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| Question | |
| **Should CPR in the prone position vs. CPR in the supine position be used for cardiac arrest occurring in the prone position?** | |
| **Population:** | cardiac arrest occurring in the prone position |
| **Intervention:** | CPR in the prone position |
| **Comparison:** | CPR in the supine position |
| **Main outcomes:** | Systolic blood pressure during CPR-Mazer; Diastolic blood pressure during CPR-Mazer; Mean arterial pressure during CPR-Mazer; Systolic blood pressure during CPR-Wei; Diastolic blood pressure during CPR-Wei; |
| **Setting:** | any setting |
| **Perspective:** |  |
| **Background:** | Prone positioning has been used increasingly for critically ill patients with severe hypoxemic respiratory failure, especially during the COVID-19 pandemic. This has made the question of how to proceed with CPR when a patient arrests in the prone position a timely one. |
| **Conflict of interests:** | none |

# Assessment

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| Problem Is the problem a priority? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know | There is very little evidence on the effectiveness of prone compressions compared to supine compressions for cardiac arrest, consisting of only case reports and two very small prospective studies, as well as one observational simulation study. | The COVID-19 pandemic and the consequent increase in the number of patients with refractory hypoxemic respiratory failure has led to a significant rise in the use of prone positioning for patients on mechanical ventilation in intensive care. This has brought the question of how to manage resuscitation when these patients arrest while prone to the forefront. |
| Desirable Effects How substantial are the desirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know | Minimal evidence addressing the question. Case reports and small studies suggest CPR done prone can be effective in at least some cases. | Potential desirable effects of starting CPR while patient still prone include faster CPR start/shorter no-flow time, and (suggested by some investigators) possibly higher arterial blood pressure with prone compressions, although this evidence is at extremely high risk of bias. Supinating a critically ill patient in a hurried fashion could also lead to some risk of dislodging tracheal tubes or IV lines, and performing CPR while patient still prone could avoid some of this risk. |
| Undesirable Effects How substantial are the undesirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Large ○ Moderate ○ Small ○ Trivial ○ Varies ● Don't know | No evidence of harms but this is unknown. Notably, almost all case reports of prone CPR are in patients with an advanced airway. | Potential concerns include difficulty managing possible airway problems, and unknown effectiveness of prone CPR and defibrillation compared to supine CPR/defibrillation. |
| Certainty of evidence What is the overall certainty of the evidence of effects? | | |
| Judgement | Research evidence | Additional considerations |
| ● Very low ○ Low ○ Moderate ○ High ○ No included studies | Evidence consists of case reports, almost all of which are of patients proned in the setting or spinal or neurosurgery, and two very small prospective studies on patients already considered dead/failing supine CPR. These studies do suggest that adequate perfusion pressure is possible with prone compressions, and case reports suggest ROSC can be obtained, but there is no evidence for whether prone CPR is more or less likely to lead to ROSC than supine CPR. |  |
| Values Is there important uncertainty about or variability in how much people value the main outcomes? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Important uncertainty or variability ○ Possibly important uncertainty or variability ● Probably no important uncertainty or variability ○ No important uncertainty or variability |  |  |
| Balance of effects Does the balance between desirable and undesirable effects favor the intervention or the comparison? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ● Don't know |  | Whether starting CPR while a patient is still prone or turning them supine prior to starting CPR is beneficial may depend on multiple factors, including: patient size, available personnel, ability to generate (and measure) an adequate arterial pressure and ETCO2 with prone compressions, and whether supinating them quickly is feasible and safe for that individual. Supine CPR is the standard of care and is known to be effective. However, the very limited evidence available suggests that prone CPR can be life-saving as well and may be a reasonable option if immediate supination is difficult or poses unacceptable risks to the patient. |
| Acceptability Is the intervention acceptable to key stakeholders? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ○ Probably yes ○ Yes ○ Varies ● Don't know |  | ICU and other hospital clinicians are treating more patients in prone position that ever before, and are thus interested in this question. |
| Feasibility Is the intervention feasible to implement? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know | The feasibility of immediate supination will vary by available personnel and patient characteristics. |  |

# Summary of judgements

|  | **Judgement** | | | | | | |
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| **Problem** | No | Probably no | Probably yes | Yes |  | **Varies** | Don't know |
| **Desirable Effects** | Trivial | Small | Moderate | Large |  | Varies | **Don't know** |
| **Undesirable Effects** | Large | Moderate | Small | Trivial |  | Varies | **Don't know** |
| **Certainty of evidence** | **Very low** | Low | Moderate | High |  |  | No included studies |
| **Values** | Important uncertainty or variability | Possibly important uncertainty or variability | **Probably no important uncertainty or variability** | No important uncertainty or variability |  |  |  |
| **Balance of effects** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **Don't know** |
| **Acceptability** | No | Probably no | Probably yes | Yes |  | Varies | **Don't know** |
| **Feasibility** | No | Probably no | Probably yes | Yes |  | **Varies** | Don't know |

# Type of recommendation

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| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | Conditional recommendation for the intervention | Strong recommendation for the intervention |
| ○ | ○ | ○ | ○ | ○ |

# Conclusions

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| Recommendation |
| Treatment recommendations:  For patients with cardiac arrest occurring while in the prone position with an advanced airway already in place, and where immediate supination is not feasible or poses significant risk to the patient, initiating CPR while the patient is still prone may be a reasonable approach (Good practice statement).  Invasive blood pressure monitoring and continuous ETCO2 monitoring may be useful to ascertain whether prone compressions are meeting benchmarks for adequate perfusion or not, and this information could inform decision making on when to prioritize supination (Good practice statement).  For patients with cardiac arrest occurring while in the prone position without an advanced airway already in place, we recommend turning the patient supine as quickly as possible and beginning CPR (strong recommendation, very low certainty of evidence).  For patients with cardiac arrest with a shockable rhythm who are in the prone position and cannot be supinated immediately, attempting defibrillation in the prone position is a reasonable approach (Good practice statement). |
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| Justification |
| TF discussed that normally we would not generate treatment recommendations based on the level of evidence available for this question, which is of extremely low certainty, but that the COVID-19 pandemic and the large increase in the number of critically-ill patients treated with prone positioning has made this an important question for clinicians around the world.  TF discussed weighing the possible risk of delaying CPR start and defibrillation against the possible risk of prone CPR/defibrillation being less effective, and acknowledged that the balance of effects is very unclear.  TF discussed that additional studies, which would be quite feasible to perform, would be very useful. These could include larger case series representing the total experience of a center or centers, or even additional case reports that report quality metrics such as ETCO2 and arterial blood pressure during prone compressions. More data on ICU patients particularly is needed, as virtually all published case reports on prone CPR are in patients proned for spinal or brain surgery in the operating room.  TF discussed the fact that in many ICU settings, patients who are proned and on mechanical ventilation are highly likely to have arterial lines in place and ETCO2 monitoring ongoing, thus allowing for the rapid assessment of whether prone compressions are effective.  TF discussed that the difficulty of supinating a patient will vary widely based on patient size, personnel immediately available, and interventions in place such as chest tubes, advanced airways, IV lines, personal protective equipment and isolation requirements, and potentially open wounds/exposed hardware (in the case of patients in the operating room).  TF discussed that the etiology of the cardiac arrest will determine the urgency of supination. For example a primary airway problem such as a dislodged tracheal tube will require immediate supination, whereas the need for hemorrhage control during surgery in the prone position surgery may necessitate CPR in the prone position. |

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| Subgroup considerations |
| Evidence does not differ significantly between adult and paediatric patients, although in many cases supination of children may be easier due to patient size. |

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| Implementation considerations |
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| Monitoring and evaluation |
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| Research priorities |
| TF discussed that additional studies, which would be quite feasible to perform, would be very useful. These could include larger case series representing the total experience of a center or centers, or even additional case reports that report quality metrics such as ETCO2 and arterial blood pressure during prone compressions. More data on ICU patients particularly is needed, as virtually all published case reports on prone CPR are in patients proned for spinal or brain surgery in the operating room. |