Resuscitation Council UK

Special circumstances Guidelines

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Key points

- This section aims to ensure identification and appropriate treatment of potentially reversible causes in situations outside the usual cardiac arrest due to ischaemic heart disease situation, as covered in the BLS/ALS sections.
- There are no major changes in the 2021 Special Circumstances Guidelines, which follow the more detailed 2021 ERC guidelines.
- New topics include obesity, mass casualty incidents and cardiac arrest in sport, all of which are becoming increasingly frequent.
- The UK updated guidance for anaphylaxis has been incorporated into these guidelines, which includes guidance for refractory anaphylaxis.

Introduction

Guidelines 2021 are based on the International Liaison Committee on Resuscitation 2020 Consensus on Science and Treatment Recommendations for Basic Life Support and Automated External Defibrillation and the European Resuscitation Council Guidelines for Resuscitation (2021) Adult basic life support. (https://cprguidelines.eu/) Refer to the ERC guidelines publications for supporting reference material.

The Special Circumstances section of the 2021 guidelines is new for RCUK but covers important situations where modifications or additions to existing guidelines may be of benefit to the patient. It brings together in one section key information on cardiac arrest where consideration must be given to the cause or circumstances of the arrest and where specific treatments may play a key factor in outcome.

Key information is included on cardiac arrest in specific medical conditions (including the 4 H's and 4 T's), in addition to considerations needed in managing cardiac arrest in specific locations or settings. Specific information has been included for certain settings including Helicopter Emergency Medical Services (HEMS) and air ambulance settings, operating theatres and cardiac surgery.

Management of cardiac arrest in patients with known or suspected COVID-19 is not specifically included in these guidelines, but is covered within the separate COVID-19 guidance which is accessible from the RCUK website.

The process used to produce the Resuscitation Council UK Guidelines 2021 is accredited by the National Institute for Health and Care Excellence (NICE). The guidelines process includes:

- Systematic reviews with grading of the certainty of evidence and strength of recommendations. This led to the International Liaison Committee on Resuscitation (ILCOR) Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations.
- The involvement of stakeholders from around the world including members of the public and cardiac arrest survivors.
- Details of the guidelines development process can be found in the Resuscitation Council UK Guidelines Development Process Manual.

Specific causes

Hypoxia

- Follow the standard ALS guidelines when resuscitating patients with asphyxial cardiac arrest.
- Treat the cause of the asphyxia/hypoxaemia as the highest priority because this is a potentially reversible cause of the cardiac arrest.
- Effective ventilation with the highest feasible inspired oxygen is a priority in patients with asphyxial cardiac arrest.

Traumatic cardiac arrest (TCA)

- TCA (hypovolemic shock, obstructive shock, neurogenic shock) is different from cardiac arrest due to medical causes.
- The response to TCA is time critical and success depends on a well-established chain of survival, including focused pre-hospital and specialised trauma centre care.
- Resuscitation in TCA should focus on the immediate, simultaneous treatment of reversible causes. Chest compression must not delay treatment of reversible causes in TCA.
- Control haemorrhage with external pressure, haemostatic gauze, tourniquets and pelvic binder.
- Use ultrasound to identify the underlying cause of cardiac arrest and target resuscitative interventions.
- Immediate resuscitative thoracotomy (RT) has a role in TCA.

Anaphylaxis

- Recognise anaphylaxis based on:
    - sudden onset and rapid progression of symptoms
    - Airway and/or Breathing and/or Circulation problems
    - skin and/or mucosal changes (flushing, urticaria, angioedema) – but these can be absent in up to 20% of cases.
- The diagnosis is supported if there is exposure to a known allergen for that patient.
- Treat life-threatening features, using the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach.
- Adrenaline is the first-line treatment for anaphylaxis. Give intramuscular (IM) adrenaline early (in the anterolateral thigh) for Airway/Breathing/Circulation problems.

    - A single dose of IM adrenaline is well-tolerated and poses minimal risk to an individual having an allergic reaction. If in doubt, give IM adrenaline.
    - Repeat IM adrenaline after 5 minutes if Airway/Breathing/Circulation problems persist.
- Intravenous (IV) adrenaline must only be used in certain specialist settings, and only by those skilled and experienced in its use.
    - IV adrenaline infusions form the basis of treatment for refractory anaphylaxis: seek expert help early in patients whose respiratory and/or cardiovascular problems persist despite 2 doses of IM adrenaline.
- Follow the NICE guideline for the assessment and referral of patients suspected to have had anaphylaxis; specifically:
    - All patients should be referred to a specialist clinic for allergy assessment.
    - Offer the patient (or, if appropriate, their parent and/or carer) an appropriate adrenaline auto-injector as an interim measure before the specialist allergy review (unless the reaction was drug-induced).
    - Individuals prescribed adrenaline auto-injectors must receive training in their use, and an emergency management or action plan
- Further research is needed to better identify and treat patients at greatest risk of severe anaphylaxis.
    - Anaphylaxis reactions should be reported to the UK Anaphylaxis Registry at anaphylaxie.net (to register, email anaphylaxis.registry@ic.ac.uk). For more information, please refer to the RCUK 2021 Anaphylaxis Guidelines.

Sepsis

Cardiac arrest prevention in sepsis

- Follow the Surviving Sepsis Guidelines Hour-1 bundle for the initial resuscitation of sepsis and septic shock.
- Specifically:
    - Measure lactate level.
    - Obtain blood cultures prior to administration of antibiotics.
    - Administer broad-spectrum antibiotics.
    - Begin rapid administration of 30 mL kg^{-1} crystalloid for hypotension or a lactate ≥ 4 mmol L^{-1}.
    - Apply vasopressors if the patient is hypotensive during or after fluid resuscitation to maintain mean arterial pressure ≥ 65 mmHg.

Cardiac arrest treatment due to sepsis

- Follow standard ALS guidelines, including administering the maximal inspired oxygen concentration.
- Intubate the trachea if able to do so safely.
- Commence intravenous (IV) crystalloid fluid resuscitation with a 500 mL initial bolus. Consider administering further boluses.
- Control the source of sepsis, if feasible, and give antibiotics early.

Hypo-/hyperkalaemia and other electrolyte disorders

Recognition

- Consider hyperkalaemia or hypokalaemia in all patients with an arrhythmia or cardiac arrest.
- Check for hyperkalaemia using point-of-care testing if available.
- The ECG may be the most readily available diagnostic tool.

Treatment of hyperkalaemia

- Follow the treatment algorithm for management of hyperkalaemia in adults. (Adapted from the UK Renal Association Hyperkalaemia guideline 2020). For a patient in cardiac arrest:
    - Confirm hyperkalaemia using blood gas analyser if available.
    - Protect the heart: give 10 mL calcium chloride 10% IV by rapid bolus injection. Consider repeating dose if cardiac arrest is refractory or prolonged.
    - Shift potassium into cells: Give 10 units soluble insulin and 25 g glucose IV by rapid injection. Monitor blood glucose. Administer 10% glucose infusion guided by blood glucose to avoid hypoglycaemia.
    - Shift potassium into cells: Give 50 mmol sodium bicarbonate (50 mL 8.4% solution) IV by rapid injection.
    - Remove potassium from the body: Consider dialysis for refractory hyperkalaemic cardiac arrest.
    - Consider the use of a mechanical chest compression device if prolonged CPR is needed.
    - Consider ECLS or ECPR for patients who are peri-arrest or in cardiac arrest as a rescue therapy in those settings where it is feasible.

Hypothermia

Accidental hypothermia

- Assess core temperature with a low reading thermometer; tympanic in spontaneously breathing, oesophageal (distal) in patients with a tracheal tube or a supraglottic device with an oesophageal channel in place.
- Check for the presence of vital signs for up to one minute.
- Prehospital insulation, triage, fast transfer to a hospital and rewarming are key interventions.
- Hypothermic patients with risk factors for imminent cardiac arrest (i.e. core temperature < 30°C, ventricular arrhythmia, systolic blood pressure < 90 mmHg) and those in cardiac arrest should ideally be directly transferred to an extracorporeal life support (ECLS) centre for rewarming.
- Hypothermic cardiac arrest patients should receive continuous CPR during transfer.
- Chest compression and ventilation rate should not be different to CPR in normothermic patients.
- Consider the use of a mechanical chest compression device if prolonged CPR is needed.
- If ventricular fibrillation (VF) persists after three shocks, delay further attempts until the core temperature is > 30°C.
- Withhold adrenaline if the core temperature is < 30°C.
- Increase administration intervals for adrenaline to 6-10 minutes if the core temperature is 30-34°C.
- If prolonged transport is required or the terrain is difficult, use of a mechanical CPR device is recommended.
- In hypothermic cardiac arrest, rewarming should be performed with ECLS, preferably with extra-corporeal membrane oxygenation (ECMO) over cardiopulmonary bypass (CPB).
- Non-ECLS rewarming should be initiated in a peripheral hospital if an ECLS centre cannot be reached within hours (e.g. 6 hours).

Hyperthermia and malignant hyperthermia

Hyperthermia

- Heat syncope - remove patient to a cool environment, cool passively and provide oral isotonic or hypertonic fluids.
- Heat exhaustion - remove patient to a cool environment, lie them flat, administer IV isotonic or hypertonic fluids, consider additional electrolyte replacement therapy with isotonic fluids. Replacement of 1–2 L crystalloid at

500 mL h^{-1} is often adequate.
- Simple external cooling measures are usually not required but may involve conductive, convective and evaporative measures.
- Heat stroke - a ‘cool and run’ approach is recommended:
    - Remove patient to a cool environment.
    - Lie them flat.
    - Immediately active cool using whole body (from neck down) water immersion technique (1-26 °C) until core temperature < 39°C.
    - Where water immersion is not available, use any technique that provides the most rapid rate of cooling.
    - Administer IV isotonic or hypertonic fluids (with blood sodium ≤ 130 mmol L^{-1} up to 3x 100 mL NaCl 3%).
    - Consider additional electrolyte replacement with isotonic fluids. Substantial amounts of fluids may be required.
    - In exertional heat stroke, a cooling rate faster than 0.10°C min^{-1} is safe and desirable.

Malignant Hyperthermia

- Stop triggering agents immediately.
- Provide oxygen.
- Aim for normocapnia using hyperventilation.
- Consider correction of severe acidosis with bicarbonate (1-2 mmol kg^{-1}).
- Treat hyperkalaemia (calcium, glucose/insulin, hyperventilation).
    - Give dantrolene (2.5 mg kg^{-1} initially, and 10 mg k^{-1} as required).
- Start active cooling.
- Follow the ALS algorithm in cardiac arrest and continue cooling.
- After return of spontaneous circulation (ROSC) monitor the patient closely for 48-72h, as 25% of patients experience relapse.
- Contact an expert malignant hyperthermia centre for advice and follow-up.

Thrombosis

Pulmonary Embolism

Cardiac arrest management:

- Cardiac arrest commonly presents as pulseless electrical activity (PEA).
- Low $ETCO_2$ readings (< 1.7 kPa or 13 mmHg) while performing high-quality chest compressions may support a diagnosis of pulmonary embolism, although it is a non-specific sign.

- Consider emergency echocardiography performed by a skilled operator as an additional diagnostic tool.
- Administer thrombolytic drugs for cardiac arrest when PE is the suspected cause of cardiac arrest.
- When thrombolytic drugs have been administered, consider continuing CPR attempts for at least 60-90 minutes before termination of resuscitation attempts.
- Consider the use of a mechanical chest compression device if prolonged CPR is needed.
- Use thrombolytic drugs or surgical embolectomy or percutaneous mechanical thrombectomy for cardiac arrest when PE is the known cause of cardiac arrest.
- Consider ECPR as a rescue therapy for selected patients with cardiac arrest when conventional CPR is failing in settings in which it can be implemented.

Coronary Thrombosis

Detect parameters suggesting coronary thrombosis:

- chest pain prior to arrest
- known coronary artery disease
- initial rhythm: VF, pulseless ventricular tachycardia (pVT)
- post-resuscitation 12-lead ECG showing ST-elevation

Resuscitate and treat possible causes (establish reperfusion strategy):

- Patients with sustained ROSC
    - STEMI patients:
        - Primary percutaneous coronary intervention (PCI) strategy ≤120 min from diagnosis: activate catheterisation laboratory and transfer patient for immediate PCI.
        - Primary PCI not possible in ≤120 min perform pre-hospital thrombolysis and transfer patient to PCI centre.
    - NSTEMI patients: individualise decisions considering patient characteristics, OHCA setting and ECG findings.
        - Consider quick diagnostic work-up (discard non-coronary causes and check patient condition).
        - Perform urgent coronary angiography (≤120 min) if ongoing myocardial ischaemia is suspected or the patient is haemodynamically/ electrically unstable.

        - Consider delayed coronary angiography if there is no suspected ongoing ischaemia and the patient is stable.
- Patients with no sustained ROSC: Assess setting and patient conditions and available resources.
    - Futile: Stop CPR.
    - Not-futile: Consider patient transfer to a percutaneous coronary intervention (PCI) centre with ongoing CPR.
        - Consider mechanical chest compression and ECPR.
        - Consider coronary angiography.

Cardiac tamponade

- Decompress the pericardium immediately.
- Point of care echocardiography supports the diagnosis.
- Perform resuscitative thoracotomy or ultrasound guided pericardiocentesis.

Tension pneumothorax

- Diagnosis of tension pneumothorax in a patient with cardiac arrest or haemodynamic instability must be based on clinical examination or point of care ultrasound (POCUS).
- Decompress chest immediately by open thoracostomy when a tension pneumothorax is suspected in the presence of cardiac arrest or severe hypotension.
- Needle chest decompression serves as rapid treatment, and it should be carried out with specific needles (longer; non-kinking).
- Any attempt at needle decompression under CPR should be followed by an open thoracostomy or a chest tube if the expertise is available.
- Chest decompression effectively treats tension pneumothorax and takes priority over other measures.

Toxic agents

Prevention

- Poisoning rarely causes cardiac arrest.
- Manage hypertensive emergencies with benzodiazepines, vasodilators and pure alpha-antagonists.
- Drug induced hypotension usually responds to IV fluids.
- Use specific treatments where available in addition to the ALS management of arrhythmias.

- Provide early advanced airway management.
- Administer antidotes, where available, as soon as possible.

Cardiac arrest treatment

- Ensure your personal safety.
- Consider using specific treatment measures as antidotes, decontamination and enhanced elimination.
- Do not use mouth-to-mouth ventilation in the presence of chemicals such as cyanide, hydrogen sulphide, corrosives and organophosphates.
- Exclude all reversible causes of cardiac arrest, including electrolyte abnormalities which can be indirectly caused by a toxic agent.
- Measure the patient's temperature because hypo- or hyperthermia may occur during drug overdose.
- Be prepared to continue resuscitation for a prolonged period of time. The toxin concentration may fall as it is metabolised or excreted during extended resuscitation measures.
- Consult regional or national poison centres for information on treatment of the poisoned patient.
- Consider ECPR as a rescue therapy for selected patients with cardiac arrest when conventional CPR is failing in settings in which it can be implemented.

Special settings

Cardiac arrest in the operating room (OR)

- Recognise cardiac arrest by continuous monitoring.
- Inform the surgeon and the theatre team. Call for help and the defibrillator.
- Initiate high-quality chest compressions and effective ventilation.
- Follow the ALS guidelines with a strong focus on reversible causes, especially hypovolaemia (anaphylaxis, bleeding), hypoxia, tension-pneumothorax, thrombosis (pulmonary embolism).
- Use ultrasound to guide resuscitation.
- Adjust the height of the operating table to enable high-quality CPR.
- Check the airway and review the $ETCO_2$ waveform.
- Administer oxygen with a FiO_2 1.0.
- Open cardiac compression should be considered as an effective alternative to closed chest compression.

- Consider ECPR as a rescue therapy for selected patients with cardiac arrest when conventional CPR is failing.

Cardiac surgery

- Prevent and be prepared:
  - Ensure adequate training of the staff in resuscitation technical skills and ALS.
  - Ensure equipment for emergency re-sternotomy is available in the ICU.
  - Use safety checklists.
- Detect cardiac arrest and activate cardiac arrest protocol:
  - Identify and manage deterioration in the postoperative cardiac patient.
  - Consider echocardiography.
  - Confirm cardiac arrest by clinical signs and pulseless pressure waveforms.
  - Shout for help and activate cardiac arrest protocol.
- Resuscitate and treat possible causes:
  - Resuscitate according to ALS MODIFIED algorithm:
    - Do not routinely give adrenaline during the cardiac arrest.
    - VF/pVT: Defibrillate: apply up to 3 consecutive shocks (< 1 min).
    - Asystole/ extreme bradycardia: Apply early pacing at maximal output (< 1 min).
    - PEA - Correct potentially reversible causes. If paced rhythm, turn off pacing to exclude VF.
  - No ROSC:
    - Initiate chest compression and ventilation.
    - Perform early resternotomy (< 5 min).
    - Consider circulatory support devices and ECPR.

Dialysis unit

- Follow the universal ALS algorithm.
- Assign a trained dialysis nurse to operate the haemodialysis (HD) machine.
- Stop dialysis and return the patient’s blood volume with a fluid bolus.
- Disconnect from the dialysis machine (unless defibrillation-proof) in accordance with the International Electrotechnical Committee (IEC) standards.
- Leave dialysis access open to use for drug administration.
- Dialysis may be required in the early post resuscitation period.
- Provide prompt management of hyperkalaemia.

- Avoid excessive potassium and volume shifts during dialysis.

Dentistry

- Causes of cardiac arrest usually relate to pre-existing comorbidities, complications of the procedure or allergic reactions.
- All dental care professionals should undergo annual practical training in the recognition and management of medical emergencies, including the delivery of CPR, including basic airway management and the use of an AED.
- Check patient's mouth and remove all solid materials from the oral cavity (e.g. retractor, suction tube, tampons). Prevention of foreign body airway obstruction should precede positioning.
- Recline the dental chair into a fully horizontal position. If reduced venous return or vasodilation has caused loss of consciousness (e.g. vasovagal syncope, orthostatic hypotension), cardiac output can be restored.
- Place a stool under the backrest for stabilisation.
- Start chest compressions immediately while patient lying flat on the chair.
- Consider the over-the-head technique of CPR if access to either side of chest is limited.
- Basic equipment for standard CPR including a bag-valve-mask device should be available immediately.

Transportation

Helicopter emergency medical services (HEMS) and air ambulances

- Proper pre-flight-evaluation of the patient, early recognition and communication within the team, early defibrillation, high-quality CPR with minimal interruption of chest compressions, and treatment of reversible causes before flight are the most important interventions for the prevention of CPR during HEMS missions.
- Check the patient status properly before flight. Sometimes ground-based transport might be a suitable alternative, especially for patients with high-risk of cardiac arrest.
- Check security of the airway and ventilator connections prior to flight. For a cardiac arrest in an unventilated patient during flight consider a SGA for initial airway management.
- Pulse oximetry (SpO_2) monitoring and oxygen supplementation should be available immediately if not already attached.

- CPR should be performed as soon as possible, over-the-head-CPR (OTH-CPR) might be possible depending on the type of helicopter.
- If cabin size does not allow high-quality CPR, consider immediate landing.
- Always consider attaching a mechanical CPR device before flight.
- Consider three stacked shocks in case of shockable rhythm during flight.
- Defibrillation during flight is safe.

Cardiac arrest in sport

Planning

- All sports and exercise facilities should undertake a medical risk assessment of the risk of sudden cardiac arrest.
- Where there is a raised risk, mitigation must include resuscitation planning to include:
    - staff and members training in the recognition and management of cardiac arrest
    - direct provision of an AED or clear directions to the nearest public access AED.

Implementation

- Recognise collapse.
- Gain immediate and safe access to the Field of Play.
- Call for help and activate EMS.
- Assess for signs of life.
- If no signs of life:
    - Commence CPR.
    - Access an AED and defibrillate if indicated.
- If ROSC occurs, carefully observe and monitor the casualty until advanced medical care arrives.
- If there is no ROSC:
    - Continue cardiopulmonary resuscitation and defibrillation until advanced medical care arrives.
    - In a sport arena, consider moving patient to a less exposed position and continue resuscitation. This should be accomplished with minimal interruption to chest compressions.

Drowning

Initial rescue

- Undertake a dynamic risk assessment considering feasibility, chances of survival and risks to the rescuer:
    - Submersion duration is the strongest predictor of outcome.
    - Salinity has an inconsistent effect on outcome.
- Assess consciousness and breathing:
    - If conscious and/or breathing normally, aim to prevent cardiac arrest.
    - If unconscious and not breathing normally, start resuscitation.

Cardiac arrest prevention

- Airway:
    - Ensure a patent airway.
    - Treat life threatening hypoxia with 100% inspired oxygen until the arterial oxygen saturation or the partial pressure of arterial oxygen can be measured reliably.
    - Once SpO_2 can be measured reliably or arterial blood gas values are obtained, titrate the inspired oxygen to achieve an arterial oxygen saturation of 94-98% or arterial partial pressure of oxygen (PaO_2) of 10 -13 kPa (75-100 mmHg).
- Breathing:
    - Assess respiratory rate, accessory muscle use, ability to speak in full sentences, pulse oximetry, percussion and breath sounds; request chest x-ray.
    - Consider non-invasive ventilation if respiratory distress and safe to do so.
    - Consider invasive mechanical ventilation if respiratory distress and unsafe or unable to initiate non-invasive ventilation.
    - Consider extracorporeal membrane oxygenation if poor response to invasive ventilation.
- Circulation:
    - Assess heart rate and blood pressure; attach ECG.
    - Obtain IV access.
    - Consider IV fluids and / or vasoactive drugs to support the circulation.
- Disability:
    - Assess using AVPU or GCS.
- Exposure:
    - Measure core temperature.
    - Initiate hypothermia algorithm if core temperature < 35°C.

Cardiac arrest management

- Start resuscitation as soon as safe and practical to do so. If trained and able this might include initiating ventilations whilst still in the water or providing ventilations and chest compressions on a boat.
- Start resuscitation by giving 5 rescue breaths / ventilations using 100% inspired oxygen if available.
- If the person remains unconscious, without normal breathing, start chest compressions.
- Alternate 30 chest compressions to 2 ventilations.
- Apply an AED if available and follow instructions.
- Intubate the trachea if able to do so safely.
- Consider ECPR in accordance with local protocols if initial resuscitation efforts are unsuccessful.

Mass casualty incidents

- Identify hazards and immediately request assistance if necessary.
- Use adequate personal protection equipment (PPE) (e.g. bulletproof vest, respirator, long-sleeved gown, eye and face protection) depending on specific risks on scene.
- Reduce secondary risks to other patients and providers.
- Use a locally established triage system to prioritise treatment. Perform life-saving interventions in patients triaged as “immediate” (highest priority) to prevent cardiac arrest.
- Consider assigning a higher triage risk level to elderly and to survivors of high-energy trauma in order to reduce preventable deaths.
- Healthcare professionals must be regularly trained to use the triage protocols during simulations and live exercises.

Resuscitation where there is high risk of infection

- Resuscitation events will require healthcare workers to take extra precautions including cases where there is a high infection risk.
- In such situations, staff should always be aware of, and follow national guidance on the use of personal protective equipment (PPE). Guidance for the COVID-19 pandemic can be found at https://www.resus.org.uk/library/additional-guidance/guidance-covid-19.

- For resuscitation service planning, we recommend that local decision makers decide the level of risk within each area and follow contemporary national guidelines in order to ensure appropriate treatment.
- Integral to this will be clear policies and communication to all members of staff to ensure that there is no delay to resuscitation and no increased risk to healthcare worker safety.

Specific health conditions

Asthma and COPD

Cardiac arrest prevention

- Airway:
  - Ensure a patent airway.
  - Treat life threatening hypoxia with high flow oxygen.
  - Titrate subsequent oxygen therapy with pulse oximetry (SpO_2 94-98% for asthma; 88-92% for chronic obstructive pulmonary disease (COPD)).
- Breathing:
  - Assess respiratory rate, accessory muscle use, ability to speak in full sentences, pulse oximetry, percussion and breath sounds; request chest x-ray.
  - Look for evidence of pneumothorax / tension pneumothorax.
  - Provide nebulised bronchodilators (oxygen driven for asthma, consider air driven for COPD).
  - Administer steroids (Prednisolone 40-50 mg or hydrocortisone 100mg).
  - Consider IV magnesium sulphate for asthma.
  - Seek senior advice before giving IV aminophylline or salbutamol.
- Circulation:
  - Assess heart rate and blood pressure; attach ECG.
  - Obtain vascular access.
  - Consider IV fluids.

Cardiac arrest management

- Administer high concentration oxygen.
- Ventilate with respiratory rate (8-10 min^{-1}) and sufficient tidal volume to cause the chest to rise.
- Intubate the trachea early if able to do so safely.

- Check for signs of tension pneumothorax and treat accordingly.
- Disconnect from positive pressure ventilation if relevant and apply pressure to manually reduce hyper-inflation.
- Consider IV fluids.
- Consider ECPR in accordance with local protocols if initial resuscitation efforts are unsuccessful.

Obesity

- Delivery of effective CPR in obese patients may be challenging due to a number of factors:
    - patient access and transportation
    - vascular access
    - airway management
    - quality of chest compressions
    - efficacy of vasoactive drugs
    - efficacy of defibrillation.
- Provide chest compressions up to a maximum of 6 cm.
- Compressions may be necessary from the head end of the patient in some patients.
- Change the rescuers performing chest compression more frequently.
- Consider escalating defibrillation energy to maximum for repeated shocks.
- Manual ventilation with a bag-mask should be minimised and be performed by experienced staff using a two-person technique.

Pregnancy

Prevention of cardiac arrest in the deteriorating pregnant patient

- Use a validated obstetric early warning scoring system when caring for the ill-pregnant patient.
- Use a systematic ABCDE approach to assess and treat the pregnant patient.
- Place the patient in the left lateral position or manually and gently displace the uterus to the left to relieve aortocaval compression.
- Give oxygen guided by pulse oximetry to correct hypoxaemia.
- Give a fluid bolus if there is hypotension or evidence of hypovolaemia.
- Immediately re-evaluate the need for any drugs being given.
- Seek expert help early – obstetric, anaesthetic, critical care and neonatal specialists should be involved early in the resuscitation.

- Identify and treat the underlying cause of cardiac arrest (e.g. control of bleeding, sepsis).
- Give intravenous tranexamic acid 1g IV for postpartum haemorrhage.

Modification for Advanced Life Support in the pregnant patient

- Call for expert help early (including an obstetrician and neonatologist).
- Start basic life support according to standard guidelines.
- Use the standard hand position for chest compressions on the lower half of the sternum if feasible.
- If over 20 weeks pregnant or the uterus is palpable above the level of the umbilicus:
    - Manually displace the uterus to the left to remove aortocaval compression.
    - If feasible, add left lateral tilt – the chest should remain on supported on a firm surface (e.g. in the operating room). The optimal angle of tilt is unknown. Aim for a tilt between 15 and 30 degrees. Even a small amount of tilt may be better than no tilt. The angle of tilt used needs to enable high-quality chest compressions and if needed allow surgical delivery of the fetus.
- Prepare early for emergency hysterotomy.
- If over 20 weeks pregnant or the uterus is palpable above the level of the umbilicus and immediate (within 4 minutes) resuscitation is unsuccessful, deliver the fetus by emergency hysterotomy aiming for delivery within 5 minutes of collapse.
- Place defibrillator pads in the standard position as far as possible and use standard shock energies.
- Consider early tracheal intubation by a skilled operator.
- Identify and treat reversible causes (e.g. haemorrhage). Focused ultrasound by a skilled operator can be used to identify reversible causes and may also be used to assess if a fetal heart rate is present.
- Consider extracorporeal CPR (ECPR) as a rescue therapy if ALS measures are failing.

References

ERC Guidelines 2021: https://cprguidelines.eu/

Additional resources

- Obstetric Anesthetists Association OBS QRH

Related content

ALS: 2 Day Course (Advanced Life Support) Course

Downloads

Acute Coronary Syndrome Algorithm 2021 34.07 KB

Adult Reperfusion Therapy STEMI Algorithm 2021 32.37 KB

RCUK Adult QRH May 2024 1.48 MB