest [Class A; Expert Consensus Opinion].

GLUCOSE CONTROL

Poor neurological outcomes in adults after cardiac arrest are associated with spontaneous and induced elevated blood glucose levels while hypoglycaemia in the newborn infant exacerbates hypoxic induced brain injury¹. Consequently, blood glucose levels should be monitored at cardiac arrest and in the recovery phase with the aim of maintaining normoglycaemia. If insulin is used to control hyperglycaemia, care should be taken to avoid hypoglycaemia [Class B; Expert Consensus Opinion].

PROGNOSIS and PREDICTION OF OUTCOME

There is no objective evidence on which to base a prognosis or to reliably foretell the outcome during paediatric resuscitation⁶. Resuscitation in circumstances such as severe environmental hypothermia due to drowning in iced-water, or witnessed VF arrest, can result in better outcomes than average. It is acceptable (Class B, Expert Consensus Opinion) to continue resuscitation efforts longer in these circumstances. Long term outcome from paediatric cardiopulmonary arrest out-of-hospital is poor, but better if the arrest is respiratory alone or if cardiorespiratory arrest occurs in hospital^{7,8}.

CESSATION OF CARDIOPULMONARY RESUSCITATION

The decision to cease cardiopulmonary resuscitation should be based on a combination of factors including but not limited to the pre-arrest status, duration of arrest, response to resuscitation, remediable factors, duration and quality of resuscitation, likely outcome, opinions of experienced personnel, desires of parents and ready availability of extracorporeal life support for in-hospital arrest.

Although there are no highly reliable means of determining outcome, available scientific studies^{1,7} have shown that, in the absence of reversible causes (e.g., poisoning, hypothermia as in iced-water drowning), prolonged resuscitative efforts for children are unlikely to be successful and can be discontinued if after 20-30 minutes of appropriate advanced cardiac life support there is no return of spontaneous circulation. Severe hypothermia may confound a diagnosis of cardiac arrest. If feasible, a child in cardiac arrest out-of-hospital should be transported to hospital if there has been any ROSC during resuscitation.

If a situation is deemed futile (such as the realisation that resuscitation is prolonging death rather than saving life) or not in the child's 'best interests', physicians can legally and ethically withdraw or withhold treatment, preferably with the agreement of a parent or legal guardian⁹. Healthcare professionals are under no legal obligation to persist indefinitely to try to save life⁹.

ASSISTING PARENTS

Parents should be kept closely informed of events. They should be given the opportunity but not coerced to be present at the resuscitation of their child [Class B; Expert Consensus Opinion]. Although parents and relatives may take solace in having witnessed the efforts of those involved [LOE II] they may also experience emotional trauma¹⁰. Family presence may negatively affect performance of resuscitation by health-care personnel⁶. If resuscitation is unsuccessful or treatment is withdrawn or withheld, parents should be given the opportunity to be with their deceased child after equipment has been removed. If a coronial enquiry is necessary, removal of devices may require permission from a coroner. Follow-up discussion should be routinely offered to parents.

ASSISTING STAFF

The requirement for CPR may be sudden as when a child collapses out-of-hospital and arrives unannounced to the Emergency Department or when a child's condition deteriorates rapidly on a ward or occurs as a result of mishap. These situations always test the readiness, skills and abilities of individuals and the organisation of institutions. It is prudent to monitor performance with a view to improvement and not ignore the psychological impact which such events have on individuals. Sensitive debriefing sessions should be encouraged along with regular education.

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