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| RESEARCH QUESTION |
| **Should inclusion of team or leadership training vs. no such training be used for training of health care providers (RCT)?** |
| **Population:** | training of health care providers (RCT) |
| **Intervention:** | inclusion of team or leadership training |
| **Comparison:** | no such training |
| **Main outcomes:** | Patient survival; Skill performance in actual resuscitations; Skill performance at 3 months - 15 months (patient tasks); Skill performance at 3 months - 15 months (teamwork); Skill performance at 3 months - 15 months (leadership); Skill performance at course conclusion (patient tasks); Skill performance at course conclusion (teamwork); Skill performance at course conclusion (leadership); Cognitive knowledge; |
| **Setting:** | Health care provider education |
| **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 | Teamwork and leadership is increasingly recognised as a factor contributing to patient safety and outcome in healthcare (Rosen M. Am Psychol. 2018 ; 73(4): 433–450. doi:10.1037/amp0000298.). In the context of advanced life support, which is fundamentally a team effort, the contribution of teamwork and leadership is therefore expected to make a significant contribution to patient outcome. | Cooper and Wakelam were amongst the first to identify the lack of team and leadership training in ALS courses (Cooper and Wakelam, Leadership of Resuscitation Teams: "Lighthouse leadership " Resuscitation 1999;42:27-45) |
| Desirable EffectsHow substantial are the desirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial○ Small● Moderate○ Large○ Varies○ Don't know | Desirable effectsThere are only three observational studies and no randomised studies for the critical outcome "patient survival". These studies suffer from risk of bias, indirectness and imprecision. Andreatta reported an increase of survival rate of inhospital cardiac arrest from 33 to 48% after the first year of a mock code program. There was a significant effect size of the training on survival. However, team training was only a part of the mock code training. Our confidence in the effect size of the actual team training on survival is limited. |  |
| Undesirable EffectsHow substantial are the undesirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Large○ Moderate● Small○ Trivial○ Varies○ Don't know | Undesirable effects:We could not find evidence for undesirable effects of team and leadership training | A focus during training on team and leadership may distract from other educational outcomes such as technical performance. Team and leadership training may also incur costs. |
| 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 overall quality of the evidence that team and leadership training leads to improved patient outcome is low to very low. The overall certainty of the evidence for our critical outcomes is very low. | Maybe team and leadership training alone will not lead to improved patient outcome. In addition to training, exposure may be required in order to achieve improved patient outcome. it is unknown how training and exposure relate to each other. It is unknown if (simulation) training may substitute low exposure. |
| 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 | We assume that both health care professionals and patients and relatives of patients will value patient survival more than any educational outcome. We do not think that there will be much variation between individuals on how they value the intervention. |  |
| 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 | We judge the desirable effects to be moderate (certainly if one included the educational outcomes) and the undesirable effects small. Balancing the effects we favour the intervention. |  |
| 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 | There is a cost to train instructors to teach non technical skills during advanced life support courses, and there may be a cost for the participants. Overall these costs seem moderate.  |  |
| 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 | it is not known how team and leadership may be trained most cost-effectively. Cost may vary between e-learning, instruction, instructor-led low-fidelity simulation and high fidelity simulation.  |  |
| 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 | We cannot assess the cost-effectiveness of the intervention compared to the comparison. There is very significant heterogeneity between studies regarding the type and the duration of the intervention. |  |
| 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 | Most studies consider team and leadership training as an "add on" to standard advanced life support training. As such it may only be relevant to areas that already have implemented such courses, thereby increasing inequity. It may, however, also be possible to consider team and leadership as an integral part of any resuscitation training; also for low-resource settings. To our knowledge, there are no data to support such strategy. |  |
| AcceptabilityIs the intervention acceptable to key stakeholders? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know | As costs are probably modest, we expect health care providers to accept the intervention. |  |
| FeasibilityIs the intervention feasible to implement? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no○ Probably yes● Yes○ Varies○ Don't know | Team and leadership training may be implemented as an integral part of any advanced life support training, which is feasible and sustainable. |  |

# 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 |
| **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 that specific team and leadership training be included as part of advanced life support training for healthcare providers (weak recommendation, very low certainty evidence). |
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| Justification |
| Teamwork and leadership are increasingly recognised as factors contributing to patient safety and outcome in healthcare (Rosen M. Am Psychol. 2018; 73(4): 433–450. doi:10.1037/amp0000298.). In the context of advanced life support, which is fundamentally a team effort, the contribution of teamwork and leadership is therefore expected to make a significant contribution to patient outcome. The relevance of this review is further supported by the observations in 1999 by Cooper who reported that leadership during resuscitation is associated with team performance and that, therefore, leadership training should be provided (Cooper S, Wakelam A. Leadership of Resuscitation Teams: "Lighthouse leadership " Resuscitation 1999;42:27-45). In 2015 the EIT Task Force suggested in its Treatment Recommendation to recommend team and leadership training in ALS courses (weak recommendation based on low-quality evidence)Although our current review identified many new studies since the 2015 CoSTR, no RCT addressed the most critical outcome "patient survival". On the other hand, we found three observational studies for this critical outcome "patient survival", but they suffer from risk of bias, indirectness and imprecision. In making our recommendation about team and leadership training in ALS courses, we have placed emphasis on the potential benefit, lack of harm, and high level of acceptance of team and leadership training and lesser value on associated costs.In the studies, many different methods to train leadership and team behaviour were reported: through e-learning, video-based training, instruction, demonstration, low fidelity simulation or high fidelity simulation. Team and leadership training may be delivered as an add-on training module to an ALS course, or as an integral part of an ALS course. As such, there was considerable heterogeneity in the studies analysed. The EIT Task Force was of the opinion that integration of team and leadership training in ALS courses may promote its sustainability. In addition to team and leadership training, sufficient exposure to resuscitation may be required in order to achieve improved patient outcome. |

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| Subgroup considerations |
| Unclear what the effects of separate team and leadership training are. |

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| Implementation considerations |
| Team and leadersthip training should be considered a (first) step towards improved resuscitation practice and efficacy. However, team leader and team member experience/exposure are likely to be required for successful implementation and ultimately patient survival. |

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| Monitoring and evaluation |
| Registries could be useful to monitor improved survival as team and leadership training are implemented. |

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| Research priorities |
| • What is the most effective/efficient method of team and leadership training (e-learning, instruction, demonstration, simulation training,...)?• How do team training and leadership training interact and what is their relative importance? Is training of the leader more efficient than training of the team? • What is the effect of team and leadership training on patient outcome (there are no RCTs)?• How do team/.leadership training and provider experience/exposure to resuscitation interact? |