



## Article Appraisal

**Article:** Ahn, S et al. Sodium bicarbonate on severe metabolic acidosis during prolonged cardiopulmonary resuscitation: a double-blind, randomized, placebo-controlled pilot study. *J Thorac Dis* 2018; 104(4): 2295-2302.

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### Background and Study Objective(s):

“Sodium bicarbonate administration during cardiopulmonary resuscitation (CPR) is controversial. Current guidelines recommend sodium bicarbonate injection in patients with existing metabolic acidosis, but clinical trials, particularly, those involving patients with acidosis, are limited. We aimed to evaluate the efficacy of sodium bicarbonate administration in out-of-hospital cardiac arrest (OHCA) patients with severe metabolic acidosis during prolonged CPR.”

**Clinical Question:** Does sodium bicarbonate lead to a higher rate of sustained ROSC in adult patients with non-traumatic prolonged OHCA with severe acidosis?

### Study Design:

Prospective, double-blind, randomized, placebo-controlled, single-center pilot trial conducted between January 2015 and December 2015. The population was consecutive adult OHCA patients who did not achieve ROSC after 10 minutes of resuscitation and who had an arterial blood gas with pH < 7.1 or bicarbonate < 10 mEq/L. Patients who regained pulses, did / could not have an ABG within 10 minutes, those on ECMO, those not meeting metabolic criteria, or those who were do-not-resuscitate, were excluded. The intervention was either 1 ampule of sodium bicarbonate (50 mEq/L) or placebo. The primary endpoint was ROSC > 20 minutes, whiel the secondary endpoint was survival to hospital admission, and good neurologic outcomes at 1 and months.

### Results:

157 patients presented during the enrollment period with cardiac arrest. 50 patients were randomized to NaHCO<sub>3</sub> or NS. 107 were excluded. Baseline characteristics were similar between groups. There was no difference in sustained ROSC (4% bicarbonate / 16% placebo) but the bicarbonate group had a higher pH (6.99 versus 6.90) and bicarbonate (21 versus 9). There were no differences in survival to admission, or in neurologic outcomes.

### **Validity of Results:**

While this is a randomized, double-blinded, placebo-controlled trial, it is substantially underpowered for any relevant clinical outcome. The primary endpoint was a laboratory value and never clearly defined, and the sample size calculation dubious. Bicarbonate dose was not weight based, which may have led to both under/over-dosing. 10-minute blood gas analyses may have been venous rather than arterial leading to lower pH and bicarbonate values. Those in the HCO<sub>3</sub> group may have benefited from hyperventilation (by theoretically countering respiratory acidosis), whereas those in the NS group may have potentially been harmed by this.

### **Generalizability of Results:**

The patient population is likely similar to ours, but many patients were excluded and obtaining a pH of these patients prior to deciding upon bicarbonate therapy may not be feasible. Overall, while bicarbonate improved metabolic status somewhat, this did not translate into better survival outcomes.

### **The Bottom Line:**

The use of sodium bicarbonate did not demonstrate any improvement in patient focused outcomes in this small single centre study. Subsequent larger studies are required to answer this question.