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## Letter to the Editor

# To PPE or not to PPE? Making sense of conflicting international recommendations for PPE during chest compressions in patients with COVID-19



**Keywords:** CPR, COVID-19, SARS-CoV-2, Aerosol transmission, Chest compressions

Dear Editor,

As the COVID-19 pandemic intensifies, increasing number of patients with COVID-19 will require cardiopulmonary resuscitation (CPR). Whether personal protective equipment (PPE) is recommended for chest compressions to prevent viral transmission to healthcare workers remains debatable.

We therefore reviewed the COVID-19 resuscitation guidelines of the ten countries with the highest incidence of COVID-19 as of 29th June 2020, focusing on PPE recommendations for chest compressions. In addition, we searched MEDLINE between 1 December 2019 and 29th June 2020, using the terms “guidelines,

recommendations, COVID-19, resuscitation, and chest compressions” and approached experts in infectious diseases and resuscitation to systematically identify any guidelines independent of the resuscitation councils.

Five countries (Brazil, Russia, Peru, Chile and Iran) did not have any resuscitation guidance for patients with COVID-19. Russia referred to International Liaison Committee on Resuscitation (ILCOR) guidance which recommends the use of full PPE, with surgical gown, gloves, visor and at least an FFP-2 level mask prior to CPR (Table 1).

**Table 1 – Summary of national guidance for whether chest compressions are considered an AGP and the PPE required for those conducting chest compressions in patients with COVID-19 as of 29th June 2020. The ten countries with the highest incidence of COVID-19 are arranged in descending order. Abbreviations used: COVID-19: coronavirus disease 2019; PPE: personal protective equipment; AGP: aerosol generating procedure.**

Country	Confirmed cases	Deaths	Source of evidence	Are chest compressions considered an AGP	Recommended PPE for chest compressions
USA	2,549,069	125,803	Center for Disease Control and Prevention, citing the Tran et al meta-analysis. <sup>1</sup> American Heart Association, which cites ILCOR publication.	Both the Center for Disease Control and Prevention and the American Heart Association considers the entirety of CPR as aerosol generating. Chest compressions are not considered separately.	<u>Full PPE prior to chest compressions</u> Surgical gown, gloves, visors, and at least FFP-2 level respirator protection. <i>No explicit statement about low level of evidence for chest compressions to be aerosol generating or not.</i>
Brazil	1,344,143	57,622	There are no updated resuscitation guidelines made in relation to COVID-19.	N/A	Unspecified
Russia	640,256	9152	There are no updated resuscitation guidelines in relation to COVID-19; refers directly to the European Resuscitation Council guidance.	N/A	<u>Unspecified</u>
India	548,318	16,475	Indian Resuscitation Council suggested guidelines for comprehensive cardiopulmonary life support	Considers the entirety of CPR as aerosol generating. Chest compressions are not considered separately	<u>Full PPE prior to chest compressions</u> Surgical gown, gloves, visors, and at least FFP-2 level respirator protection

**Table 1 (continued)**

Country	Confirmed cases	Deaths	Source of evidence	Are chest compressions considered an AGP	Recommended PPE for chest compressions
United Kingdom	312,653	43,634	for suspected or confirmed coronavirus disease patients. <u>Public Health England (PHE)</u> Chest compressions are not aerosol generating. <u>Resuscitation council (RCUK)</u> chest compressions are aerosol generating.	There is disagreement between PHE and RCUK	<u>PHE – No full PPE for chest compressions</u> First responders can commence chest compressions/defibrillation without full PPE, until airways procedures are required <i>No explicit statement about low level of evidence for chest compressions to be aerosol generating or not, despite an extra statement explaining that NERV-TAG (advisory group to the UK government) saying that the “having reviewed all the evidence . . . does not support chest compressions being procedures that are associated with a significantly increased risk of transmission of acute respiratory infections”</i> <u>RCUK – Full PPE for chest compressions</u> Surgical gown, gloves, visors, and at least FFP-2 level respirator protection <i>No explicit statement about low level of evidence for chest compressions to be aerosol generating or not. However, additional statement on 28<sup>th</sup> April acknowledging the low level of evidence for chest compressions to be aerosol generating.</i> Unspecified
Peru	279,419	9317	There are no updated resuscitation guidelines made in relation to COVID-19.	N/A	Unspecified
Chile	271,982	5509	There are no updated resuscitation guidelines made in relation to COVID-19.	N/A	Unspecified
Spain	248,770	5280	Spanish Resuscitation Council which cites the ILCOR publication.	Considers chest compressions as aerosol generating but qualifies the evidence is weak.	<u>Full PPE prior to chest compressions</u> Surgical gown, gloves, visors, and at least FFP-2 level respirator protection. <i>However, considering the weak evidence it may be reasonable to defibrillate prior without PPE.</i>
Italy	240,310	34,738	Italian Resuscitation council which cites the WHO guidance. <sup>3</sup>	Considers the entirety of CPR as aerosol generating Chest compressions are not considered separately	<u>Full PPE prior to chest compressions</u> Surgical gown, gloves, visors, and at least FFP-2 level respirator protection. <i>However, in the absence of appropriate PPE chest compressions should be performed.</i> Unspecified
Iran	222,669	10,508	There are no updated resuscitation guidelines made in relation to COVID-19.	N/A	Unspecified

The USA's Center for Disease Control and Prevention (CDC) and American Heart Association (AHA), as well as India, Spain and Italy recommend the use of full PPE for compressions; Italian guidelines recommend chest compressions to be performed in the absence of full PPE if there is no availability. Within the UK, there are opposing views from two national bodies; Public Health England (PHE) recommends chest compressions to be performed without full PPE, whilst the UK Resuscitation Council recommends full PPE.

Spain, AHA and UK Resuscitation Council acknowledge the evidence for chest compressions to be aerosol generating to be low. PHE cite a meta-analysis by Tran et al.<sup>1</sup> The AHA and Spain cite the ILCOR guidelines.<sup>2</sup> The UK and Italy cite World Health Organisation (WHO) guidance<sup>3</sup> as the basis for their recommendations.

There is in fact, little evidence for or against transmission of SARS-CoV-2 during chest compressions. Whilst there is biological

plausibility for viral aerosolisation from passive ventilation during chest compressions, generation of robust clinical evidence is difficult due to the sudden and emergent nature of CPR.<sup>1</sup> The recently commissioned systematic review by Couper et al., from ILCOR, recommends full PPE prior to commencing chest compressions, whilst acknowledging the low level of evidence upon which to generate these recommendations are made.<sup>4</sup> This is in contrast to the older evidence cited by PHE to refute the requirement for full PPE during CPR. It is worth noting this review is based on respiratory viruses other than SARS-CoV-2 and the USA cite the same meta-analysis whilst concluding the opposite and recommending full PPE.<sup>1</sup>

In conclusion, guidelines for chest compressions in patients with COVID-19 amongst different countries are highly variable. Importantly, there is currently no clear consensus as to whether PPE should be worn during chest compressions. Further research is needed to establish how infectivity during CPR can be measured accurately. The development of an evidence-based CPR guideline for patients with COVID-19 is an urgent research priority.

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### Conflict of interest

None declared.

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### Author statement form

NLM and DP conceived and designed the study. DP, SS, NLM acquired, analysed and interpreted the data. NLM and DP drafted the manuscript. All authors critically reviewed the manuscript for important intellectual content. DP is the guarantor. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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