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| Question |
| **Should Double Sequential Defibrillation vs. Standard defibrillation be used for Adult cardiac arrest patients with a shockable (VF/pVT) cardiac arrest rhythm?** |
| **Population:** | Adult cardiac arrest patients with a shockable (VF/pVT) cardiac arrest rhythm |
| **Intervention:** | Vector change (anterior-posterior pad placement, VC) defibrillation |
| **Comparison:** | Standard defibrillation (SD) |
| **Main outcomes:** | Good Neurological Outcome at Discharge; Survival to Hospital Discharge; Survival to Hospital Admission; Return of Spontaneous Circulation; Termination of VF; |
| **Setting:** | Any Setting |
| **Perspective:** |  |
| **Background:** |  |
| **Conflict of interests:** |  |

# Assessment

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| ProblemIs the problem a priority? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no○ Probably yes● Yes○ Varies○ Don't know | Survival from sudden cardiac arrest is low. Patients who present in an initial cardiac rhythm of ventricular fibrillation (VF) have a higher rate of good outcome. Approximately 20% of VF patients, however, will remain in VF despite standard resuscitation interventions. Patients in refractory VF have significantly lower rates of survival than patients who respond to standard resuscitation treatments.  |  |
| Desirable EffectsHow substantial are the desirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial○ Small○ Moderate●  Large○ Varies○ Don't know | Improvement in survival to discharge and neurologic outcome is substantial.  |  |
| Undesirable EffectsHow substantial are the undesirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Large○ Moderate○ Small○ Trivial○ Varies● Don't know | It is not currently known if there are undesirable effects of VC defibrillation. Whether changing the orientation of pad placement during resuscitation would have any negative effect, such as interrupting CPR or delaying defibrillation, is not known.  |  |
| Certainty of evidenceWhat is the overall certainty of the evidence of effects? |
| Judgement | Research evidence | Additional considerations |
| ●  Very low● Low○ Moderate○ High○ No included studies | The certainty around the evidence for VC compared with SD is low to very low. The new randomized trial is the first of its kind, and shows a benefit from VC compared with SD for VF termination and survival to discharge. Point estimates also suggested possible benefit for ROSC and survival with favorable neurologic outcome, but statistical significance was not achieved for those outcomes. The certainty of evidence was downgraded for risk of bias due to the unavoidable lack of blinding on the part of the treating paramedics, and because of the cluster randomization, with a paramedic service being aware of the treatment group at the time of enrolment and treatment. Evidence was also downgraded for imprecision as the optimal information size, based on the author’s own sample size calculations, was not met due to the trial being terminated early. Certainty was downgraded additionally for imprecision for ROSC and favorable neurologic outcome, due to a confidence interval spanning both benefit and harm.  |  |
| ValuesIs 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 | There is little uncertainty around the value that people put on the main outcome of neurological survival and/or survival to hospital discharge.  |  |
| Balance of effectsDoes 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 | Although the certainty of evidence is low to very low, the existing evidence suggests a beneficial effect with VC compared with SD on all included outcomes.  |  |
| Resources requiredHow large are the resource requirements (costs)? |
| Judgement | Research evidence | Additional considerations |
| ○ Large costs○ Moderate costs○ Negligible costs and savings○ Moderate savings○ Large savings○ Varies● Don't know | No research examined costs associated with the intervention.  | Changing pad orientation could require some cost for training.  |
| Certainty of evidence of required resourcesWhat is the certainty of the evidence of resource requirements (costs)? |
| Judgement | Research evidence | Additional considerations |
| ○ Very low○ Low○ Moderate○ High● No included studies | No research examined the resource requirements for the intervention |  |
| Cost effectivenessDoes the cost-effectiveness of the intervention 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● No included studies | Not known. No included studies |  |
| EquityWhat would be the impact on health equity? |
| Judgement | Research evidence | Additional considerations |
| ○ Reduced○  Probably reduced● Probably no impact○ Probably increased○ Increased○ Varies○ Don't know | While no studies addressing the effect on equity were identified, changing the pad placement should be feasible in any setting where a defibrillator is already available, and thus we do not anticipate that a VC strategy would affect equity.  |  |
| AcceptabilityIs the intervention acceptable to key stakeholders? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no●  Probably yes○ Yes○ Varies○ Don't know | Stakeholders are likely to accept the benefit vs risk. If effective, the benefit is high, while the relative risks would be low. |  |
| FeasibilityIs the intervention feasible to implement? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know | There is no research examining the feasibility of this intervention. It is likely to be feasible as no additional equipment would be required.  |  |

# Summary of judgements

|  | **Judgement** |
| --- | --- |
| **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 |
| **Resources required** | Large costs | Moderate costs | Negligible costs and savings | Moderate savings | Large savings | Varies | **Don't know** |
| **Certainty of evidence of required resources** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **Cost effectiveness** | Favors the comparison | Probably favors the comparison | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | **No included studies** |
| **Equity** | Reduced | Probably reduced | **Probably no impact** | Probably increased | Increased | 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 |
| We suggest thata double sequential defibrillation strategy may be considered instead of a standard defibrillation strategy for adults with cardiac arrest who remain in ventricular fibrillation or pulseless ventricular tachycardia after 3 or more consecutive shocks in settings where this practice is feasible. (weak recommendation, low certainty of evidence)  In settings where double sequential defibrillation would require allocation of significant additional resources, we suggest thata vector change defibrillation strategy (placement of defibrillation pads in the anterior-posterior position instead of anterior-lateral) may be considered for adult patients with cardiac arrest who remain in ventricular fibrillation or pulseless ventricular tachycardia after 3 or more consecutive shocks. (weak recommendation, low to very low certainty of evidence) If a double sequential defibrillation strategy is utilized, we suggest an approach similar to that in the available trial, with a single operator activating the defibrillators in sequence. (good practice statement) |
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| Justification |
| Existing data provides low certainty evidence of improved ROSC, VF termination, survival to discharge and favorable neurologic outcome (mRS 0-2) with DSED compared with SD for refractory VF. These data also provide low certainty evidence for improvement in VF termination and survival to discharge with VC compared with SD. Benefits from VC compared with SD on ROSC and favorable neurologic outcome at hospital discharge did not reach statistical significance. However it is not possible to conclude with the data available whether DSED is superior to VC for this patient population. There are no trials on either intervention in IHCA, but the TF opinion is that this evidence could be applied to the IHCA, with additional downgrading for indirectness.  |

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| Subgroup considerations |
| None |

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| Implementation considerations |
| Implementation of DSED would require training of frontline staff as well as ensuring that there were defibrillators that were available to provide the intervention. Implementation of a VC strategy would require training, but would not necessarily require additional defibrillators.  |

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| Monitoring and evaluation |
| It is important to monitor the intervention, not just to determine effectiveness but to track any adverse events such as harm to the patient, defibrillator damage, the increase in resource utilization etc.  |

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| Research priorities |
| -Comparison of the effectiveness of DSD and VC in this patient population-Optimal timing of either of these defibrillation strategies-Whether pad placement with SD affects efficacy |

**Reference**

Crampton R. Accepted, controversial, and speculative aspects of ventricular defibrillation. Progress in Cardiovascular Diseases. Volume 23, Issue 3, 1980, 167-186