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| QUESTION | |
| **Glascow Coma Scale motor score 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:** | Glasgow Coma Scale motor score evaluated within 96h after cardiac arrest. |
| **COMPARISON:** | *None.* |
| **MAIN OUTCOMES:** | Prediction of good neurological outcome defined as Cerebral Performance Categories (CPC) 1-2 at 3 or at 6 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 Unpublished studies, reviews, case reports, case series, studies including less than 10 patients, letters, editorials, conference abstracts, and studies published in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. The majority of these deaths occur as a result of withdrawal of life-sustaining treatment (WLST) based on the high likelihood of severe hypoxic brain injury and 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. Identifying patients with a likely good outcome based on clinical examination could facilitate the continuation of care in some unconscious patients. The Glasgow Coma Scale motor score less than three is an integral part of the prognostication algorithm for predicting poor outcome. |  |
| Desirable Effects How substantial are the desirable anticipated effects? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know | The Glasgow Coma Score (GCS) motor score was investigated in two observational studies [Hifumi, 2015 2201; Moseby-Knappe, 2020 1852]. According to bias assessments the overall bias was moderate in one study [Moseby-Knappe 2020 1852] and high in one study [Hifumi 2015 2201].  In both studies the clinical examination was done off-sedation.  In one study [Moseby-Knappe, 2020 1852] GCS motor score of > 3 on a day three or four (72–96h) after cardiac arrest predicted good outcome at 6 months with specificity of 84% (95% CI 79-83%) and sensitivity of 77% (95% CI 67-85%). In the same study GCS motor score 3–5 on day 4 predicted good outcome with 72% (95% CI 66-77%) specificity and 96% (95% CI 93-97%) sensitivity.  In one study [Hifumi, 2015 2201] GCS motor score 4–5 evaluated on ICU admission predicted good outcome at 3 months after cardiac arrest with specificity of 98% (95% CI 93-99%)and sensitivity of 12% (95% CI 7-17%). | Sedation may interfere with clinical examination potentially reducing its accuracy for predicting good neurological outcome.  In the study with motor response evaluated on hospital admission [Hifumi, 2015 1852] GCS motor score 4–5 was a relatively uncommon but highly specific (98%) predictor of good neurological outcome. If confirmed by further stud- ies, this sign may be considered to screen patients destined to neurological recovery early after arrest and potentially rationalise post-resuscitation interventions |
| Undesirable Effects How substantial are the undesirable anticipated effects? | | |
| JUDGEMENT | RESEARCH EVIDENCE | ADDITIONAL CONSIDERATIONS |
| ○ Large ○ Moderate ○ Small ● Trivial ○ Varies  ○ Don't know | Cardiac arrest patients with prolonged unconsciousness are the population in whom prognostic uncertainty is maximal in the intensive care unit (ICU), and who are the target of currently recommended prognostic algorithms. In these patients, combining multiple prognostic tests may reduce uncertainty. Continuing care and conducting more confirmatory tests with signs of a possible good outcome based on a test result of GCS motor score higher than three is not likely to have undesirable effects as it may increase the certainty of the patients’ prognosis. |  |
| 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 from GCS motor score is very low because of the small number of studies, the risk of bias (high to moderate), and the risk of interference related to the use of sedation and pain medication. | Similarly to other predictors based on clinical examination, GCS motor score cannot be concealed from the treating team.  GCS motor score is prone to confounding due to sedation.  The performance of the painful stimulus eliciting the motor response is not standardized. |
| 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 | It is common to define CPC scores of 1–2 as a favorable neurological outcome after cardiac arrest. There is limited data available regarding whether some people value a CPC of 3 as a favorable outcome. |  |
| 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 | Assessment of the GCS motor score is an integral part of prognostication in patients after cardiac arrest. It is already recommended as a way to identify those unconscious patients who have a GCS motor score less than 3, and who should undergo further testing for hypoxic brain injury. Using the GCS motor score in order to identify those with a better motor response, is not likely to have undesirable effects. On the other hand the effect of administered sedation and pain medication may influence the assessment of the GCS motor score and the adequate time for achieving a reliable test result may vary between patients. |  |
| 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 | Costs for the assessment of GCS motor score are negligible. | No study assessing savings from prognostication based on GCS motor score was identified in our review. Using the GCS instead of other means of prognostication could lead to saving but no such studies were found. |
| 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 | Assessing the GCS motors score is not costly, but we did not identify any studies specifically assessing costs of GCS motor score. |  |
| 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. |  |
| 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 | Considering the negligible costs of GCS motor score, a problem of inequity is unlikely. |  |
| 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 study assessing acceptability, but 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 | Although feasibility was not specifically addressed in any of the studies included in this review, the assessment of GCS motor score does not require special skills or equipment. Nevertheless, the examiner needs to be familiar with the basics of clinical neurological examination. |  |

# 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 assessing the Glasgow Coma Scale motor score in the first four days after cardiac arrest to identify patients with a score higher than three, which may indicate an increased likelihood of favourable outcome (weak recommendation, very low certainty of evidence). |
| Justification |
| The evidence is limited, but the assessment of GCS is without cost and is an integral part of intensive care. The need to ensure that the assessment is not influenced by sedation is likely to be a problem that clinicians are somewhat familiar with. We note that the admission GCS motor score also was specific for predicting outcome but since the evidence was of such low certainty, its value is unclear. |

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| Subgroup considerations |
| The data are exclusively from patients with OHCA and those with a cardiac cause of the arrest. |
| Implementation considerations |

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| Monitoring and evaluation |
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| Research priorities |
| Larger studies on the use of the GCS in cardiac arrest patients at various time-points are needed. In addition, there is a need to include in-hospital cardiac arrest patients as well as those with a non-cardiac cause of the arrest.  The clinical course and the need for further prognostic tests in patients with a GCS motor score of three (flexion) is currently unclear.  Studies comparing the use of GCS motor score to other means of assessing the prognosis are needed. This includes studies assessing costs and cost-effectiveness.  Studies on whether there is inter-rater variability between different health care professionals assessing the GCS motor score. |

References:

Hifumi T, Kuroda Y, Kawakita K, et al. Effect of Admission Glasgow Coma Scale Motor Score on Neurological Outcome in Out-of-Hospital Cardiac Arrest Patients Receiving Therapeutic Hypothermia. Circ J. 2015;79(10):2201-8.

Moseby-Knappe, M., Westhall, E., Backman, S. et al. Performance of a guideline-recommended algorithm for prognostication of poor neurological outcome after cardiac arrest. Intensive Care Med 46, 1852–1862 (2020).