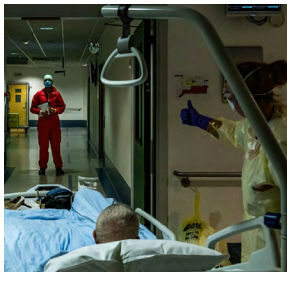
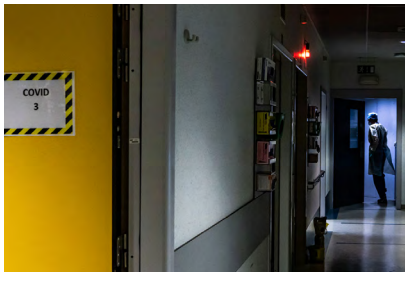
European Resuscitation Council COVID-19 Guidelines





EUROPEAN RESUSCITATION COUNCIL

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European Resuscitation Council COVID-19 Guidelines

Edition 1

Section 4

Paediatric Basic and Advanced Life Support

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▶ *This guideline was provided on 24 April 2020 and will be subject to evolving knowledge and experience of COVID-19. As countries are at different stages of the pandemic, there may be some international variation in practice.*

Introduction

Children are susceptible to coronavirus disease 2019 (COVID-19) but often seem to have only mild disease.[1-7] Very young children and children with co-morbid diseases may be more prone to severe illness.8 In the largest, currently-published, paediatric, case-series (Chinese CDC 01/16 – 02/08; n=2143) 5.2% had severe disease (defined as 'dyspnoea, central cyanosis and an oxygen saturation of less than 92%'), and 0.6% had critical disease.[9] However, many other pathogens and/or underlying aetiologies might cause respiratory failure in children and a clear diagnosis may be difficult to obtain.[10]

Taking this into account, the ERC paediatric guideline writing group [pWG] is aware that any changes to resuscitation guidelines might have a significant impact on the management and subsequent outcomes of critically ill children.[11-13]

These 'temporary' adaptations to the existing paediatric guidelines in the setting of COVID-19 should be interpreted within the context of each healthcare system, e.g. considering the degree of COVID-19 spread and evolving disease profile within that region, and the overall impact on available resources. Given the limited evidence, the following guidelines are mainly the result of expert consensus. They are based on the

recent ILCOR systematic review, and on the existing guidelines from other societies and councils, whilst including the data from existing paediatric clinical studies.[8,14-20] Indirect evidence from adult studies or non-clinical papers (on pathophysiology etc.) has also been considered in informing our final insights.

Protection of bystanders and healthcare professionals

a. *Healthcare systems should have procedures and necessary materials available for the proper protection of their providers (healthcare professionals, first responders etc.).* This includes having personal protective equipment [PPE] and guidelines on its use; having clear strategies on cohorting, testing and decontamination; and having written protocols and dedicated teams for high-risk procedures.[21]

   These procedures need to consider the different clinical contexts and associated risks, as well as available resources. Strategies for implementation in all settings, and ongoing (simulation) training is essential.

b. *Healthcare providers should use PPE when treating a critically ill child who has confirmed or suspected COVID-19.* The type of PPE should be defined at 'system' level, proportionate to the presumed risk of transmission.17 To limit the risk of transmission and conserve resources, only essential healthcare providers should be involved on scene / in the room.

c. *Lay bystanders should protect themselves as far as feasible and avoid actions with a high risk of transmission.* Rescuers who are caregivers or household members of the child will probably have already been exposed to the virus, and are likely to be more willing to provide support regardless of the potential increased risk.

d. Lay bystanders and healthcare providers must be aware of potential risks, and the decision on when and how to intervene should be an individual one, but only as far as it does not endanger another provider or bystander.

In approximately 70% of paediatric out-of-hospital cardiac arrests, rescuers are likely to be family members and therefore to have had previous exposure to SARS-CoV-2 (if the child was infected). They might also consider their personal risk far less important than the potential benefit for the child. This is unlikely to be true for random bystanders. Healthcare providers may also value the benefit for the child higher than their personal risk, but they should be aware of their responsibility towards their relatives, colleagues and the wider community as well.[23]

Recognition of the critically ill child

The current advice for the recognition of the seriously ill child still holds, whether or not the child has COVID-19.[24] The ERC emphasises the importance of early recognition of severe illness, initially by means of a quick hands-off observational assessment of behaviour, breathing and bodily colour (e.g. as in the Paediatric Assessment Triangle) and subsequently, if needed, a comprehensive stepwise pathophysiology-based ABCDE approach *(see also topic 3 for the management of airway and breathing)*.[25] There are no clinical signs or biochemical parameters with good sensitivity or specificity for COVID-19 in isolation.[2,26-28] Providers should have a high level of suspicion for either hypoxia or myocarditis, which can occur without other obvious clinical signs being present. Teamwork is important in the management of any seriously ill or injured child but the team size should be optimised at every stage (in view of effectiveness).

Airway & breathing management of a critically child with potential COVID-19 infection

a. Open and maintain, if needed, the airway by means of positioning and, as far as feasible, head tilt - chin lift *(see also topic 4)* or jaw thrust (in trauma or when performing bag-mask ventilation [BMV]). Regardless of the child's COVID-19 status, proper airway maintenance remains a crucial part of the respiratory management of any critically ill or injured child *(see also below)*.

b. Use supplemental oxygen early to support oxygenation (but avoid unnecessary hyperoxia).[30-31] Oxygen can be given by nasal cannula, a simple oxygen mask or a non-rebreathing mask. Provide the patient with a surgical mask when using any of these devices (in all patients for whom COVID-19 cannot be ruled out). If needed, give medication via MDI/spacer instead of a nebuliser (even if in itself not an aerosol-generating procedure (AGP), the latter may be associated with a higher risk of disease transmission). High-flow nasal cannula oxygen, again combined with a surgical mask, should be considered in those failing initial low-flow oxygen therapy. COVID-19 patients may respond well to continuous positive airways pressure (CPAP), potentially avoiding intubation.

c. Consider timely tracheal intubation to support oxygenation and ventilation in patients that fail NIV, who have decompensated respiratory failure with severe respiratory distress, or who are in cardiac arrest. If temporary bag-mask ventilation (BMV) is required, aim for minimal leak during ventilation and use a viral filter (heat and moisture exchanger (HME) filter or high-efficiency particulate air (HEPA) filter) between mask and bag. If a single rescuer is unable to create a tight mask seal, switch to a two-provider approach (the person doing chest compressions can pause to squeeze the bag). A supraglottic airway (SGA) may be considered by those experienced in their use, however it is important to ensure a proper seal. Prevention of aerosol generation with a SGA is less reliable than with a tracheal tube, but it may provide a better airway seal than a facemask.[31]

d. Airway interventions must be performed by the most competent provider available. Protocols should be in place for emergency and elective intubation of all children potentially having COVID-19.[16] Ideally, dedicated teams should be pre-defined and specific intubation trolleys (with adequate PPE, including face shields for staff involved) made available beforehand.[17] Cuffed tracheal

tubes are advised and providers should take care to inflate to a sufficient cuff pressure (before the first insufflation). Competent providers should consider, if available, the use of videolaryngoscopy instead of direct laryngoscopy, in view of both operator safety and improved visualisation. In the setting of CPR of these children, providers should pause chest compressions during an intubation attempt.

There is a high risk of transmission of virus during all airway procedures including tracheal intubation, inserting a supraglottic airway, performing BMV, non-invasive ventilation, a tracheostomy, disconnecting the ventilatory circuit, in-line suctioning or using an oro- or nasopharyngeal airway. These procedures demand that all providers who are present in the room wear airborne-precaution PPE.[16] Limit aerosol spread by inserting a viral filter (heat and moisture exchanger (HME) filter or high-efficiency particulate absorbing (HEPA) filter) between the patient's airway and breathing circuit, and an additional filter on the expiratory limb of a ventilator; clamp the tube and stop the ventilator before disconnecting; use a neuromuscular blocking drug to prevent coughing; and use closed suction systems.

Recognition of cardiac arrest in children and BLS algorithm

Check for *responsiveness* - in an unresponsive child, assess *breathing* visually (chest rise) and optionally by placing a 'hand on the belly'.[32] Do not approach the victim's mouth or nose at this stage. Cardiac arrest is defined by 'being unresponsive and not breathing normally'. Untrained lay rescuers will likely have called the emergency medical services [EMS] dispatcher (112/national emergency number) at the start; trained providers should do so before starting chest compressions. In cases where there are two or more rescuers, a second rescuer should call the EMS immediately.

Once cardiac arrest is identified, rescuers should *provide at least compression-only CPR*. In such a case, place a surgical mask over the child's mouth and nose before commencing chest compressions. The routine use of a cloth as an alternative is not advised because of the potential risk of airway obstruction and/or restriction of passive air movement (due to compressions); there is also no evidence that a cloth prevents airborne transmission. However, when a surgical mask is not available and this cloth encourages rescuers to provide support where otherwise they would not, they should use it (lightly draped over mouth and nose).

Unless a primary cardiac origin is likely ('sudden witnessed collapse'), those rescuers who are willing and able should also *open the airway and provide rescue breaths,* as per 2015 guidelines, knowing that this is likely to increase the risk of infection (if the child has COVID-19), but can significantly improve the outcome *(see 'Protection of bystanders and healthcare professionals')*.[24, 31]

When an *automated external defibrillator [AED]* is readily available, trained providers should use it as soon as feasible. An AED should primarily be advised as part of dispatcher-assisted CPR in those cases where the likelihood of a primary shockable rhythm is sufficiently high: in cases of sudden witnessed collapse; for children with a specific 'cardiac' history; or for children older than 1y of age without any identifiable non-cardiac cause of arrest, always provided there are at least two bystanders and an AED nearby.

Pre-hospital EMS or in-hospital ALS teams must wear airborne-precaution PPE before arriving at the patient's side, unless COVID-19 has been ruled out, even if it delays commencing or continuing CPR *(see "Protection of bystanders and healthcare professionals")*.[17] Protocols should be in place to facilitate this and to minimise delays. Personnel wearing only droplet-precaution PPE may consider providing initial defibrillation before putting on airborne-precaution PPE in children with an identified shockable rhythm. Once wearing airborne- precaution PPE, perform CPR according to the 2015 algorithms. Do not delay CPR in order to secure an invasive airway. Provide initial ventilations with a bag-mask *(see 'Airway & breathing management of a critically child with potential COVID-19 infection')*.

Communicate the child's COVID-19 status to all providers involved *(see also ERC COVID-19 Guidelines on Ethics)*.

Foreign body airway obstruction (FBAO)

The existing guidelines still hold good for the management of FBAO regardless of the presumed COVID-19 status.[24] Most often, rescuers will be caregivers or household members of the child and thus have only limited risk. In cases where the cough is still considered effective, bystanders or providers should encourage coughing whilst keeping proper distance. Do not put a surgical mask on the child at this stage. Bystanders should call the EMS dispatch centre early on, especially if coughing threatens to become ineffective.

Advanced Life Support

a. In children with confirmed or suspected COVID-19, ALS teams must wear appropriate PPE before arriving at the patient's side. Keep teams as small as possible but without compromising efficacy.

b. If a defibrillator is immediately available, switch it on, apply the defibrillator pads and deliver a shock if the rhythm is ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT). If the child remains in VF/pVT, and if wearing airborne-precaution PPE, start chest compressions. If not wearing airborne-precaution PPE, give up to two additional shocks (if indicated) while other healthcare workers are putting on airborne-precaution PPE.[17,31]

c. Early identification and proper treatment of any reversible causes during CPR is important. Some of these reversible causes demand 'advanced' resuscitation techniques: consider early transport to a centre capable of performing this for children. There is insufficient evidence to advocate for or against the use of extracorporeal life support for children with COVID-19. In settings where this facility is available, providers should balance the use of such advanced resources with the likelihood of a good outcome for the individual patient.

Ethics of resuscitation in children during the COVID pandemic

For this we refer to the dedicated ERC COVID-19 Guidelines on Ethics. The ethical principles and guidance do not differ essentially between adults and children.

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