The prognostic performance of lactate in out of hospital cardiac arrest, a post hoc analysis of the TTM-trial

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Does the early measurement of lactate in the setting of out-of-hospital cardiac arrest(OHCA) provide clinical relevant information regarding prognosis?

Levels of lactate, a marker of anaerobic metabolism, and lactate clearance are recommended as means for risk stratification in sepsis and trauma. Although the level of evidence for lactate and lactate clearance is low in the setting of OHCA, it is regularly measured in this context in the emergency department and intensive care units. We tested the prognostic performance of lactate at admission, lactate at 12 hours and the level of reduction of lactate within 12 hours of admission as predictors of 30-day mortality.

Method: In this post hoc analysis, lactate at admission and at 12 hours was measured at two temperatures(33 and 36 C) and collected from the TTM-trial database along with demographic and survival status at 30 days. 12-hour lactate clearance was determined as percentage of reduction between lactate at admission and at 12 hours. Pooled data were measured for association with 30-day mortality. Prognostic performance was estimated by calculating the area under the receiver operator characteristics curve(ROC). **Results:** 939 patients were analyzed. 30-day survival was 56%. Median admission lactate was 6.0 mmol/l [3.0-

Baseline characteristics in the TTM Trial	Alive at day 30 (n=528)	Dead at day 30 (n=411)	p-value
Age, years (mean (sd))	60.89 (12.22)	68.18 (10.82)	<0.001
Medical history, no (%)			
Congestive heart failure	25 (4.7)	36 (8.8)	0.018
Ischemic heart disease	126 (24.0)	134 (32.7)	0.004
Arterial hypertension	192 (36.5)	182 (44.5)	0.016
Diabetes	63 (12.0)	78 (19.1)	0.004
Intra-arrest data, no (%)			
Witnessed cardiac arrest	481 (91.3)	357 (86.9)	0.039
Bystander CPR	414 (78.6)	269 (65.6)	<0.001
Shockable rhythm	488 (92.6)	264 (64.2)	<0.001
Adrenaline mg (median [IQR])	1 [1, 4]	3 [1, 5]	<0.001
Time to ROSC (median [IQR])	21 [15, 30]	32 [22, 50]	<0.001
Intra-Hospital Characteristics			
Admission lac (median [IQR])	4.7 [2.4, 8.0]	7.3 [4.5, 10.7]	<0.001
12-h Lac (median [IQR])	1.4 [1.0, 2.3]	2.0 [1.2, 3.3]	<0.001
12-h Lac clearance (mean (sd))	44 (70)	54 (46)	0.03

9.5]. With no difference between temperature arms Average lactate values were slightly higher in the 33C-group, p<0.001. Survivors at day 30 had lower admission lactate and 12-hour lactate.

	Univariate analysis				Multivariate analysis			
	OR	95% CI	p-Value		OR	95% CI	p-Value	
Admission lactate	1.12	1.08 1.16	<0.01		1.08	1.03 1.12	<0.01	
Lactate at 12h	1.21	1.12 1.31	<0.01		1.12	1.01 1.23	<0.03	
Lactate clearance 12h	1.003	1.00 1.01	0.03		1.00	1.00 1.00	0.47	

Odds ratio(OR) for 30 day mortality and lactate measures. In multiple variate analysis adjustment were made for age, sex, time to ROSC, shock on admission, STEMI, bystander CPR, witnessed arrest, shockable rhythm, dose of adrenaline and temperature allocation. 12h lactate and 12h lactate clearance were adjusted for lactate at admission

12-hour lactate clearance was lower in 30-day survivors. In an unadjusted regression analysis the risk of dying by day 30 increased by 12% per 1 mmol/l increase in admission lactate, 21% per 1 mmol/l increase in 12-hour lactate, and 0.3% per increase in 12-hour lactate clearance. When adjusting for confounders only admission lactate and 12-hour lactate remained independent predictors of 30-day mortality.

The area under the curve in the ROC illustrates poor prognostic utility for predicting 30-day mortality using admission lactate, 12-hour lactate or 12-hour lactate clearance in the clinical setting of OHCA.

Reciever Operator Characteristics for lactate measures predicting 30-day mortality.

Conclusion: Lactate levels at admission and at 12 hours are independently associated with 30 day mortality, 12-hour lactate clearance is not. In this study the precision and utility of these tests as predictors of 30-day mortality are well below acceptable levels to be of clinical use.

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