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Abstract Title:

Impact of sodium bicarbonate on mortality in cardiac arrest matched for initial presenting rhythm

Authors:

M Machnicz, A West , K Shepard, AR Levine, D O’Sullivan, AL Zeiner; Hospital of Central Connecticut, New Britain, Connecticut

Background/Purpose:

The 2020 American Heart Association Advanced Cardiac Life Support guidelines do not recommend administration of sodium bicarbonate in patients with undifferentiated cardiac arrest. This recommendation is based on conflicting literature showing sodium bicarbonate has either improved, worsened, or no impact on return of spontaneous circulation (ROSC). The initial presenting rhythm is a potential confounding variable that has not been accounted for in previous studies and may explain the variability of responses seen with sodium bicarbonate. Therefore, the objective of this study was to assess the impact of sodium bicarbonate administration on mortality based on initial presenting rhythm in cardiac arrest.

Methods:

This study was an Institutional Review Board approved multi-center, retrospective chart review. Patients were divided into two groups based on whether sodium bicarbonate was administered or not. Each group was then matched in a 1:1 fashion based on initial presenting rhythm (shockable vs. non-shockable). Patients were included in the study if they were 18 years or older with a witnessed cardiac arrest and had documentation describing the start time of the code, the initial presenting rhythm, and whether or not sodium bicarbonate was administered. The primary outcome was the percentage of patients with sustained ROSC for greater than or equal to 20 minutes. The secondary outcomes were survival to 24 hours and survival to discharge. To account for the influence, if any, of differences that were observed with univariate testing such as location of cardiac arrest or total length of code, a multivariate logistic regression was used to calculate the odds ratio (OR) with 95% confidence intervals (CI) for each covariate that was associated with any of the primary or secondary outcomes.

Results:

There were 1252 patients screened, resulting in 200 patients meeting the inclusion criteria. Baseline characteristics were similar between both groups except for location of cardiac arrest and total code time. Patients who did not receive sodium bicarbonate with an initial shockable rhythm were 3.53 times more likely to obtain ROSC ≥20 minutes (OR=3.53; 95% CI: 1.10-11.30; p=0.034), 4.65 times more likely to survive to 24 hours (OR=4.65; 95% CI: 1.72-12.56; p=0.002), and 7.88 times more likely to survive to discharge (OR=7.88; 95% CI: 3.06-20.25; p<0.001) compared to those who received sodium bicarbonate. A longer code duration was also associated with a lower chance of survival to 24 hours in the shockable (OR=0.928: 95% CI: 0.889-0.969, p=0.001) and non-shockable groups (OR=0.803: 95% CI: 0.724-0.892, p<0.001), respectively. In the non-shockable group, a longer code duration was also associated with a lower chance of survival to discharge (OR=0.871; 95% CI 0.780-0.972, p=0.013). Patients in the non-shockable group with an in-hospital cardiac arrest were associated with a lower likelihood of survival to 24 hours compared to those with an out-of-hospital cardiac arrest (OR=0.076; 95% CI: 0.011-0.508; p=0.008).

Conclusion:

After matching for the previously unstudied impact of initial presenting rhythm on ROSC in cardiac arrest, this study found that sodium bicarbonate negatively impacts mortality in shockable rhythms. This study adds to the growing body of literature that sodium bicarbonate administration during cardiac arrest has a potential negative impact on ROSC, survival to 24 hours, and survival to discharge.