This guidance describes general principles and action to be taken for paediatric resuscitation. FAQs linked to specific situations are also discussed. These questions and answers may also be relevant to other scenarios.

Paediatric resuscitation principles

In the current clinical climate, as in the pre COVID-19 era, identifying deteriorating patients
early and taking steps to prevent cardiac arrest is critically important. However, some children will require cardiopulmonary resuscitation unexpectedly. In these it is essential that the correct personal protective equipment (PPE) is available and prepared. This may require having full aerosol generating procedure (AGP) protective equipment immediately available in a range of sizes in prominent places wherever children are cared for. These may need to be in grab bags for the arrest team to carry to an unexpected location (canteen, corridors, etc).

It is not acceptable for staff to have to choose between resuscitating a child and protecting themselves. Given that the vast majority of resuscitation scenarios in children are not primarily cardiac (children will almost always develop respiratory failure and respiratory arrest before cardiac arrest) it is highly likely that every resuscitation will become aerosol generating very quickly. Therefore, the RCPCH supports the RCUK statement on AGPs and resuscitation. Staff attending a paediatric resuscitation should first put on personal protective equipment to deal with aerosol generating procedures (eye protection/visor, FFP3 mask, gown/coverall and gloves).

We note there remains a difference on AGP between the Public Health England position advised by NERVTAG and the RCUK. This may be salient in adult resuscitation, which are primarily of cardiac origin and consideration of hands only chest compressions may be of benefit.

Make early treatment escalation plans to avoid inappropriate escalation and treatment.

All paediatricians and all those working in paediatrics should be aware of Public Health England and Resuscitation Council UK resources to support staff safety and effective resuscitation:

- A visual guide to safe PPE
- Video: Donning and doffing of Personal Protective Equipment (PPE) for non Aerosol Generating Procedures (AGP)
- Video: Donning and doffing of PPE for AGPs specific to COVID-19.
- Resuscitation Council UK Statement on COVID-19 in relation to Paediatric CPR and resuscitation in acute hospital settings
- Resuscitation Council UK Statement on COVID-19 in relation to Paediatric CPR and resuscitation in first aid and community settings
- PHE list of aerosol generating procedures. This list specifically excludes chest compressions and defibrillation.
- Resuscitation Council UK statement on chest compressions as AGP’s and other frequently asked questions (FAQ’s) re COVID-19 positive patients and resuscitation procedures
- Table: PHE recommended PPE for healthcare workers by secondary care inpatient clinical setting, NHS and independent sector
- Table: PHE recommended PPE for primary, outpatient, community and social care by setting, NHS and independent sector

Note: reference to PPE levels in these scenarios are based on Resuscitation Council guidance.

- Level 2 PPE: disposable gloves, disposable apron, fluid resistant surgical mask and
**Action on collapse**

*Figure 1: Action on collapse*
First responder to check for absence of signs of life and absence of normal breathing.

**DO NOT** listen or feel for breathing by placing your ear and cheek close to the patient’s mouth and nose.

Call **2222** to request further help.

Follow Trust advice and state risk of COVID-19 if policy.

Is the first responder wearing AGP PPE?

- **Yes**
  - Continue with RCUK paediatric algorithm

- **No**
  - Ensure oxygen on the patient
  - Locate bag and correct mask
  - Attach HME filter to the bag
  - Hand over to arriving resuscitation team
  - Doff PPE and exit the room
  - Don AGP PPE along with other rescuers and re-enter the room if requested
RCUK Paediatric advanced life support steps

1. Apply bag-valve-mask and heat and moisture exchanger (HME) filter with high flow oxygen and give 5 inflation breaths, check for response.
2. If no response or pulse below 60 beats per minute, or you are not sure, start chest compressions. If chest compressions not needed ventilate the patient at 12-20 breaths per minute.
3. Limit access to the room to essential staff in level 3 PPE for AGP.
4. Airway interventions (e.g. supraglottic airway insertion or tracheal intubation) must only be carried out by experienced individuals.
5. Use intraosseous access via intraosseous needle insertion (e.g. EZ-IO) for rapid vascular access if patient does not already have a cannula.
6. Defibrillate shockable rhythms rapidly, the early restoration of circulation may prevent the need to airway and ventilatory support.

Dispose of, or clean, all equipment used during CPR following local infection control guidelines.

Post resuscitation debrief is important and should be planned taking local infection control precautions into account.

Paediatric resuscitation FAQs

Questions may be relevant to other scenarios but have been linked to specific situations to give background and focus.

A previously fit and well 5-year-old is admitted to the COVID area of the children’s assessment unit. She has had 8 days of fever and cough and is now short of breath. Her nasopharyngeal swab on admission was positive for COVID-19. She deteriorates and suffers a cardiac arrest. A nurse wearing non-AGP PPE is present.

Is it acceptable for the nurse to start ventilations whilst wearing non-AGP PPE?

No. It is not acceptable to expect medical/nursing staff to put themselves at risk without the correct PPE. In the hospital environment anticipation is all important; if a child is entering a periarrest phase then team members must don PPE for AGP before they are needed. Wards with COVID-19 positive or suspected cases must have well-signed and preprepared PPE trolleys in prominent areas. Clinical teams must rehearse different scenarios and their response. Children will almost always develop respiratory failure and respiratory arrest before cardiac arrest. By training and preparation delays with emergency airway intervention should be kept to a minimum.

Are chest compressions AGPs?

There has been a discussion if chest compressions are AGP’s (see principles, above). The current position of RCUK is that chest compressions are an AGP and staff should wear PPE for APGs. International guidelines currently list CPR as an AGP but they do not universally make clear which steps of the CPR process (e.g. defibrillation, chest compression, airway
and ventilation) are AGP. The RCUK COVID-19 pediatric advanced life support algorithm reflects this. PHE does not recognise chest compressions as AGP but does allow for healthcare organisations to advise their clinical staff to wear AGP PPE as long as there is no delay in delivering treatment.

Are airway interventions AGPs?

Open suctioning of the respiratory tract, bag and mask ventilation, tracheostomy procedures including insertion and suctioning, induction of sputum and intubation are all AGPs.

Why does RCUK advice for PPE differ to that issued by PHE?

In the absence of high-quality evidence to state that anything less than AGP PPE is sufficient for healthcare professional safety, Resuscitation Council UK maintains its belief that AGP PPE provides the safest level of protection when administering chest compressions, CPR, and advanced airway procedures in known or suspected COVID-19 patients.

Why does the guidance for lay people and health care workers differ regarding the need for PPE?

Out of hospital cardiac arrest will almost certainly lead to death if basic life support interventions are not started immediately. PPE may be available but that is unlikely, and it is equally unlikely that if it was available the first responder will have been trained to don PPE quickly, effectively and safely. For out-of-hospital cardiac arrest, the importance of calling an ambulance and taking immediate action cannot be stressed highly enough. If a child is not breathing normally and no actions are taken, their heart will stop, and full cardiac arrest will occur. It is understood that doing rescue breaths will increase the risk of transmitting the COVID-19 virus, either to the rescuer or the child/infant. However, this risk is small compared to the risk of taking no action as this will result in certain cardiac arrest and the death of the child. If the first responder to the child/infant having an out-of-hospital cardiac arrest is a family member, they will have been exposed to the same level of infectivity within the home setting.

In hospitals health care workers are not infrequently faced with an emergency situation, the risk of this being COVID-19 related is higher and protecting themselves with correct PPE would not delay effective resuscitation if the hospital teams are effectively trained. Therefore, for the safety of health care workers who may be routinely placed in situations where risk of COVID-19 transmission is higher full PPE must be worn.

What about wearing PPE in other establishments such as in social care homes and inpatient psychiatric units?

Social care homes, in-patient children’s psychiatric units and other health care facilities away from acute care will need to perform their own risk assessments on requirements for PPE training for staff. If a cardiac arrest occurred (either illness related or traumatic) the risk of COVID-19 transmission would be the same as in the community and the need to provide effective basic life support whilst waiting for the ambulance would be the priority.

Can you explain the RCUK EPALS COVID-19 algorithm?

Priority is expectant planning. Ensure systems are in place for the recognition and treatment of the deteriorating child. For example, use of PEWS, regular monitoring and treatments for
peri-arrest situations. If an arrest situation occurs then the resuscitation team should wear full PPE, but the remainder of the algorithm remains the same as standard paediatric algorithms.

Some children will have an advanced care plan (ACP) or treatment escalation plan in place which may include a “do not attempt cardiopulmonary resuscitation decision”. It’s important to have hospital systems in place such that these directives are immediately highlighted and respected.

**What should happen to parents if present at the bedside of deteriorating or arrested children?**

Asymptomatic parents should be isolated with their child and should not leave the area except when wearing a fluid resistant surgical mask.

Presence of parents during resuscitation is well recognised as beneficial but their own vulnerabilities must be considered and they may be asked to withdraw for various procedures.

**Why can’t we start resuscitation in non-AGP PPE?**

Public Health England advise health care workers to protect themselves from infection as part of safe systems of working, for health and social care workers relative to their day-to-day work.

The best way to do that is to wear appropriate PPE for the duties and roles they are performing. This includes wearing correct PPE for AGP, of which paediatric resuscitation is one.

A child is suffering from prolonged seizure in a ward area.

**What initial management can be undertaken in non-AGP PPE in this situation? Are there general principles that could apply to all situations?**

Administration of oxygen, obtaining IV access and administration of anticonvulsants could be undertaken whilst wearing non-AGP PPE.

As there is a risk of respiratory arrest and need for airway protection, other team members should be donning level 3 PPE for AGP procedures in readiness.

**Can oxygen therapy be administered without AGP PPE in the floppy quiet child?**

Absolutely but an arrest call and arrival of team members in full PPE will be needed next.

**If the child desaturates and requires ventilations, why do we need an HME filter on the bag-valve-mask device and what does this do?**

A heat and moisture exchanger (HME) filter placed between the bag and the mask is designed to enhance the protection against airborne microbes to help to reduce the transfer of viruses and bacteria. Expert consensus on preventing nosocomial transmission during respiratory care for critically ill patients infected by 2019 novel coronavirus pneumonia recommend their use in this situation. They should be placed on the stem between the bag-
valve and mask, such that it becomes bag-HMEF-mask. Good mask fit is also required to reduce viral aerosolisation and a two-person technique can be the best procedure for this.

**What precautions are needed for cannulation/venous access in this and other situations?**

Standard PPE as required for risk assessment and hospital policies.

An infant was admitted for nasogastric tube (NGT) feeding with very poor feeding, an increased respiratory rate and saturations of 94% in air. COVID-19 was suspected and a swab was awaited. When the NGT was being inserted, the infant became very distressed and then limp with slow laboured breathing, saturations are 60% and a face mask delivering high flow oxygen is placed on the patient.

**Should the NGT be removed and how do we dispose of it safely?**

The NGT should be removed. This is a non-AGP and can be disposed of in clinical waste bins. It should be replaced as soon as practical to reduce build-up of stomach distension during resuscitation.

**What precautions do we take if suction is required?**

Open suctioning is an AGP and level 3 PPE is required.

**If an Xray is required, or the child needs to be moved to another ward, do we need AGP PPE or universal precautions?**

A risk assessment is needed beforehand to decide on level of PPE needed and safety of moving the patient after resuscitation as this will depend on the level of support the child requires. Moving a ventilated patient with any leak from the circuit is an AGP and needs to be done safely and effectively.

**If staff are present in non-AGP PPE, in order to fetch and carry, how far from the child’s bedside do they stand?**

Ways of isolating patients whilst having AGPs are needed. Ideally, they need to be in separate cubicles and those “fetching and carrying” to be on the other side of closed doors. For neonates it is suggested that 2m is sufficient given low risk of infection in the baby even in the COVID-19 positive mother.

Evidence is lacking on safe distancing for AGPs so there is no advice available on this from PHE

**Latest updates on this page**

Updates in this version (27 May 2020)

- 'APLS steps' subheading updated to 'RCUK paediatric advanced life support steps'.

Updates in this version (22 May 2020)
- Added Resuscitation Council UK logo
- Updated Action on Collapse flowchart