**The Prognostic Usefulness of the Lactate/Albumin Ratio for Predicting Clinical Outcomes in Out-of-hospital Cardiac Arrest: A Prospective, Multi-centre Observational Study (KoCARC Study)**

**Supplements**



**Supplement 1.** Flow diagram of patient enrolment in the validation cohort.

**Supplement 2.** Univariate logistic regression analysis for predictors of good neurological outcome and survival discharge.

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| --- | --- | --- |
| **Variables** | **Good neurologic outcome** | **Survival discharge** |
| **OR (95% CI)** | ***P*** | **OR (95% CI)** | ***P*** |
| Age (per 1 year) | 0.958 (0.945-0.970) | <0.001 | 0.964 (0.952-0.975) | <0.001 |
| Female sex (vs male) | 0.286 (0.154-0.530) | <0.001 | 0.549 (0.357-0.844) | 0.006 |
| Arrest to ROSC time (per 1 min) | 0.915 (0.897-0.934) | <0.001 | 0.939 (0.926-0.952) | <0.001 |
| Bystander CPR  | 1.514 (0.968-2.368) | 0.069 | 1.006 (0.692-1.464) | 0.974 |
| Witnessed collapse (vs non-witnessed) | 2.246 (1.281-3.940) | 0.005 | 2.364 (1.497-3.732) | <0.001 |
| Initial shockable rhythm (vs non-shockable) | 10.529 (6.276-17.665) | <0.001 | 3.527 (2.354-5.286) | <0.001 |
| Times of defibrillation shock (per 1 time) | 0.969 (0.878-1.069) | 0.532 | 0.947 (0.860-1.043) | 0.27 |
| **Laboratory data** |  |  |  |  |
| Glucose (per 100 mg/dL) | 0.869 (0.742-1.018) | 0.082 | 0.966 (0.856-1.090) | 0.576 |
| White blood cell count (per 103/μL) | 1.028 (0.995-1.062) | 0.094 | 1.021 (0.992-1.051) | 0.16 |
| Haemoglobin (per 1 g/dL) | 1.566 (1.397-1.755) | <0.001 | 1.389 (1.277-1.512) | <0.001 |
| ALT (per 100 IU/L) | 0.964 (0.901-1.031) | 0.285 | 0.940 (0.877-1.007) | 0.08 |
| Total bilirubin (per 1 mg/dL) | 0.728 (0.512-1.035) | 0.077 | 0.757 (0.586-0.977) | 0.032 |
| CK-MB (per 1 mcg/L) | 0.989 (0.975-1.003) | 0.132 | 0.997 (0.990-1.005) | 0.501 |
| Troponin I (per 1 mcg/L) | 1.002 (0.971-1.035) | 0.896 | 0.993 (0.960-1.027) | 0.67 |
| D-dimer (per 1 mcg/mL) | 0.998 (0.994-1.002) | 0.308 | 1.000 (0.997-1.002) | 0.808 |
| **Comorbidity** |  |  |  |  |
| Hypertension | 0.559 (0.349-0.897) | 0.016 | 0.720 (0.490-1.058) | 0.094 |
| Diabetes mellitus | 0.455 (0.259-0.798) | 0.006 | 0.534 (0.344-0.831) | 0.005 |
| Dyslipidaemia | 1.701 (0.733-3.947) | 0.216 | 1.394 (0.647-3.002) | 0.397 |
| **Management in hospital** |  |  |  |  |
| ECMO cardio-pulmonary resuscitation | 0.634 (0.185-2.169) | 0.467 | 0.324 (0.095-1.103) | 0.071 |
| Coronary revascularisation procedures |  |  |  |  |
| No | Ref (1) |  | Ref (1) |  |
| Yes (≤24 h) | 10.860 (3.708-31.803) | <0.001 | 21.989 (4.875-99.180) | <0.001 |
| Yes (>24 h) | 4.273 (2.573-7.095) | <0.001 | 3.453 (2.181-5.469) | <0.001 |
| Application of TTM | 1.388 (0.874-2.205) | 0.165 | 1.939 (1.311-2.868) | <0.001 |
| **Lactate/albumin ratio** | 0.473 (0.389-0.574) | <0.001 | 0.553 (0.479-0.638) | <0.001 |

\*P<0.05

ALT, alanine aminotransferase; CPR, cardiopulmonary resuscitation; ECMO, extra corporeal membrane oxygenation; ROSC, return of spontaneous circulation; TTM, targeted temperature management

**Supplement 3.** Comparing clinical markers for the prediction of favourable neurologic outcome (A) and survival discharge (B) using the area under the curve using the Delong method.

**(A)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **AUC (95% CI)** | ***P*** | ***P*(vs LAR)** | ***P*(vs First monitored rhythm)** | ***P*(vs Witnessed arrest)** | ***P*(vs ACLS duration)** | ***P*(vs BLS duration)** | ***P*(vs Arrest to ROSC)** |
|
| LAR | 0.820 (0.772-0.867) | <0.001\* | Ref | 0.068 | <0.001\* | 0.443 | 0.259 | 0.367 |
| First monitored rhythm | 0.762 (0.713-0.812) | <0.001\* | 0.068 | Ref | <0.001\* | 0.018\* | 0.572 | 0.019\* |
| Witnessed arrest | 0.582 (0.538-0.626) | <0.001\* | <0.001\* | <0.001\* | Ref | <0.001\* | <0.001\* | <0.001\* |
| ACLS duration | 0.842 (0.794-0.889) | <0.001\* | 0.443 | 0.018\* | <0.001\* | Ref | 0.052 | 0.84 |
| BLS duration | 0.783 (0.736-0.831) | <0.001\* | 0.259 | 0.572 | <0.001\* | 0.052 | Ref | <0.001\* |
| Duration of arrest to ROSC  | 0.845 (0.801-0.890) | <0.001\* | 0.367 | 0.019\* | <0.001\* | 0.84 | <0.001\* | Ref |

\*P<0.05

ACLS, advanced cardiac life support; AUC, area under cover; CI, confidence interval; BLS, basic life support; ROSC, return of spontaneous circulation.

**(B)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **AUC (95% CI)** | ***P*** | ***P*(vs LAR)** | ***P*(vs First monitored rhythm)** | ***P*(vs Witnessed arrest)** | ***P*(vs ACLS duration)** | ***P*(vs BLS duration)** | ***P*(vs Arrest to ROSC)** |
|
| LAR | 0.780 (0.739-0.822) | <0.001\* | Ref | <0.001\* | <0.001\* | 0.893 | 0.02\* | 0.915 |
| First monitored rhythm | 0.637 (0.592-0.682) | <0.001\* | <0.001\* | Ref | 0.084 | <0.001\* | 0.013 | <0.001\* |
| Witnessed arrest | 0.586 (0.547-0.626) | <0.001\* | <0.001\* | 0.084 | Ref | <0.001\* | <0.001\* | <0.001\* |
| ACLS duration | 0.777 (0.733-0.821) | <0.001\* | 0.893 | <0.001\* | <0.001\* | Ref | 0.02 | 0.715 |
| BLS duration | 0.714 (0.666-0.762) | <0.001\* | 0.02\* | 0.013\* | <0.001\* | 0.02\* | Ref | <0.001\* |
| Duration of arrest to ROSC  | 0.783 (0.740-0.826) | <0.001\* | 0.915 | <0.001\* | <0.001\* | 0.715 | <0.001\* | Ref |

\*P<0.05

ACLS, advanced cardiac life support; AUC, area under cover; CI, confidence interval; BLS, basic life support; ROSC, return of spontaneous circulation

**Supplement 4.** Sensitivity, specificity, accuracy, and odds ratio of the LAR, nomogram using the LAR and several meaningful clinical markers for predicting favourable neurologic outcome (A) and survival discharge (B).

**(A)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Cutoff point** | **Sensitivity (95% CI)** | **Specificity (95% CI)** | **Accuracy (95% CI)** | **OR (95% CI)** | **p-value** |
| **LAR** | **< 2.82** | **0.768(0.684-0.853)** | **0.786(0.747-0.824)** | **0.782(0.747-0.818)** | **0.082(0.048-0.140)** | **<0.001\*** |
| **Nomogram using the LAR** | **≥ 179** | **0.889(0.824-0.954)** | **0.887(0.856-0.917)** | **0.887(0.860-0.914)** | **62.500(30.337-128.762)** | **<0.001\*** |
| First monitored rhythm | Shockable rhythm | 0.725(0.634-0.817) | 0.800(0.762-0.837) | 0.787(0.751-0.822) | 10.529(6.276-17.665) | <0.001\* |
| Witnessed arrest | Witnessed | 0.821(0.744-0.898) | 0.329(0.284-0.373) | 0.418(0.376-0.460) | 2.246(1.281-3.940) | 0.005\* |
| ACLS duration | < 3.5 min | 0.747(0.660-0.835) | 0.830(0.794-0.865) | 0.815(0.782-0.848) | 0.069(0.041-0.117) | <0.001\* |
| BLS duration  | ≤ 21 min | 0.863(0.794-0.932) | 0.683(0.639-0.727) | 0.716(0.677-0.754) | 0.074(0.040-0.137) | <0.001\* |
| Duration of Arrest to ROSC  | ≤ 26 min | 0.842(0.769-0.915) | 0.776(0.737-0.816) | 0.788(0.753-0.823) | 0.054(0.030-0.098) | <0.001\* |

\*P<0.05

ACLS, advanced cardiac life support; AUC, area under cover; CI, confidence interval; BLS, basic life support; min, minute; ROSC, return of spontaneous circulation

**(B)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Cutoff point** | **Sensitivity (95% CI)** | **Specificity (95% CI)** | **Accuracy (95% CI)** | **OR (95% CI)** | **p-value** |
| **LAR** | **< 3.62** | **0.801(0.739-0.864)** | **0.644(0.595-0.693)** | **0.691(0.651-0.730)** | **0.137(0.088-0.214)** | **<0.001\*** |
| **Nomogram using the LAR** | **≥ 207** | **0.795(0.730-0.859)** | **0.804(0.763-0.845)** | **0.801(0.767-0.836)** | **15.866(9.891-25.448)** | **<0.001\*** |
| First monitored rhythm | Shockable rhythm | 0.487(0.407-0.566) | 0.788(0.746-0.830) | 0.700(0.661-0.739) | 3.527(2.354-5.286) | <0.001\* |
| Witnessed arrest | Witnessed | 0.814(0.753-0.875) | 0.351(0.302-0.399) | 0.489(0.446-0.531) | 2.364(1.497-3.732) | <0.001\* |
| ACLS duration | < 6.5 min | 0.731(0.661-0.800) | 0.682(0.634-0.730) | 0.697(0.657-0.736) | 0.172(0.113-0.260) | <0.001\* |
| BLS duration | < 23 min | 0.718(0.647-0.789) | 0.666(0.618-0.714) | 0.681(0.641-0.721) | 0.197(0.131-0.297) | <0.001\* |
| Duration of arrest to ROSC  | < 32.5 min | 0.763(0.696-0.830) | 0.712(0.666-0.758) | 0.727(0.689-0.765) | 0.126(0.082-0.194) | <0.001\* |

\*P<0.05

ACLS, advanced cardiac life support; AUC, area under cover; CI, confidence interval; BLS, basic life support; min, minute; ROSC, return of spontaneous circulation