Management of adult cardiac arrest in the COVID-19 era: consensus statement from the Australasian College for Emergency Medicine

Simon Craig1,2, Mya Cubitt3,4, Ashish Jaison5, Steven Troupakis1,6, Natalie Hood1,7, Christina Fong1,6, Adnan Bilgrami1, Peter Leman8,9, Juan Carlos Ascencio-Lane10,11, Guruprasad Nagaraj12,13, John Bonning14,15, Gabriel Blecher16,2, Rob Mitchell5,2, Ellen Burkett17,18, Sally M McCarthy19, Amanda M Rojek1,20, Kim Hansen21,22, Helen Psihogios1, Peter Allely9,23, Simon Judkins24, Lai Heng Foong25,26, Stephen Bernard27, Peter A Cameron2,5

Abstract

Introduction: The global pandemic of coronavirus disease 2019 (COVID-19) has caused significant worldwide disruption. Although Australia and New Zealand have not been affected as much as some other countries, resuscitation may still pose a risk to health care workers and necessitates a change to our traditional approach. This consensus statement for adult cardiac arrest in the setting of COVID-19 has been produced by the Australasian College for Emergency Medicine (ACEM) and aligns with national and international recommendations.

Main recommendations:

- In a setting of low community transmission, most cardiac arrests are not due to COVID-19.
- Early defibrillation saves lives and is not considered an aerosol generating procedure.
- Compression-only cardiopulmonary resuscitation is thought to be a low risk procedure and can be safely initiated with the patient’s mouth and nose covered.
- All other resuscitative procedures are considered aerosol generating and require the use of airborne personal protective equipment (PPE).
- It is important to balance the appropriateness of resuscitation against the risk of infection.
- Methods to reduce nosocomial transmission of COVID-19 include a physical barrier such as a towel or mask over the patient’s mouth and nose, appropriate use of PPE, minimising the staff involved in resuscitation, and use of mechanical chest compression devices when available.
- If COVID-19 significantly affects hospital resource availability, the ethics of resource allocation must be considered.

Changes in management: The changes outlined in this document require a significant adaptation for many doctors, nurses and paramedics. It is critically important that all health care workers have regular PPE and advanced life support training, are able to access in situ simulation sessions, and receive extensive debriefing after actual resuscitations. This will ensure safe, timely and effective management of the patients with cardiac arrest in the COVID-19 era.

In the setting of low community transmission, cardiac arrest is very unlikely to be due to COVID-19. Although the risk posed to health care workers is very small, a number of considerations exist. These include acknowledging that early defibrillation and chest compressions save lives, balancing the appropriate- ness of resuscitation against the risk of health care worker infection, and appropriate use of personal protective equipment (PPE). In addition, if widespread COVID-19 infections affect...
hospital resource availability, the ethics of resource allocation must be considered.

Most recommendations in this document are based on low certainty evidence. We have applied standard resuscitation principles and substantially rely on expert opinion. Similar to other COVID-19 guidelines, as knowledge develops during the pandemic, recommendations may change and this consensus statement will need to be updated. However, at the time of writing (17th June 2020), it is believed that these recommendations are safe and appropriate for use in pre-hospital and emergency care systems during the current COVID-19 pandemic.

**Appropriateness of resuscitation**

Ethical consideration of the appropriateness of resuscitation should balance:

- individuals’ goals of care and requests for limitations on measures to prolong life — these should be clarified early for all patients admitted to hospital or at risk of requiring hospital admission; this is a shared responsibility of community- and hospital-based clinicians;
- the likelihood that the patient will benefit from treatment;
- the potential for such treatment to limit capacity to offer treatment to other patients with an imperative for fair resource allocation; and
- the potential of such treatments to cause harm, including harm to other patients (by diverting staff from attending to other patients who then deteriorate) and staff (through transmission of infection).

A variety of resources are available to assist patients and clinicians in discussions regarding treatment limitations and end-of-life decisions. ACEM’s broader clinical guidelines include specific recommendations for establishing treatment goals in the context of COVID-19 (Box 1). To ensure appropriate and evidence-based care for the dying, palliative care pathways should be used for patients when resuscitation is deemed inappropriate.

If the health system becomes overwhelmed, resource-based decision making regarding the care of individual patients may be required. Discussions should occur at jurisdictional level, including with medical regulators, to ensure that decisions are made fairly, and according to ethical principles.

### 1 An ethical framework for establishing treatment goals in the context of coronavirus disease 2019 (COVID-19)*

| Critically ill patient during COVID-19 pandemic | Determine likely cause for presentation |
|-----------------------------------------------|----------------------------------------|
| Early clinical assessment by senior doctor    | Assess risk of mortality               |
| Understand patient/family wishes              | • Acute illness severity (eg, SOFA or qSOFA) |
|                                              | • Premorbid frailty (eg, Clinical Frailty Scale) |
|                                              | • Likelihood of success of treatment options |
| Aggressive life-saving treatment indicated    | Assess risk to staff and other patients or treatment options |
|                                              | Refer to documented patient wishes (where available) |
|                                              | • Advance health directive               |
|                                              | • Advance care plan                      |
|                                              | • Statement of wishes                    |
|                                              | • Any expressed wishes for care          |
| Determine treatment pathway                   | Aggressive life-saving treatment not indicated |
|                                              | • Supportive care                         |
|                                              | • Manage symptoms                         |
|                                              | • End-of-life care if required            |
|                                              | • Psychological support to patient and relatives |
|                                              | Ward or palliative care admission depending on anticipated prognosis |
| • Supportive care including critical interventions |                                  |
| • Manage symptoms                            |                                      |
| • Psychological support to patient and relatives |                                  |
| Refer to intensive care unit                 |                                      |
Consensus statement

Systems to recognise clinical deterioration and prevent cardiorespiratory arrest due to progression of severe illness are also important within the community, in the ED and in hospital.

In the event that resuscitation is required, a number of factors should be considered, including goals of care or advance care directives, community prevalence of COVID-19, adequacy of staff protection (PPE), the availability of an appropriate resuscitation setting (single or negative pressure room) that limits infection risk, and the likelihood of successful resuscitation with good neurological outcome.

Infection control and aerosol generating procedures in the context of resuscitation

During periods when there is sustained community transmission of SARS-CoV-2 and no significant population immunity (either naturally or vaccine-acquired), there will be times when it is reasonable to assume that in the first instance, all undifferentiated critically ill patients are infected with SARS-CoV-2.

On the other hand, if rates of community transmission are extremely low, local health department advice may be that specific precautions against COVID-19 are no longer necessary for critically ill patients.

Box 2 provides a summary of the minimum recommended PPE for various resuscitation procedures. Some patients will have been assessed as low risk for COVID-19 = coronavirus disease 2019; CPR = cardiopulmonary resuscitation. * Or N95 (or P2) mask if available. † Surgical mask, eye protection, gloves, gown/apron, visor, hat and neck protection as per local guidelines.

| Procedure | Surgical mask,* eye protection and gloves | Droplet PPE † | Airborne PPE ‡ |
|-----------|----------------------------------------|--------------|----------------|
| First responder (recognise cardiac arrest and send for help) | ✔ | ✔ | High risk for COVID-19 |
| Low risk for COVID-19 or unable to assess risk | ✔ | |
| Oxygen mask (up to 10 L/min) on patient, covered with towel, cloth, clear plastic sheet or surgical mask | ✔ | ✔ | High risk for COVID-19 |
| Low risk for COVID-19 or unable to assess risk | ✔ | |
| Defibrillation (with patient’s face covered) | ✔ | ✔ | High risk for COVID-19 |
| Low risk for COVID-19 or unable to assess risk | ✔ | |
| Initial (first responder) compression-only CPR while awaiting staff in airborne PPE | ✔ | ✔ | High risk for COVID-19 |
| Low risk for COVID-19 or unable to assess risk | ✔ | |
| Basic airway manoeuvres (chin lift/head tilt/jaw thrust) | ✔ | ✔ | High risk for COVID-19 |
| Low risk for COVID-19 or unable to assess risk | ✔ | |
| Ongoing chest compressions during CPR | ✔ | ✔ | High risk for COVID-19 or unable to assess risk |
| Low risk for COVID-19 | ✔ | |
| Oropharyngeal/nasopharyngeal airway | ✔ | ✔ | High risk for COVID-19 or unable to assess risk |
| Low risk for COVID-19 | ✔ | |
| Bag mask ventilation | ✔ | ✔ | High risk for COVID-19 or unable to assess risk |
| Low risk for COVID-19 | ✔ | |
| Supraglottic airway | ✔ | ✔ | High risk for COVID-19 or unable to assess risk |
| Low risk for COVID-19 | ✔ | |
| Intubation | ✔ | ✔ | High risk for COVID-19 or unable to assess risk |
| Low risk for COVID-19 | ✔ | |
COVID-19 before deterioration and will not require droplet precautions for initial resuscitation steps. However, other patients will either be at high risk for COVID-19 or their risk will be unable to be determined.

There is active debate and ongoing research regarding the extent to which resuscitative procedures are considered to be aerosol generating. At the time of writing, defibrillation is not considered an aerosol generating procedure, with a recent ILCOR systematic review finding no evidence that defibrillation generates aerosols.21

Compression-only cardiopulmonary resuscitation (CPR) has recently been assessed by the UK New and Emerging Respiratory Virus Threats Advisory Group22 and the Australian Department of Health23 and is not considered an aerosol generating procedure by either body. ILCOR suggests — through a weak recommendation based on very low certainty evidence — that chest compressions have the potential to generate aerosols.21

Current Australian Government recommendations for paramedics and ambulance first responders suggest that it is reasonable to commence compression-only CPR with eye protection, gloves and a surgical mask (or with a fit-checked N95 [or P2] mask if available).24 All other resuscitative procedures are considered to be aerosol generating and should be performed by health care workers wearing airborne PPE. However, these recommendations are based on weak evidence, and further research may lead to changes in advice. We have taken a deliberately conservative approach, in line with various resuscitation organisations.10–12,15,16,19,25

The level of PPE dictates which interventions may be safely provided by health care workers. A staff member should be specifically assigned as a “spotter” to ensure safe PPE use by all staff participating in resuscitation. Attention should be paid to mask fit for staff members wearing airborne PPE and to supervising appropriate donning and doffing.

Senior oversight and expertise should be used to minimise the number of people involved in resuscitation. In situ simulation may be helpful for ED staff to become familiar with the roles and practical challenges of a smaller resuscitation team.

**Optimal setting for resuscitation**

Cardiac arrests do not always occur in a convenient location. In hospital, a collapse may occur in a waiting room, a bathroom, a corridor or in a patient cubicle. Traditionally, resuscitation occurs in a large, open ED resuscitation cubicle.

A single negative pressure room is the most appropriate location for aerosol generating procedures (Box 3), and the patient should be moved to one as soon as practicable. However, resuscitation should not be withheld if a single room is not immediately available.

**Changes in the management of cardiac arrest**

Modifications to existing advanced life support protocols are necessary. These are discussed below in the context of the DRSABC (Danger, Response, Send for help, Airway, Breathing, Circulation) approach. It should be emphasised that all standard resuscitation interventions are still appropriate but need to be performed by staff wearing adequate PPE.

**Danger**

Ideally, all resuscitation should be performed by health care workers in PPE suitable for aerosol generating procedures. However, it is recognised that this may not be possible for first responders.

Based on the available evidence, we recommend that first responders should be wearing at least a surgical mask, eye protection and gloves. If the patient is suspected or known to have COVID-19, first responders should be wearing droplet PPE.

- The patient’s mouth and nose should be covered by an oxygen mask (if available) with flow of up to 10 L/min. Additional protection against droplet or spray contamination is recommended, and can be achieved by covering the oxygen mask with a towel, cloth, surgical mask or clear plastic sheet.11 If a view of the mouth and nose is obscured, regularly check the patient’s airway for vomit or secretions.
- A staff member wearing a minimum of gloves, eye protection and surgical face mask should immediately place defibrillation pads on the chest, check the cardiac rhythm, and defibrillate the patient if they are in a shockable rhythm.
- Compression-only CPR (with the face covered) should be instituted rapidly by the first available staff member wearing a minimum of gloves, eye protection and a surgical mask (or N95 [or P2] mask if available). It is reasonable for compression-only CPR to commence outside and en route to a single room (eg, in a corridor or waiting room).
- Further resuscitation (ongoing chest compressions, assisted ventilation and advanced airway manoeuvres) should be carried out in an appropriate space by staff in airborne PPE who...
should take over resuscitation as soon as possible. Any rescuers not wearing airborne PPE should leave the area, remove their PPE and perform careful hand hygiene.

Response and send for help
If the patient is unresponsive and not breathing normally, then resuscitation may be necessary. Call for help. Ensure that all clinicians are wearing appropriate PPE.

Airway and breathing
Listening or feeling for breathing should not occur. Instead, place a hand on the patient’s chest to feel for chest rise and fall while assessing for normal breathing.

Place a standard oxygen mask (eg, Hudson mask) on the patient and open their airway with a head tilt/chin lift. Do not attempt to clear the airway using any other methods. Suctioning of the oropharynx should not occur through an open suction device (ie, Yankauer sucker) until the patient is in an appropriate location with staff using airborne PPE.

Provide passive oxygen at a flow rate of 10 L/min. Do not provide positive pressure ventilation until the patient is in an appropriate physical location and staff are wearing airborne PPE. An appropriate heat and moisture exchanger filter must be connected to any positive pressure oxygen delivery device as close to the patient as possible. Take care to ensure that all connections are secure.

Bag mask ventilation should be minimised. If required, use two hands to hold the mask. Compressions should be paused, and the bag should be squeezed by a second rescuer at a compression to ventilation ratio of 30:2.21 Compressions should also be paused before placing an advanced airway.

If ongoing ventilation is required, a well fitted supraglottic airway device is preferred to a face mask, as it is thought to reduce the risk of aerosols.16 This should be connected to an appropriate filter, and then to a Mapleson circuit (“anaesthetic bag”) or a standard self-inflating bag.

A Mapleson circuit is preferred due to the ability to provide passive oxygen flow without the need to deliver positive pressure ventilation. If using a Mapleson circuit, connect the circuit to the oxygen but do not squeeze the bag.

If using a standard self-inflating bag, monitor the movement of the reservoir bag. If oxygen is being delivered, then do not squeeze the bag. However, in the absence of respiratory effort, oxygen may not be delivered due to the valve mechanism of a standard self-inflating bag and gentle squeezing of the bag may be required.

If possible, positive pressure ventilation should only be delivered once an endotracheal tube has been inserted in the trachea, the cuff has been inflated, a heat and moisture exchanger filter connected, and correct placement confirmed.

Suctioning through an endotracheal tube should occur through a closed inline system, in the highest level of isolation available and by a health care worker wearing airborne PPE.

Circulation
Rapid rhythm assessment and defibrillation should be prioritised. Until endotracheal intubation has occurred, compression-only CPR is recommended. However, if positive pressure ventilation is required, then compressions should be paused to allow ventilation while using a mask or supraglottic airway.12

Mechanical CPR devices should be used when available and staff are adequately trained in their use. These devices may be useful to reduce the number of health care workers present during resuscitation.

Modified resuscitation algorithm
The algorithm for adult advanced life support presented in Box 4 has been adapted from the New Zealand Resuscitation Council algorithm. An approach to the initial steps of resuscitation is presented in Box 5.

Monitoring of resuscitation
Apart from minimising the number of people in the room, resuscitation should occur according to established protocols. Waveform capnography should be used. Focused cardiac ultrasound may be useful to guide resuscitation efforts.

Advanced resuscitation techniques
Advanced resuscitation techniques such as extracorporeal life support should be carefully considered and only used in exceptional circumstances for currently accepted indications (eg, massive pulmonary embolism, or specific toxicological emergencies). Provision of such interventions should include assessment of the potential benefit to the patient, resources required, and the potential associated diversion of resources from others for delivery of such treatments.

In the setting of a cardiac arrest in the ED from presumed COVID-19, escalation to extracorporeal life support is not currently recommended due to a high likelihood of futility. However, as the evidence matures, this recommendation may change.

Post-resuscitation care
If return of spontaneous circulation is achieved before intubation, assess the need for and potential benefit of intubation in the context of the individual’s goals of care.

If mechanical ventilation is required, clamp the endotracheal tube before disconnecting from the patient. Ensure a closed inline suction system is connected.

At the end of resuscitation attempts, everyone should remove the PPE carefully and perform hand hygiene. It is recommended that staff observe each other while removing PPE to monitor for possible breaches in infection control procedures.

Equipment should be cleaned, disinfected or disposed of according to hospital protocols.

A post-resuscitation debrief should address clinical care and decision making, communication, PPE, and prevention of COVID-19 transmission. Any breaches of PPE should be documented, reported and followed up according to local protocols. Maintain a log of staff attending the resuscitation to facilitate appropriate infection control follow-up if required.
4 Suggested algorithm for adult advanced life support in the coronavirus disease 2019 (COVID-19) era

Ensure all staff have adequate and appropriate PPE before any resuscitation efforts.

Conversations and decisions on emergency treatment completed and documented.

Attempt CPR?

No

End-of-life care

Yes

Unresponsive and not breathing normally

Compression-only CPR

Minimum of gloves, eye protection, mask (surgical or N95/P2)

Assess rhythm every 2 minutes

Call for help

Assume COVID-19

Shockable (VF/pulseless VT)

Shock

Return of spontaneous circulation

Non-shockable (PEA/asystole)

Immediate post-cardiac arrest treatment:
- Use ABCDE approach
- Aim for SpO$_2$ of 94–98%
- Aim for normal PaCO$_2$
- 12-lead ECG
- Treat precipitating cause
- Targeted temperature management
- Airborne PPE if AGP interventions

Continue compression-only CPR

Continue compression-only CPR

If wearing airborne PPE CPR (compression & ventilation) Minimise interruptions

If wearing airborne PPE CPR (compression & ventilation) Minimise interruptions

Airborne PPE required for ongoing chest compressions, intubation, bag-mask, LMA insertion

During CPR:
- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Consider reversible causes (4Hs and 4Ts)
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (IV or IO)
- Give adrenaline every 3–5 minutes
- Give amiodarone after 3 shocks

Recommended PPE:
- Disposable gloves
- Disposable apron/gown
- Fluid resistant surgical mask
- Disposable eye protection

Airborne PPE (suitable for AGPs):
- Disposable gloves
- Disposable gown
- Filtering face mask (N95/P2)
- Disposable eye protection

Consider:
- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR in selected circumstances

4 Hs = Hypoxia (low levels of oxygen), Hypovolaemia (shock), Hyperkalaemia/hypokalaemia/hypoglycaemia/hypocalcaemia (plus other metabolic disturbances), Hypothermia; 4 Ts = Tension pneumothorax, Tamponade, Thrombosis, Toxins; ABCDE = Airway, Breathing, Circulation, Disability, Exposure; AGP = aerosol generating procedure; CPR = cardiopulmonary resuscitation; ECG = electrocardiogram; IO = introral; IV = intravenous; LMA = laryngeal mask airway; PaCO$_2$ = arterial partial pressure of carbon dioxide; PEA = pulseless electrical activity; PPE = personal protective equipment; SpO$_2$ = oxygen saturation measured by pulse oximetry; VF = ventricular fibrillation; VT = ventricular tachycardia. Source: Adapted, with permission, from the New Zealand Resuscitation Council.\textsuperscript{11}
Termination of resuscitation

Decisions regarding resuscitation termination should be made according to currently accepted standards. A cardiac arrest in a patient with COVID-19 infection and respiratory failure should prompt rapid assessment and treatment of potentially reversible causes. If no such cause is identified, clinicians should give early consideration to futility of ongoing resuscitation.26

Care for family members

During the COVID-19 pandemic, family members are likely to be restricted from entering resuscitation rooms, apart from exceptional circumstances (eg, paediatric cardiac arrest).

Unsuccessful resuscitation

If resuscitation is unsuccessful, family members may be allowed to view the body — according to local hospital policies and infection control measures. However, restrictions in place due to COVID-19 may significantly disrupt usual grieving processes; for example, not being allowed to touch or kiss the deceased.27 If required, social work support should be provided to family members in a safe location or via telehealth where COVID-19 precludes visitation. Appropriate PPE should be used by staff when preparing the body for the mortuary.

Training and simulation

The changes outlined above require a significant adaptation for many doctors, nurses and paramedics. All health care workers should have regular PPE and advanced life support training, be able to access in situ simulation sessions, and receive extensive debriefing after actual resuscitations. This will ensure safe, timely and effective management of the patient with cardiac arrest in the COVID-19 era.

Conclusion

Although infection risks posed by COVID-19 influence all aspects of adult cardiac arrest management, the basic principles of resuscitation remain the same. Prioritisation of rapid defibrillation and attention to reversible causes of cardiac arrest remain critical interventions. Modifications to traditional approaches include a greater emphasis on the safety of health care workers and on the use of adequate PPE. Future updates to this document will be available at www.acem.org.au/covid-19.

Endorsement

This consensus statement is endorsed by ACEM and the Safe Airway Society.

Acknowledgements: The authors would like to acknowledge the assistance of the following ACEM staff in the production of this consensus statement: Robert Lee, Nicola Ballenden, Andrea Johnston and Belinda Rule.

Competing interests: No relevant disclosures.

Provenance: Not commissioned; externally peer reviewed.

The unedited version of this article was published as a preprint on mja.com.au on 24 April 2020.

© 2020 AMPCo Pty Ltd

COVID-19 arrest: "PANDEMIC"

Goals of care
Check goals of care – is resuscitation appropriate?

P
PPE
Ensure appropriate PPE is worn by all staff. Cover patient’s nose and mouth with at least an oxygen mask.

A
Alert resuscitation team
Call emergency number through switchboard

N
No breaths
Confirm patient’s nose and mouth is covered with an oxygen mask. Consider adding a towel/white surgical mask/plastic over face.

D
Defibrillate
Access rhythm early

E
Eliminate
Remove non-essential staff

M
Mechanical chest compressions
Apply LUCAS 2 device if available. Continuous compressions. Ensure patient’s nose and mouth are covered.

I
Insert LMA or intubate
IF LMA, perform breaths 30:2. Intubation by skilled staff only

C
Consultation
Consult with senior staff about ongoing treatment. Ensure care for family

COVID-19 = coronavirus disease 2019; LMA = laryngeal mask airway; PPE = personal protective equipment. Source: adapted from Royal Hobart Hospital emergency department, used with permission. Acknowledgement: Ray Siauw.

5 “PANDEMIC” approach to cardiac arrest

References

1 Falconer R. Australia and New Zealand reopen after coronavirus cases plummet. Axios News 2020; 14 May. https://www.axios.com/coronavirus-australia-new-zealand-reopen-lockdown-3da28be5-1526-4790-a44a-a256c36d0895.html (viewed May 2020).

2 Chan-Yeung M. Severe acute respiratory syndrome (SARS) and healthcare workers. Int J Occup Environ Health 2004; 10: 421–427.

3 Christian MD, Loutfy M, McDonald LC, et al. Possible SARS coronavirus transmission during cardiopulmonary resuscitation. Emerg Infect Dis 2004; 10: 287–293.

4 Leeb M, McGeer A, Henry B, et al. SARS among critical care nurses, Toronto. Emerg Infect Dis 2004; 10: 251–255.

5 Wang J, Zhou M, Liu F. Reasons for healthcare workers infected with novel coronavirus disease 2019 (COVID-19) in China. J Hosp Infect 2020; 105: 100–101.

6 Fritz Z, Perkins GD. Cardiopulmonary resuscitation after hospital admission with COVID-19. BMJ 2020; 369: m1387.

7 Mahase E, Kmietowicz Z. covid-19: doctors are told not to perform CPR on patients in cardiac arrest. BMJ 2020; 368: m1282.
8 Markwell A, Mitchell R, Wright A, Brown AF. Clinical and ethical challenges for emergency departments during communicable disease outbreaks: can lessons from Ebola virus disease be applied to the COVID-19 pandemic? Emerg Med Australas 2020; 32: 520–524.

9 Australasian College for Emergency Medicine. Clinical guidelines for the management of COVID-19 in Australasian emergency departments, version 4.0. Updated June 2020. https://acem.org.au/Content-Sources/Advancing-Emergency-Medicine/COVID-19/Resources/Clinical-Guidelines (viewed July 2020).

10 Australian and New Zealand Committee on Resuscitation. Resuscitation during the COVID-19 pandemic (updated Apr 2020). Australian Resuscitation Council, 2020. https://resus.org.au/ (viewed Apr 2020).

11 New Zealand Resuscitation Council. COVID-19 modifications to essential life support (updated Mar 2020). https://www.nzrc.org.nz/assets/Guidelines/COVID-19/2020-03-27-Temporary-Guideline-in-State-of-EmergencyFINAL.pdf (viewed Apr 2020).

12 Resuscitation Council UK. Resuscitation Council UK statement on COVID-19 in relation to CPR and resuscitation in acute hospital settings (updated Apr 2020). https://www.resus.org.uk/media/statements/resuscitation-council-uk-statements-on-covid-19-coronavirus-cpr-and-resusitation-covid-healthcare/ (viewed Apr 2020).

13 Resuscitation Council UK. Guidance for the resuscitation of adult COVID-19 patients in acute hospital settings, version 4 (updated Apr 2020). https://www.resus.org.uk/media/statements/resuscitation-council-uk-statements-on-covid-19-coronavirus-cpr-and-resuscitation/covid-healthcare/ (viewed Apr 2020).

14 Couper K, Taylor-Phillips S, Grove A, et al; International Liaison Committee on Resuscitation. Consensus on Science with Treatment Recommendations (CoSTR). COVID-19 infection risk to rescuers from patients in cardiac arrest (updated Apr 2020). Brussels: International Liaison Committee on Resuscitation, 2020. https://costr.ilcor.org/document/covid-19-infection-risk-to-rescuers-from-patients-in-cardiac-arrest (viewed Apr 2020).

15 Edelson DP, Sasson C, Chan PS, et al. Interim guidelines for basic and advanced life support in adults, children, and neonates with suspected or confirmed COVID-19: from the American Heart Association. Circulation. 2020; 141:e933–e943.

16 Brewster DJ, Chrmes N, Do TB, et al. Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. Med J Aust 2020; 212: 472–481. https://www.mja.com.au/journal/2020/212/10/consensus-statement-safe-airway-society-principles-airway-management-and-0

17 Australian and New Zealand Intensive Care Society. ANZICS COVID-19 guidelines. Melbourne: ANZICS, 2020. https://www.anzics.com.au/coronavirus-guidelines/ (viewed Apr 2020).

18 Siegel JD, Rhinehart E, Jackson M, Chiarello L; Healthcare Infection Control Practices Advisory Committee. 2007 Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings (updated July 2019). https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guide lines-H.pdf (viewed June 2020).

19 World Health Organization. Rational use of personal protective equipment for coronavirus disease (COVID-19): interim guidance, 27 Feb 2020. https://apps.who.int/iris/handle/10665/331235 (viewed Apr 2020).

20 Davies A, Thomson G, Walker J, et al. A review of the risks and disease transmission associated with aerosol generating medical procedures. J Infect Prev 2009; 10: 122–126.

21 International Liaison Committee on Resuscitation. COVID-19: practical guidance for implementation (updated Apr 2020). https://www.ilcor.org/covid-19 (viewed Apr 2020).

22 Public Health England. PHE statement regarding NERVTAG review and consensus on cardiopulmonary resuscitation as an aerosol generating procedure (AGP); 2020. https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control-statement-regarding-nervtag-review-and-consensus-on-cardiopulmonary-resuscitation-as-an-aerosol-generating-procedure-agp (viewed May 2020).

23 Australian Government, Department of Health. Guidance on the use of personal protective equipment (PPE) in hospitals during the COVID-19 outbreak. https://www.health.gov.au/resourc es/publications/guidance-on-the-use-of-personal-protective-equipment-ppe-in-hospitals-during-the-covid-19-outbreak (viewed May 2020).

24 Australian Government, Department of Health. Coronavirus Disease (COVID-19): information for paramedics and ambulance first responders. https://www.health.gov.au/resources/publications/coronavirus-covid-19-information-for-paramedics-and-ambulance-first-responders (viewed May 2020).

25 World Federation of Societies of Anaesthesiologists. Coronavirus — guidance for anaesthesia and perioperative care providers. WFSA, 2020. https://www.wfsa.org/resources/coronavirus (viewed Apr 2020).

26 Shao F, Xu S, Ma X, et al. In-hospital cardiac arrest outcomes among patients with COVID-19 pneumonia in Wuhan, China. Resuscitation 2020; 151: 18–23.

27 Department of Health and Human Services. Handling the body of a deceased person with suspected or confirmed COVID-19. https://www.dhhs.vic.gov.au/guidance-handling-body-deceased-person-suspected-or-confirmed-covid-19 (viewed Apr 2020).