# QUESTION

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| **Unintentional injury from CPR to Victims Not in Cardiac Arrest** | |
| **POPULATION:** | Among adults and children who are not in cardiac arrest out-side of a hospital |
| **INTERVENTION:** | Provision of chest compressions from lay persons |
| **COMPARISON:** | No use of chest compressions |
| **MAIN OUTCOMES:** | Survival with favorable neurological/functional outcome at discharge, 30 days, 60 days, 180 days, and/or 1 year; unintentional physical injury (previous ‘harm’) (e.g. rib fracture, bleeding); risk of injury (e.g. aspiration) |
| **SETTING:** | out-of-hospital |
| **PERSPECTIVE:** | Patient perspective |
| **BACKGROUND:** | Many lay persons are concerned that delivering chest compressions to a person who is not in cardiac arrest could lead to serious injuries and thus, are reluctant to initiate CPR, even when a person is in cardiac arrest. It is further difficult to rapidly assess if a person is in cardiac arrest or is unconscious and has bradypnea.  The 2020 International Liaison Committee on Resuscitation (ILCOR) review, for the important outcome of “harm,” identified very-low-certainty evidence and concluded with a strong recommendation (“We recommend that laypersons initiate CPR for presumed cardiac arrest without concerns of harm to patients not in cardiac arrest). Based on task force discussions, the term harm was changed to unintentional injury since harm is more related to intentional than unintentional. |
| **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 | Cardiopulmonary resuscitation has been established as a critical step in the “chain of survival” for victims of sudden cardiac arrest (Cummins et al 1991). Complications by doing CPR on patients not in cardiac arrest occur infrequently. It is reasonable to perform immediate CPR initiated by laypersons for patients in cardiac arrest against the low risk of injury in patients not in cardiac arrest.  The ILCOR Basic Life Support Task Force prioritized this PICOST as a systematic review as it had not been reviewed since the 2015 Guidelines. The systematic review underlying the COSTR was never published. The PCOST was transferred to ILCORs First Aid task force in 2023 and an updated review was undertaken. | Pooled data from the five included studies on 1031 patients shown a frequency of less than 1 % on unintentional injury or risk of such. |
| **Desirable Effects**  How substantial are the desirable effects? | | |
| **JUDGEMENT** | **RESEARCH EVIDENCE** | **ADDITIONAL CONSIDERATIONS** |
| * Trivial * Small * Moderate * Large * Varies * Don't know | The FA Task Force considered the likely survival benefit of CPR initiated by lay persons for patients in cardiac arrest to outweigh the low risk of injury in patients not in cardiac arrest. | Chest compressions should be started within seconds according to guidelines. Recognition of a cardiac arrest within that timeframe for both a lay person and a dispatcher might be challenging. The task force (TF) values starting chest compressions far greater than a delay to such by adding time for recognition of cardiac arrest. |

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| **Undesirable Effects**  How substantial are the undesirable anticipated effects? | | |
| **JUDGEMENT** | **RESEARCH EVIDENCE** | **ADDITIONAL CONSIDERATIONS** |
| * Large * Moderate * Small * Trivial * Varies * Don't know | Case reports and case series of serious injuries to persons receiving CPR who are not in cardiac arrest are considered likely to be published as they are of general interest to a broad group of health care providers.  The overall reported percentage of patients with unintentional injuries was <1%. This strengthens the belief that the desirable effects will far outweigh undesirable effects. |  |
| **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 | The evidence is of observational studies and case series only. Many studies reported zero injuries or risk of complications although this may be due to underreporting secondary to lack of standardized follow-up in these category of patients and a substantial portion of the patients being discharged after assessment in the emergency department. |  |
| **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 | There is little uncertainty about people valuing survival from cardiac arrest.  The First Aid (FA) Task Force believes risk from CPR to patients not in cardiac arrest (but with a condition serious enough to be mistaken for a cardiac arrest) is acceptable to the general population given the potential benefits of early CPR in cardiac arrest. |  |
| **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 | In making this recommendation, we place a higher value on the survival benefit of CPR initiated by laypersons for patients in cardiac arrest, and lower value to what is believed to be minimal risk of injury to patients not in cardiac arrest. |  |

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| **Resources required**  How 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 studies examined costs. |  |
| **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? | | |

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| **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 | No studies examined the cost-effectiveness. |  |
| **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 | No studies examined health equity. | Very few of the characteristics listed in the Cochrane checklist for equity, PROGRESS Plus, were reported in the included studies.  However, it was noted that the layperson often had some kind of relation to the victim, either as a family member or personnel at a nursing home. They might both fear harm and prioritize survival. |
| **Acceptability**  Is the intervention acceptable to key stakeholders? | | |
| **JUDGEMENT** | **RESEARCH EVIDENCE** | **ADDITIONAL CONSIDERATIONS** |
| * No * Probably no * Probably yes * Yes * Varies * Don't know | No studies examined acceptability. |  |

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| **Feasibility** | | |
| **JUDGEMENT** | **RESEARCH EVIDENCE** | **ADDITIONAL CONSIDERATIONS** |
| * No * Probably no * Probably yes * Yes * Varies * Don't know | No studies examined feasibility. |  |

# SUMMARY OF JUDGEMENTS

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|  | **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**

## Recommendation

We recommend that laypersons initiate CPR for presumed cardiac arrest without concerns of causing unintentional injury (Strong recommendation, low certainty evidence).

We recommend that other rescuers (e.g., trained bystanders, health care professionals and those with a duty to respond) initiate CPR for presumed cardiac arrest’ without concerns of unintentional injury to patients not in cardiac arrest (Good practice statement).

## Justification

* In making this discordant recommendation, the FA Task Force placed a much higher value on the potential survival benefits of CPR initiated by lay persons for patients in cardiac arrest, and a lower value on the low risk of injury in patients not in cardiac arrest. The intention of this recommendation is to strongly encourage and support lay persons who are willing to initiate CPR in any setting when they believe someone to have suffered from a cardiac arrest.
* The included studies focused on lay persons, i.e. not other persons such as health care professionals or those with a duty to response who might be fully or partly trained in first aid and CPR, but the TF believe that the benefit of starting CPR outweigh the injuries and used the indirect evidence to make a good practice statement.
* Three studies were on different dispatcher protocols for CPR and it might be possible to use the result to support emergency medical dispatchers or telecommunicators in their efforts to provide telephone assisted CPR instructions in suspected cardiac arrest calls, but the TF felt that it is beyond the scope of first aid.
* The incidence of chest wall bone fractures was substantially lower than the incidence reported after CPR in patients who were in cardiac arrest. This is likely the result of shorter duration of CPR (most often less than 5 min) initiated by laypersons but stopped by professional rescuers. However, the possibility of under reporting due to non-systematic diagnostic studies cannot be excluded

## Implementation considerations

* In making this discordant recommendation, the FA Task Force placed a higher value on the potential survival benefits of CPR initiated by lay persons for patients in cardiac arrest, and a lower value on the low risk of injury in patients not in cardiac arrest. The intention of this recommendation is to strongly encourage and support lay persons who are willing to initiate CPR in any setting when they believe someone to have suffered a cardiac arrest.
* The included studies focused on lay persons, i.e. not other persons such as health care professionals or those with a duty to response who might be fully or partly trained in first aid and CPR, but the TF believe that the benefit of starting CPR outweigh the harm and used the indirect evidence to make a good practice statement.
* Three studies were on different dispatcher protocols for CPR and it might be possible to use these results to support emergency medical dispatchers or telecommunicators in their efforts to provide telephone assisted CPR instructions in suspected cardiac arrest calls, but the TF felt this to be beyond the scope of first aid.
* The incidence of chest wall bone fractures was substantially lower than the incidence reported after CPR in patients who were in cardiac arrest. This is likely the result of shorter duration of CPR (most often less than 5 min) initiated by laypersons but stopped by professional rescuers. However, the possibility of under reporting due to non-systematic diagnostic studies cannot be excluded.

## Monitoring and evaluation

Registries on out-of-hospital cardiac arrest (OHCA) and suspected OHCA might allow for identification of unintentional injury.

## Research priorities

Current knowledge gaps include but are not limited to:

* More studies are needed with robust methodology to identify unintentional injuries and provide follow-up after hospital discharge.
* There is a possibility of under reporting due to nonsystematic diagnostic studies. Further, as follow up was limited (i.e. many patients were discharged from the ED), it is possible that symptoms occur later.
* Only one study included people under 18 years. Children might have a different pattern of both causes and injuries.
* The included studies were from the United States and Asia. Attitudes towards performing layperson CPR might differ between cultures.
* Few aspects of equity were reported in studies, the use of a structure such as Cochranes PROGRESS Plus might increase reporting.

Equity statement:

Few aspects of equity were reported in studies. The use of a structure equity assessment, such as the Cochrane PROGRESS Plus tool, might increase reporting. The proportion of men and women were roughly equal in the studies. However, in three studies the layperson often had some kind of relationship to the victim, either as a family member or personnel at a nursing home. They might both fear causing an injury and prioritize survival.