

Prognostic Utility of Initial Lactate for ED Drug Overdose Fatality: A Validation Cohort

Randy Cheung¹, Robert Hoffman², David Vlahov³, Alex Manini⁴

¹State University of New York, Buffalo, NY, USA, ²NYU School of Medicine, New York, NY, USA,

³University of California, San Francisco, CA, USA, ⁴Icahn School of Medicine at Mount Sinai, New York, NY, USA

Background: We previously demonstrated that the initial ED lactate had prognostic utility for in-hospital mortality from acute drug poisoning.

Research Question: To validate the prognostic utility of initial lactate for drug overdose fatality in ED patients.

Methods: This was an observational, prospective, cohort study over 5-years at two urban teaching hospitals. Subjects were consecutive adult (>18y) ED acute drug overdose patients; we excluded children, prehospital cardiac arrest, alternative diagnoses, non-drug overdose, and missing data. Demographics, history, vitals, and drug exposures were obtained from medical records using standardized data abstraction. Initial lactate was drawn as part of clinical care by ED clinicians, the primary outcome was inpatient fatality, and the secondary outcome was occurrence of shock (vasopressor requirement). Receiver operating characteristics (ROC) were plotted using SPSSv22 to determine optimal lactate cutpoint (point that maximizes sensitivity+specificity), along with test characteristics (sensitivity/specificity), area under the curve (AUC), odds ratios (OR), and 95% confidence intervals (CI).

Results: Out of 3739 patients screened, 2333 met exclusion criteria (1,487 missing lactate, 376 children, 278 missing outcomes, 141 alternate diagnoses, 37 non-drugs, 14 prehospital arrests), leaving 1406 patients for analysis (56% female, mean age 43.1 years), of whom 54 patients had shock (3.9%), and 24 died (1.7%). Mean initial lactate (mmol/L) was 8.1±5.6 for fatalities and 2.4±6.7 for survivors ($p<0.001$). The AUC for prediction of fatality was 0.85 (CI 0.73-0.95). The optimal lactate cutpoint for fatality was 5.0 mmol/L (OR 34.2, CI 13.7-84.2, 70.8% sensitive, 93.3% specific) and the occurrence of either shock or death was 2.7 mmol/L (OR 7.9, CI 4.5-13.9). Initial lactate under 2.0 mmol/L had 99.5% negative predictive value (CI 98.8-99.9). Drug classes for which initial lactate had the highest utility for prediction of fatality were: salicylates (AUC=0.98, cutpoint=6.0), sympathomimetics (AUC=0.98, cutpoint=7.8), acetaminophen (AUC=0.98, cutpoint=10.0), opioids (AUC=0.97, cutpoint=3.1), digoxin (AUC=0.92, cutpoint=2.4), anti-convulsants (AUC=0.91, cutpoint=3.0); lactate had lowest utility for beta-/Ca-channel blockers (AUC=0.73, cutpoint=7.1), diuretics (AUC=0.55, cutpoint=1.1), and ACE inhibitors (AUC=0.16, cutpoint=0.9).

Discussion: The highest prognostic utility was for salicylates, sympathomimetics, and acetaminophen.

Conclusion: Lactate should be used as a biomarker for early decision-making in ED patients with acute drug overdose.