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1           **Value of EEG reactivity for prediction of neurologic outcome**  
2           **after cardiac arrest: insights from the Parisian registry**

3  
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28       persistent coma

29 **Abbreviations**

30 CA: Cardiac Arrest

31 CPC: Cerebral Performance Category

32 EEG: Electroencephalogram

33 ESM: Electronic Supplementary Material

34 FPR: False Positive Rate

35 GCS: Glasgow Coma Scale

36 ICU: Intensive-Care-Unit

37 IQR: Interquartile-Range

38 NPV: Negative Predictive Value

39 PPV: Positive Predictive Value

40 RASS: Richmond-Agitation-Sedation-Scale

41 ROSC: Return Of Spontaneous Circulation

42 SD: Standard Deviation

43 SSEP: Short-latency Somatosensory Evoked Potentials

44 TTM: Targeted Temperature Management

45 WLST: Withdrawal-of-Life-Sustaining-Treatments

46

47

48 **Abstract:**

49 **Purpose:** To evaluate the predictive value of EEG reactivity assessment and confounders for  
50 neurological outcome after cardiac arrest.

51 **Methods:** All consecutive patients admitted in a tertiary cardiac arrest center between 2007  
52 and 2016 still alive 48 hours after admission with at least one EEG recorded during coma.  
53 EEG reactivity was defined as a reproducible waveform change in amplitude or frequency  
54 following standardized stimulation. Each EEG was classified based on American Clinical  
55 Neurophysiology Society nomenclatures and classified in highly malignant (including status  
56 epilepticus), malignant, or benign EEG. We assessed the predictive values of EEG reactivity  
57 and sedation effect for neurologic outcome at ICU discharge using the Cerebral Performance  
58 Category scale (with CPC 1-2 assumed as favorable outcome and CPC 3-4-5 considered as  
59 poor outcome).

60 **Results:** Among 428 patients, a poor outcome was observed in 80% patients. The median  
61 time to EEG recording was 3 (1-4) days and 51% patients had a non-reactive EEG. The  
62 positive predictive value (PPV) of a non-reactive EEG to predict an unfavorable outcome was  
63 97.1% (IC95% 93.6-98.9), increasing to 98.3% (IC95 94.1-99.8) when the EEG had been  
64 performed without sedation. In multivariate analysis, a non-reactive EEG was associated with  
65 poor outcome (OR 12.6 IC95% 4.7-33.6;  $p < 0.001$ ). In multivariate analysis, concomitant  
66 sedation was not statistically associated with EEG non-reactivity. The PPV of a benign EEG  
67 to predict favorable outcome was 49.7% (IC95% 41.5-57.9), increasing to 66.2% (IC95%  
68 54.3-76.8) when EEG was recorded earlier, with ongoing sedation.

69 **Conclusions:** After cardiac arrest, absence of EEG reactivity was predictive of unfavorable  
70 outcome. By contrast, a benign EEG was slightly predictive of a favorable outcome.  
71 Reactivity assessment may have important implications in the neuroprognostication process  
72 after cardiac arrest and could be influenced by sedation.

## 73 **Introduction**

74 A vast majority of patients who are resuscitated after a cardiac arrest (CA) are still  
75 comatose after return of spontaneous circulation (ROSC) because of transient or definitive  
76 anoxic-ischemic brain injury. Among these comatose patients, a significant proportion of  
77 them remain unconscious after rewarming from targeted temperature management (TTM) and  
78 discontinuation of sedation. Despite the improvement of post-CA care, most of these  
79 comatose patients will die following withdrawal of life-sustaining treatment (WLST) for  
80 irreversible post-anoxic encephalopathy [1,2]. European guidelines recommend to delay the  
81 initiation of WLST until exclusion of potential confounders, focusing mostly on residual  
82 sedation [3,4]. Indeed, predictive value of clinical indicators can be influenced by remaining  
83 effects of sedatives, as illustrated by clinical studies that reported a high rate of delayed  
84 awakening [5,6]. Consequently, a combination of prognostic tools that are independent of  
85 sedation should always be combined to avoid premature WLST.

86 Electroencephalogram (EEG) is broadly used both as a diagnostic and a prognostic  
87 tool in post-CA comatose patients[7]. This bedside investigation is widely available, non-  
88 invasive and provides real-time investigation of electrical brain activity. In post-CA comatose  
89 patients, EEG may reveal a large spectrum of abnormalities carrying prognostic information,  
90 such as malignant patterns indicating brain injury. In addition, ischemia-induced neuronal  
91 damage is associated with decreased amplitude and slowing of background EEG activity, and  
92 these abnormalities are correlated with the degree of neuronal injury [8]. Data from the  
93 literature are heterogeneous regarding the predictive value of EEG non-reactivity for  
94 prediction of a poor outcome in post-anoxic patients [9–13]. By contrast, some authors have  
95 reported that the presence of EEG reactivity could also identify patients with good outcome  
96 [14,15]. However, most of these prior studies have included heterogeneous populations and  
97 did not permit to assess the interaction between sedation and background reactivity.

98 The aim of the present study was to evaluate the prognostic value of EEG reactivity

99 for neurological outcome after CA and to assess the potential confounding effect of sedation.

100

## 101 **Materials and Methods**

### 102 Population

103 We considered for inclusion all consecutive adult patients who were admitted between  
104 January 2007 and October 2016 in the intensive care unit (ICU) of the Cochin University  
105 Hospital (Paris, France) with coma (Glasgow coma scale [GCS]  $\leq 8$ ) after resuscitation from  
106 CA and in whom at least one EEG was performed during coma. We excluded patients  
107 investigated for brain death diagnosis and those who had an EEG performed after awakening.  
108 Patients who died within 48 hours post-CA (before any reliable neurological examination  
109 could be made) were also excluded. Patients' next of kin were informed that data were  
110 collected for clinical research purposes. According to the French legislation, the institutional  
111 review board waived the need for written informed consent.

### 112 Data collection

113 We performed a retrospective analysis of prospectively collected data from our CA  
114 registry that has previously been described [1,16]. The following data were recorded for each  
115 participant: patient's characteristics and cardiac arrest management data using Utstein style  
116 [17], in-hospital parameters including, TTM modalities, type of sedation, timing for  
117 discontinuation of sedation, clinical indicators of neurological status (pupillary light reflex  
118 and motor component of the GCS, status epilepticus, timing for awakening) and short-latency  
119 somatosensory evoked potentials (SSEP). Length of ICU stay, cause of death and vital status  
120 at 1 year were also reported. For the present study, we used the first EEG performed during  
121 the ICU stay.

### 122 ICU management

123 Our management protocol for patients admitted after CA has previously been  
124 described (see **ESM**) and did not change throughout the study period except for sedation [18].  
125 In the absence of contraindication, TTM was immediately started after ICU admission,  
126 targeting a core temperature of 32-34°C for 24 hours using an external cooling device. For  
127 sedation, we used midazolam and fentanyl between 2007 and 2014. Following updated  
128 guidelines, we then shifted towards propofol and remifentanyl. The Richmond Agitation-  
129 Sedation Scale (RASS) was assessed every 3 hours and the sedation level was titrated to  
130 maintain a RASS level of -5 (no response to voice or physical stimulation) all along the TTM  
131 period. Sedatives were interrupted after rewarming.

#### 132 Neurological prognostication and WLST

133 Neurological status was evaluated twice-daily by ICU physicians until death or ICU  
134 discharge. Sedation level was assessed by nurses every 3 hours and awakening was defined by  
135 the presence of 3 consecutive RASS scores of at least -2 (patient briefly awakens with eye  
136 contact to voice), as previously reported [19]. In patients who were still comatose 72 hours  
137 after sedation discontinuation, a multimodal prognostication protocol was used, according to  
138 current guidelines (**ESM**) [3,20–22]. Burst suppression or refractory status epilepticus were  
139 part of our algorithm. Importantly, EEG reactivity was not part of our prognostication  
140 algorithm during the study period.

#### 141 EEG assessment:

142 Intermittent EEG was recorded for at least 20 minutes by a skilled technician using a  
143 standardized protocol with 19 external electrodes. In order to facilitate the interpretation of  
144 tracings, physicians in charge specified several clinical data to the board-certified  
145 neurologists, such as GCS, pupillary and corneal reflexes, presence of myoclonus, timing of  
146 sedation weaning, and drugs administered during EEG recording.

147 Presence of EEG reactivity was defined as the reproducible evidence of increase or  
148 decrease in amplitude or frequency of EEG waveforms. Appearance of muscle activity or eye  
149 blink artifacts was not considered as reactive patterns. The reactivity was tested at bedside in  
150 a standardized way, by auditory stimulation (hands clap, patient name call) and nociceptive  
151 (pressure on the nail or nipple pinching only if no reactivity was obtained with other stimuli)  
152 every 2 minutes during EEG recording. [23]

153 EEG findings were collected from the daily report of neurologists in the medical  
154 record of each patient, and tracings were not re-analyzed. EEG patterns were retrospectively  
155 classified by two authors (and a third one in case of disagreement) based on the American  
156 Clinical Neurophysiology Society (ACNS) terminology [24]. Highly malignant pattern was  
157 defined as electrical status epilepticus, burst suppression or suppression. Electrical status  
158 epilepticus was considered as continuous rhythmic discharges like spikes, or spike-waves;  
159 burst suppression was defined as isoelectric voltage background with burst, and suppression  
160 as isoelectric voltage or suppressed background (<10 microvoltages) without discharges  
161 waveforms. Malignant patterns were defined as malignant periodic or rhythmic patterns,  
162 malignant background (discontinuous background, low voltage background <20  
163 microvoltages) or non-reactive EEG. Finally, EEG was considered benign in the absence of  
164 any malignant features stated above and with the presence of reactivity EEG.

165 The primary outcome was the neurological status at ICU discharge using the cerebral  
166 performance categories (CPC) scale, dichotomized in good (CPC 1 or 2) or poor (CPC 3-5)  
167 outcome.[25]

168

## 169 Statistical Analysis

170 Continuous variables were summarized using medians and interquartile range (IQR),  
171 and categorical variables were reported as proportions.



172 We first investigated the association between relevant patients' characteristics and  
173 neurologic outcome (CPC 1-2 vs CPC 3-5), including patient demographics, Utstein variables  
174 and EEG patterns. We performed Pearson's Chi2 test for categorical variables, and Wilcoxon  
175 test, when appropriate, for continuous variables. Secondly, a multivariate analysis was  
176 performed to assess independent predictors of poor outcome using logistic regression  
177 including factors with a p-value <0.15 in univariate analysis.

178 Specificity, sensitivity, positive predictive value (PPV), negative predictive value  
179 (NPV) and false positive rate (FPR) corresponding to 1- specificity using an exact binomial  
180 95% confidence interval (CI), were calculated in order to assess the predictive performance of  
181 each clinical and EEG indicator. We evaluated the predictive values for unfavorable outcome  
182 of non-reactivity, benign pattern, highly malignant pattern, malignant pattern on EEG, and  
183 bilaterally absence of N20 potentials on SSEP. To take into account the influence of potential  
184 confounders on non-reactive EEG, we stratified analysis according to the presence or absence  
185 of sedation and according to presence or absence of TTM use during EEG recording.

186 Finally, we assessed the predictors of EEG non-reactivity, using logistic regression  
187 including factors associated with EEG non-reactivity identified in univariate analysis with a P  
188 value<0.15.

189 All tests were two-sided, with P <0.05 considered statistically significant. We  
190 performed analysis using STATA/SE 14.0 software (College Station, TX, USA).

191

192

## 193 **Results**

### 194 Patients:

195 From January 2007 to October 2016, 1426 patients were admitted after CA, of them  
196 529 patients had at least one EEG performed during their ICU stay and were potentially  
197 eligible for the present analysis. Among them, 101 patients were excluded for the following  
198 reasons: 16 patients died during the first 48 hours; 45 patients were already awake at time of  
199 EEG recording; in 40 additional patients, the indication of EEG was confirmation of a brain  
200 death diagnosis (**Figure 1**).

201 Patients' characteristics are described in **Table 1** for the 428 patients retained in the  
202 analysis. Patients were mostly male (71%), with a median age of 63 years. Initial cardiac  
203 rhythm was shockable in 212 (49%) patients, and epinephrine was used during resuscitation  
204 in 320 (76%) cases. TTM was used in 96% of patients, with a median duration of sedation 1.1  
205 (0.7-1.5) days, using mostly midazolam (81%). A poor outcome was observed in 344/428  
206 patients (80%) at ICU discharge and in 342/411 patients (83%) at 1 year. Causes of death are  
207 listed in **ESM**.

#### 208 EEG and SSEP findings:

209 Patients' status at time of EEG recording is detailed in **Table 2** and EEG results  
210 according to neurologic outcome are reported in **Table 3**. Median time to EEG assessment  
211 was 3 days (2-4). Two-hundred and forty-three patients (57%) were weaned from sedation at  
212 time of EEG recording: the median delay between CA and EEG examination was 4 days (3-4)  
213 in patients assessed after weaning of sedation versus 1 day (1-2) in patients assessed with  
214 ongoing sedation  $p < 0.001$ .

215 In the whole population, 209/409 (51%) patients had a non-reactive EEG. Non-  
216 reactive EEG was far less frequent in patients with good outcome as compared with those  
217 with poor outcome (7% vs 63%,  $p < 0.001$ ). Characteristics of the 6 patients who had a good  
218 outcome despite non-reactivity on EEG are listed in **ESM**.

219 Based on the ACNS nomenclature, 113/428 patients (26%) had highly malignant

220 patterns, 162/428 (38%) had malignant patterns and 153/428 patients (36%) had a benign  
221 EEG. As compared with the good outcome group, malignant patterns were more frequently  
222 observed in the poor outcome group (9.5% vs 45%,  $p<0.001$ ), and all highly malignant  
223 patterns were observed in the poor outcome group (0% vs 33%).

#### 224 EEG for prediction of poor outcome:

225 PPV of a non-reactive EEG for prediction of a poor outcome was 97.1% (93.6-98.9)  
226 (**Table 4**). The PPV reached 98.3% (94.1-99.8) if reactivity was tested in non-sedated patients  
227 ( $p=0.41$ ). In multivariate analysis, ongoing sedation during EEG was not associated with a  
228 higher risk of non-reactive EEG (OR 1.3; IC95 (0.8-2.1)  $p=0.35$ ) (**ESM**).

229 In multivariate analysis, non-reactive EEG was significantly associated with a higher  
230 risk of poor outcome (OR 12.56; IC 95% (4.7-33.6)  $p <0.001$ ). Predictive values of other EEG  
231 patterns for poor outcome are reported in **Table 4** and **ESM**.

#### 232 EEG patterns for prediction of a good outcome:

233 The PPV of a benign EEG to predict a good outcome was 49.7% (41.5-57.9). This  
234 PPV increased up to 66.2% (54.3-76.8) when sedation was present, as compared to benign  
235 EEG without sedation, with PPV of 34.2% (23.9-45.7)  $p<0.001$ . In the subgroup of patients  
236 under TTM and still sedated during EEG recording ( $n=96$ ), this PPV increased to 72.9%  
237  $p=0.33$ . (**ESM**).

238

239

## 240 **Discussion**

241 In this population of post-CA comatose patients, we found that EEG non-reactivity  
242 was observed in half of the population, being predictive of unfavorable outcome. Sedation had

243 a modest effect on the predictive value of EEG non-reactivity, with a slightly higher PPV and  
244 lower FPR even if this difference was not significant. This would suggest that sedation might  
245 partly alter EEG reactivity, a fact that should be taken into account in the interpretation of  
246 EEG for neuroprognostication after CA. Interestingly, predictive value of a benign reactive  
247 EEG for good outcome seems to be better if EEG was assessed earlier, despite ongoing  
248 sedation.

249 The first step of neuroprognostication after CA is based on neurological examination  
250 performed after exclusion of confounders, particularly residual sedation [26]. In this context,  
251 other reliable tools are needed. Bilateral absence of N20 potentials on SSEP is highly  
252 correlated with poor neurologic outcome [27]. However, SSEP have a low sensitivity and  
253 remain underused [28]. Conventional EEG is more widely available, contributes to diagnose  
254 persistent coma with subclinical seizure and serves also as a prognostic tool after CA. In our  
255 population, EEG was performed in 37% of patients admitted for a CA, a rate that is in line  
256 with previous studies [29,30].

257 The present work highlights that sedation might interfere with reactivity assessment  
258 even the results are not statistically significant. In our population, 43% of EEG recordings  
259 were performed with ongoing sedation, mostly because EEG was performed during the first  
260 24 hours. This is concordant with other recent studies suggesting that EEG within the first 24  
261 hours after ROSC might be associated with a good prognostic accuracy [31]. In fact, sedation  
262 could probably be a confounding factor for absence of EEG reactivity, with a trend to a lower  
263 PPV regarding prediction of poor neurologic outcome. As a matter of fact, midazolam and  
264 propofol are not only sedatives drugs but they are also active against seizures and can modify  
265 EEG patterns [32]. Some studies highlighted that sedation increases suppression ratio and  
266 decreases amplitude-integrated EEG [33,34]. In a clinical study in which 8/22 post-CA  
267 patients with burst suppression survived with good outcome, all cases were possibly  
268 confounded by the concomitant use of propofol [13]. Physicians should cautiously interpret

269 the lack of reactivity during this period because of the risk of interference with sedation  
270 [9,12]. This is mostly important when the first tracing is non-reactive in a sedated patient. We  
271 reported 6 patients with an initial non-reactive EEG who later awoke and who had a favorable  
272 outcome. Interestingly, all these 6 patients were sedated with midazolam and EEG assessment  
273 was performed 1 day after CA in median, with ongoing sedation in 67% of cases. We could  
274 probably explain our statistically negative results with the under estimation of sedative effect  
275 on EEG reactivity because EEG was not systematically performed in all comatose post-CA  
276 patients.

277 We reported the presence of a highly malignant EEG pattern in 26% of patients,  
278 which was a very strong EEG indicator of poor outcome, in agreement with previous studies  
279 [15,33]. However this should be interpreted cautiously since presence of a status epilepticus  
280 was considered as a highly malignant pattern and was a part of our criteria for WLST  
281 although some study described good outcome after this event [35]. A malignant EEG pattern  
282 was strongly associated with poor outcome but with a higher rate of false positive rate,  
283 confirming that detection of low voltage and discontinuous background could be difficult  
284 [30].

285 Concerning prognostication of good outcome, we found a moderate predictive value of  
286 a reactive EEG (39%) and a benign EEG (50%) in comparison with Rossetti et al. reporting a  
287 72% PPV of presence of reactivity on early EEG and 86.2% PPV of early benign EEG for  
288 good outcome [15]. Our population differed significantly since we only included patients who  
289 had an EEG performed in case of neurological concern. This may have selected a population  
290 with a higher risk of severe brain injury. This may explain that only 20% of our patients  
291 recovered a CPC 1-2 level as opposed to 50% in Rossetti's population. Second, the diversity  
292 of reactivity testing modalities and interpretation with a possible inter-rater variability could  
293 also explain these differences [36]. Third, timing for EEG assessment was different.

294 Interestingly, the PPV of a benign EEG regarding good outcome seems to be better when a  
295 benign EEG was obtained earlier, despite ongoing sedation and TTM.

296 Our study has several strengths. First, we studied a large number of patients with  
297 inclusion criteria in concordance with current guidelines for neuroprognostication. Second,  
298 reactivity was tested in a standardized way by the same technician and the interpretation was  
299 blinded to other prognostic tools and performed by the same electrophysiologists all along the  
300 study period. Both were external consultants, thus limiting the risk of bias. Moreover,  
301 definition of EEG reactivity respected ACNS's standardized critical care EEG terminology  
302 [24].

303 This study also has some limitations. First, this is a retrospective and monocentric  
304 study in which the timing for EEG assessment was not strictly uniform, even if the median  
305 delay from CA was 3 days as recommended. EEG recordings performed under sedation were  
306 obtained earlier as compared with those performed without ongoing sedation. The difference  
307 may have influenced the results on sedation effect on EEG. EEG patterns may fluctuate and  
308 evolve, and temporal dynamic changes of EEG over time are common [8]. Second,  
309 categorization between highly malignant, malignant or benign patterns was scored  
310 retrospectively according to the detailed EEG report. We cannot exclude the risk of missing  
311 data in EEG description. Third, neurophysiologists who interpreted EEG tracings were not  
312 totally blinded for all clinical data and it could have influenced their interpretation. However,  
313 they were blinded to outcome at time of EEG interpretation. Fourth, there is a risk of  
314 subjective assessment of EEG reactivity [23,37,38]. Quantitative methods might increase  
315 reproducibility and objectivity of EEG reactivity assessment, though they are rarely used in  
316 routine practice [39,40]. Fifth, we did not use continuous EEG in our study. However, it has  
317 been reported that two standard EEG recordings of 20–30 min duration, including reactivity  
318 testing, are as informative as continuous EEG, while being less demanding on resources  
319 [10,41]. Then, we changed our sedation protocol during the 9 years collection period, which

320 could have theoretically influenced our results. Sixth, self-fulfilling prophecy is a common  
321 bias in this setting. The treating physicians were not blinded to the results of reactivity testing.  
322 However WLST decisions were not based on EEG reactivity assessment, since it was not part  
323 of our prognostication algorithm during the study period. Median ICU length of stay was 7  
324 days in the group of patients with poor outcome, illustrating the low risk of early WLST in  
325 this population. Finally, the outcome was assessed at ICU discharge for analysis while long-  
326 term outcome would have been more adapted.

327

### 328 **Conclusion**

329 Among comatose patients after CA, a non-reactive EEG was predictive of unfavorable  
330 outcome but this indicator has to be used in a multimodal approach for prognostication.  
331 Assessment of reactivity was slightly influenced by concomitant sedation. Conversely, early  
332 benign EEG seems to be a promising tool for prediction good outcome but further studies are  
333 required to confirm this finding.

334

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337 **Conflict of interest statement:** On behalf of all authors, the corresponding author states that  
338 there is no conflict of interest.

339

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492 **Tables and Figures**

493 **Figure 1:** Flow chart

494 **Table 1:** Patients' characteristics

495 **Table 2:** Status at time of EEG recording

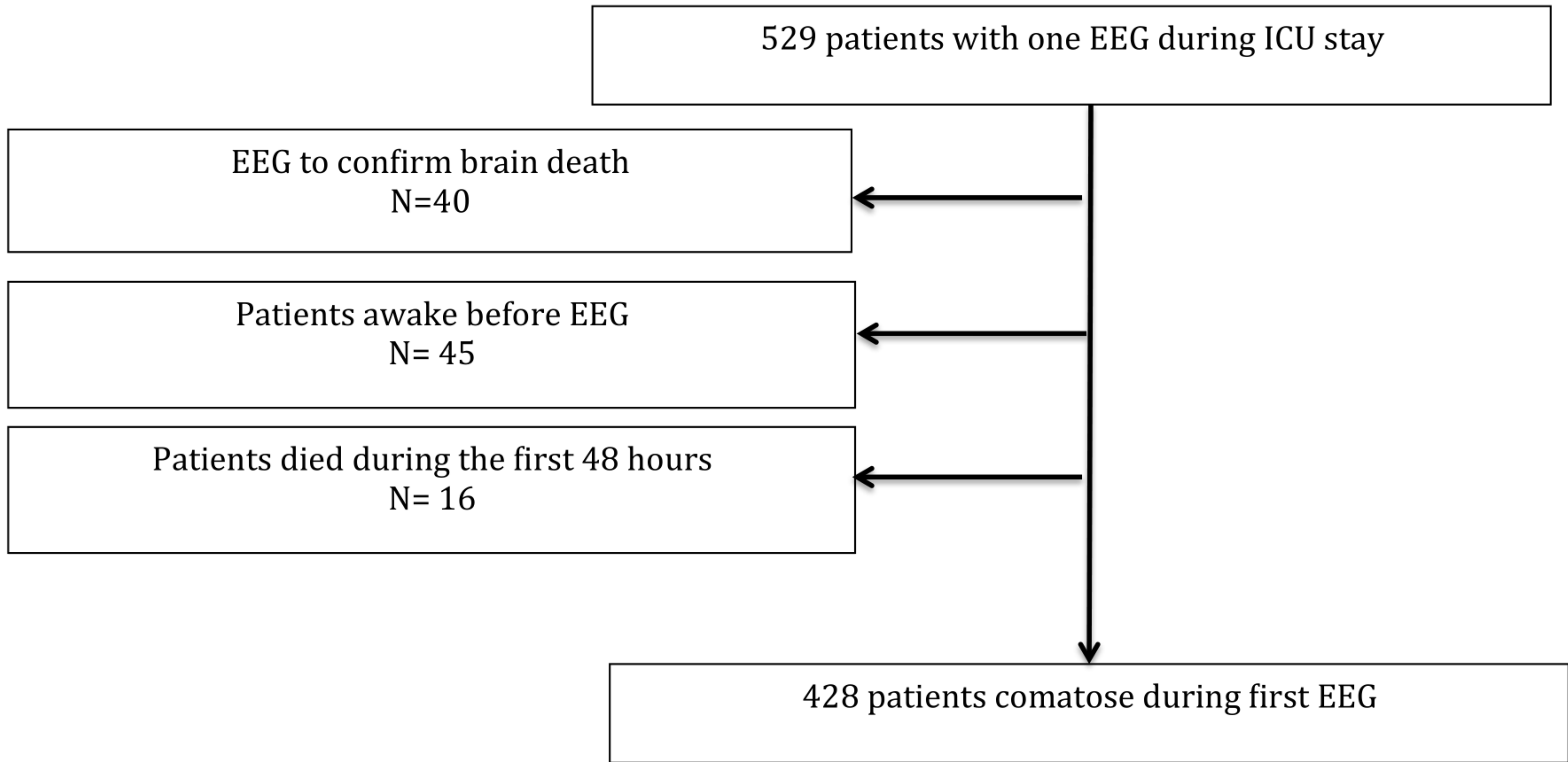
496 **Table 3:** EEG and SSEP findings

497 **Table 4:** Prognostic value of EEG parameters and SSEPs for poor outcome

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**Table 1 : Patients' characteristics**

<b>Patients' characteristics</b>	<b>All patients n=428</b>	<b>CPC 1-2 n=84</b>	<b>CPC 3-5 n=344</b>	<b>p</b>
Male gender, n (%)	304 (71)	66 (77)	239 (69)	0.15
Age > 63 years, n (%)	214 (50)	32 (38)	182 (53)	0.02
CA in a public area, n (%)	136 (32)	35 (42)	101 (29)	0.03
Witnessed CA, n (%)	375 (89)	75 (93)	300 (88)	0.26
Bystander CPR, n (%)	255 (61)	49 (61)	206 (61)	0.96
Initial shockable rhythm, n (%)	212 (49)	64 (76)	148 (43)	<0.001
Use of epinephrine, n (%)	320 (76)	35 (44)	285 (84)	<0.001
Dose of epinephrine >2 mg, n (%)	165 (39)	18 (22)	147 (43)	0.001
Time from CA to CPR >5 min, n (%)	201 (52)	31 (40)	170 (55)	0.02
Time from CPR to ROSC >20 min, n (%)	210 (50)	27 (33)	183 (55)	<0.001
Serum lactate at admission >4.5 mmol.L-1, n (%)	183 (49)	17 (23)	166 (55)	<0.001
TTM, n (%)	412 (96)	80 (95)	332 (97)	0.58
Post-resuscitation shock, n (%)	209 (48)	44 (52)	165 (48)	0.47
Duration of sedation, days, median (IQR)	1.1 (0.7-1.5)	1.1 (0.6-1.6)	1.1 (0.7-1.5)	0.68
ICU length of stay, days, median (IQR)	7.2 (5.2-9.9)	8.9 (5.5-13.9)	7 (5.2-9.0)	0.008

**Table 2:** Status at time of EEG recording

<b>Status at time of EEG recording</b>	All patients n=428	CPC 1-2 n=84	CPC 3-5 n=344	p
Glasgow motor response 1 or 2, n (%)	324/375 (86)	55/78 (71)	269/297 (91)	<0.001
No pupillary reflex, n (%)	158/428 (37)	18/84(21)	140/344 (41)	<0.001
Ongoing hypothermia, n (%)	91/428 (21)	31/84 (37)	60/84 (17)	<0.001
Ongoing sedation, n (%)	185/428 (43)	53/428 (63)	132/428(38)	<0.001

**Table 3: EEG and SSEP findings**

<b>EEG and SSEP findings</b>	<b>All patients n=428</b>	<b>CPC 1-2 n=84</b>	<b>CPC 3-5 n=344</b>	<b>p</b>
Non-reactive EEG, n (%)	209/409 (51)	6 (7)	203(63)	<0.001
Missing data 19				
Highly malignant pattern, n (%)	113 (26)	0	113 (33)	-
Burst suppression or suppression, n (%)	58 (14)	0	58 (17)	-
Status epilepticus, n (%)	55 (13)	0	55 (16)	-
Malignant pattern, n (%)	162 (38)	8 (9)	154 (45)	<0.001
Benign pattern, n (%)	153 (36)	76 (90)	77(22)	<0.001
Bilaterally absence of N20 on SSEP, n (%)	103/206 (50)	0	103/190 (54)	-



**Table 4:** Prognostic value of EEG parameters and SSEPs for poor outcome

<b>Parameters for poor outcome</b>	<b>Sensitivity (IC95%)</b>	<b>Specificity (IC95%)</b>	<b>NPV (IC95%)</b>	<b>PPV (IC95%)</b>	<b>FPR (IC95%)</b>
Non-reactive EEG (all patients) n=209	62.5 (57-67.7)	92.9 (85.1-97.3)	39 (32.2-46.1)	97.1 (93.6-98.9)	7.1 (2.7-14.9)
Non-reactive EEG (without concomitant sedation) n= 120	57.6 (50.5-64.4)	93.5 (78.6-99.2)	25 (17.4-33.9)	98.3 (94.1-99.8)	6.5 (0.8-21.4)
Non-reactive EEG (with concomitant sedation) n= 89	70.8 (61.8-78.8)	92.5 (81.8-97.9)	58.3 (47.1-7)	95.5 (88.9-98.8)	7.5 (2.1-18.2)
Highly malignant pattern n= 113	32.8 (27.9-38.1)	100 (95.7-100)	26.67 (21.9-31.9)	100 (96.8-100)	0 (0-4.3)
Malignant pattern n=162	44.8 (39.4-50.2)	90.5 (82.1-95.8)	28.6 (23.2-34.4)	95.1 (90.9-97.8)	9.5 (4.2-17.9)
Bilaterally absence of N20 n=103	54.2 (46.8-61.4)	100 (79.4-100)	15.5 (9.2-24)	100 (96.5-100)	0 (0-20.6)