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| QUESTION | |
| **Favorable EEG patterns non-ACNS-defined for prediction of good neurological outcome in adults with cardiac arrest**  **(Subsection of Prognostication ETD)** | |
| **POPULATION:** | Adults who are comatose after resuscitation from cardiac arrest (either in-hospital or out-of-hospital), regardless of target temperature management. |
| **INTERVENTION:** | Full-montage EEG assessed within 72h after cardiac arrest. |
| **COMPARISON:** | *None.* |
| **MAIN OUTCOMES:** | Prediction of good neurological outcome defined as Cerebral Performance Categories (CPC) on hospital discharge or three or six months after cardiac arrest |
| **STUDY DESIGN:** | Prognostic accuracy studies where the 2 x 2 contingency table (i.e., the number of true/false negatives and positives for prediction of good outcome) was reported, or where those variables could be calculated from reported data. are eligible for inclusion. Unpublished studies, reviews, case reports, case series, studies including less than 10 patients, letters, editorials, conference abstracts, and studies published in abstract form were excluded. |
| **TIMEFRAME:** | An ILCOR review from 2013 and an update from 2020 presented the evidence of predictors of poor neurological outcome after cardiac arrest. More recently, several studies identifying predictors of good neurological outcome after cardiac arrest have been published, therefore an ILCOR evidence review for predictors of good neurological outcome after cardiac arrest is necessary.  The most recent search of this systematic review evidence update on neuroprognostication was launched in October 2022. |

# 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 | Neurologic injury is the most common cause of death in patients with post cardiac arrest syndrome. Most of these deaths occur due to withdrawal of life-sustaining treatment (WLST) based on the prediction of poor neurological outcome. Neurological prognostication after cardiac arrest is of utmost importance to avoid futile treatments for unsalvageable patients but also to minimize the risk of falsely pessimistic prediction and self-fulfilling prophecy. |  |
| Desirable Effects How substantial are the desirable anticipated effects? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ● Trivial ○ Small  ○ Moderate ○ Large ○ Varies ○ Don't know | Three studies [Lamartine, 2016; Leao, 2015; Alvarez, 2015] defined favorable EEG patterns using heterogeneous definitions none of which complied with the American Clinical Neurophysiology Society’s (ACNS) terminology. Those definitions were mostly based on dominant frequencies of the background activity (theta or alpha vs. delta) and none excluded superimposed discharges. The timing of outcome was hospital discharge in one study [Alvarez, 2015], three months in one study [Lamartine, 2016] and six months in one [Leao, 2015].  In one study [Lamartine, 2016] EEG was assessed at several time-windows within 24 hours after CA (at 0–8h, 8–16h, and 16–24h**) and specificity to predict good outcome ranged between 64% and 77% being highest at the earliest time-window (sensitivities ranged between 86% to 96%).** In another [Alvarex, 2015] study EEG assessed within 24 hours after CA favorable EEG pattern predicted good outcome with specificity of **100% but sensitivity was low 25%.**  All three studies assessed EEG approximately **within 24–48 h after CA and the specificities to predict good outcome ranged between 68% and 91% (sensitivities from 75% to 96%)**  Lamartine Monteiro M, Taccone FS, Depondt C, et al. (2016) The prog- nostic value of 48-h continuous EEG during therapeutic hypothermia after cardiac arrest. Neurocrit Care 24:153–162  Leao RN, Avila P, Cavaco R, Germano N, Bento L (2015) Therapeutic hypothermia after cardiac arrest: outcome predictors. Revista Brasileira de terapia intensiva 27:322–332  Alvarez V, Reinsberger C, Scirica B, et al. (2015) Continuous electrodermal activity as a potential novel neurophysiological biomarker of prognosis after cardiac arrest—a pilot study. Resuscitation 93:128–135 |  |
| Undesirable Effects How substantial are the undesirable anticipated effects? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ○ Large ○ Moderate ● Small ○ Trivial ○ Varies  ○ Don't know | None known. | A falsely optimistic prediction in a patient with poor neurological outcome may potentially lead to the delivery of futile care. |
| 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 certainty of evidence about varying favorable EEG patterns is very low because of bias (mainly due to lack of blinding), inconsistency of definitions, and imprecision. |  |
| 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 | All studies defined good outcome as CPC 1–2 | Additional outcomes about neurocognitive status and quality of life were not assessed. |
| 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 | Evidence from three studies showed that heterogeneous, non-ACNS-defined benign EEG patterns mainly based on dominant frequency, are associated with good neurological outcome. However, the evidence was heterogeneous and limited to three studies. |  |
| 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 | We did not include any specific studies assessing EEG costs. However, specific equipment and skills are required for assessing EEG |  |
| 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 | We did not identify any studies specifically assessing costs of EEGs. |  |
| 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 | We did not identify any studies addressing cost-effectiveness of EEGs. |  |
| 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 | The specific equipment and skills needed to assess EEGs are not available everywhere. This can create a problem in terms of equity. |  |
| Acceptability Is the intervention acceptable to key stakeholders? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | We have not identified any research that assessed acceptability of EEGs. However, acceptability is likely. |  |
| Feasibility Is the intervention feasible to implement? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know | The equipment and skills required for their assessment may represent an obstacle for their implementation. |  |

# 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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| Recommendations |
| **We suggest against using heterogeneous, non-ACNS-defined benign EEG patterns to predict good neurological outcome after cardiac arrest.** |
| Justification |
| In recommending against using non-ACNS-defined benign EEG patterns to predict good neurological outcome after cardiac arrest, the panel considered the limited evidence and the heterogeneity of pattern definitions. |
| Subgroup considerations |
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| Implementation considerations |

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| Monitoring and evaluation |
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| Research priorities |
| Studies are needed to identify the role of dominant EEG rhythms in predicting good outcome after cardiac arrest. |