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| Question | |
| **Should a load-distributing band mechanical CPR device vs. manual CPR be used for IHCA?** | |
| **Population:** | IHCA |
| **Intervention:** | a load-distributing band mechanical CPR device |
| **Comparison:** | manual CPR |
| **Main outcomes:** | ROSC; survival to hospital discharge or 30 days or longer; survival with favorable neurological outcome at hospital discharge, 30 days or longer; resuscitation-related injuries |
| **Setting:** | **IHCA** |
| **Perspective:** |  |
| **Background:** |  |
| **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 | High quality CPR is critical to improving cardiac arrest outcomes. Use of mechanical CPR has increased significantly since the COVID pandemic, although the existing treatment recommendation suggests against routine use. |  |
| Desirable Effects How substantial are the desirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know | There were no studies investigating desirable effects of load-distributing band mechanical CPR in IHCA. |  |
| Undesirable Effects How substantial are the undesirable anticipated effects? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know | Limited evidence (one small study) has not found a significant difference in CPR-related injuries from the load-distributing band mechanical CPR device compared with manual CPR, although the point estimate for CPR-related injuries was higher. |  |
| 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 | Very low certainty of effect was found from one small study.     | **Outcomes** | **With manual CPR** | **With a load-distributing band mechanical CPR device** | **Difference** | **Relative effect (95% CI)** | | --- | --- | --- | --- | --- | | Serious resuscitation-related structural visceral damage (Koster 2017) | 77 per 1,000 | **102 per 1,000** (35 to 299) | **25 more per 1,000** (42 fewer to 222 more) | **RR 1.32** (0.45 to 3.89) | |  |
| 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 | Survival with favorable neurological outcome is widely regarded as the most critical outcome. Opinions vary on the relative importance of outcomes such as ROSC. The outcome of resuscitation-related injuries probably varies somewhat, in part based on whether increased survival with favorable neurological outcome is achieved or not. |  |
| 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 | The single trial of a load-distributing band CPR device compared with manual CPR did not show either benefit or increased harm from the use of mechanical CPR, although it was not powered for clinical outcomes. Indirect evidence from OHCA trials is mixed. |  |
| Resources required | | |
| Judgement | Research evidence | Additional considerations |
| ○ Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ● Varies ○ Don't know | Cost depends on whether hospitals are already using one of these devices. No studies were identified. |  |
| Certainty of evidence of required resources What is the certainty of the evidence of resource requirements (costs)? | | |
| Judgement | Research evidence | Additional considerations |
| ○ Very low ○ Low ○ Moderate ○ High ● No included studies |  |  |
| Cost effectiveness Does 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 |  |  |
| Equity What 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 | Because the evidence suggests neither benefit nor harm, whether or not use of these devices for OHCA is implemented likely would not impact equity, although purchasing these devices would be more difficult in low-resource settings. |  |
| Acceptability Is the intervention acceptable to key stakeholders? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | These devices are already in use in many healthcare settings. |  |
| Feasibility Is the intervention feasible to implement? | | |
| Judgement | Research evidence | Additional considerations |
| ○ No ○ Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know | Feasibility will depend on the financial and training resources of the healthcare system. |  |

# 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** | Trivial | **Small** | Moderate | Large |  | 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 against the routine use of automated mechanical chest compression devices to replace manual chest compressions for cardiac arrest (weak recommendation, very low-certainty evidence).    Automated mechanical chest compression devices may be a reasonable alternative to manual chest compressions in situations where sustained high-quality manual chest compressions are impractical or compromise provider safety (good practice statement). |
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| Justification |
| This topic was prioritized by the ALS Task Force due to awareness of a marked increase in the use of mechanical CPR in several countries since the COVID-19 pandemic, and because the Task Force was aware of new trials. For the use of a load-distributing band for IHCA, only 1 study was identified and this showed neither benefit nor harm for the use of a mechanical device for CPR compared with manual CPR). The primary focus of that study was resuscitation-related injuries. The treatment recommendation and good practice statement are therefore based primarily on evidence from trials of mechanical CPR for OHCA, or for other types of mechanical CPR devices in the IHCA setting. |

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| Subgroup considerations |
| Evidence not available, but consideration of avoiding delays in defibrillation, perhaps by not deploying mechanical CPR devices until after the first shock for shockable rhythms, is likely important. |

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| Implementation considerations |
| Not addressed |

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| Monitoring and evaluation |
| Mechanical CPR devices require training and regular practice to use efficiently. |

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| Research priorities |
| · Whether mechanical CPR improves outcome from IHCA.  · Whether the possible benefit of mechanical CPR depends on timing of use, cardiac arrest rhythm, or setting.  · Whether one mechanical CPR device is superior to another  · Whether rates of CPR-related injuries from mechanical CPR vary by patients size and age  · The optimal approach to defibrillation (ie whether to pause the device for defibrillation, vs other approaches such as timing defibrillation with compression phase) when mechanical CPR devices are used |

# References Summary